Financial Innovation in the Banking Sector of the US and the UK

A thesis

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"A good student is not always a good researcher..." but an excellent supervisor could make an adequate researcher,.....Professor Dow and Dr. Ghosh you were that supervisor.

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Αυτη η προσπαθεια αφιερωνεται
σε εκεινους που ακομα και
πεσμενοι, τολμουν να κοιταζουν
τον ουρανο !

"Philosophy begins in wonder"
Theaetetus
Plato, 375 BC

Abstract

Financial innovation is the subject of this thesis. The purpose of this thesis is to build up the first comprehensive theoretical framework able to analyze the causes, nature and process of financial innovation, in other words the first holistic and integrated approach to the phenomenon of financial innovation.

Initially, we review a significant part of the available literature on innovation. Then we discuss the financial innovation-related literature, and incorporate some features from the general innovation literature. We introduce an analytical framework and model that accounts for the process of financial innovation. The novelty of the model is that it takes into account the *integral* process of financial innovation and for the first time combines elements from both standard and financial-innovation theory. Initially we present a set of factors that cause financial innovative activity. Furthermore, we highlight the fact that very often, more than one cause contributes to the initiation of innovative activity.

In contrast with the existing literature, Silber (1975), Kane (1981), Miller (1986) and Tufano (1989), we elaborate further on the phenomenon of financial innovation by taking into account the factors that shape the innovative firm, mostly internal to the financial institution and very often related with the innovation-originated concepts. Then, we classify financial innovation according to five criteria, two of them commonly found in the innovation literature, one novel and the other two derived from the BIS (1986) classification. Finally, we present seven criteria that a financial innovation fulfills in order to be successful and "survive".

A further contribution of our model is its dynamic approach. We highlight this dynamic process, by citing examples of financial innovations that were created in order to address the shortcomings of existing innovations. In order to provide the supporting evidence for the above model, we discuss in great detail four clusters of financial innovation: special bank liabilities, derivative products, securitization and plastic cards.

During our research we encountered many financial innovations that took place in different places and times and under different circumstances. Our model provided us a *unique* analytical framework able to analyze each and every financial innovation in relation to its causes of emergence, factors that shaped the innovative output, classify in a detailed way this output and understand the reasons that enabled the survival of this innovation. Our analytical framework is not a single dimensional linear model but a dynamic, multi-level framework subject to evolution, able to provide a holistic, integrated and ageless approach.

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Abbreviations

ABC	:	Assets Backed Certificate
ABS	:	Asset Backed Security
ATM	:	Automated Teller Machine
ATS	:	Automatic Transfer Service
BIS	:	Bank of International Settlements
CA	:	Capital Adequacy
CAR	:	Certificate of Automobile Receivables
CARD	:	Certificate for Amortizing Revolving Debt
CCBN	:	Credit Card Backed Notes
CC	:	Cash Concentration
CCC	:	Competition and Credit Control
CD	:	Certificate of Deposit
CMA	:	Cash Management Account
CML	:	Centralized Mortgage Lenders
CMO	:	Collaterized Mortgage Obligation
DIDC	:	Depository Institutions Deregulation Committee
DIDMCA	:	Depository Institutions Deregulation and Monetary Control Act
EFT	:	Electronic Fund Transfer
EFTPOS	:	Electronic Fund Transfer Point Of Sale
FDIC	:	Federal Depositors Insurance Corporation
Fed'	:	Federal Reserve Board
FHLMC	:	Federal Home Loan Mortgage Corporation
FNMA	:	Federal National Mortgage Association
FRA	:	Forward Rate Agreement
FRN	:	Floating Rate Notes
GMC	:	Guaranteed Mortgage Certificate
GNMA	:	Government National Mortgage Association (Ginnie Mae)
ICA	:	Interbank Card Association
IMF	:	International Monetary Fund
MBS	:	Mortgage Backed Security
MINI	:	Mortgage Intermediary Note Issue
MMC	:	Money Market Certificates
MMD	:	Money Market Deposit
MMDA	:	Money Market Deposit Account
MMMD	:	Money Market Mutual Deposit
MMMF	:	Money Market Mutual Fund
NBFI	:	Non Banking Financial Intermediary
NBI	:	National BankAmericard service Incorporated
NOW	:	Negotiable Order of Withdrawal
OBS	:	Off Balance Sheet
OTC	:	Over The Counter
PC	:	Participation Certificate
PLC	:	Product Life Cycle

POS	:	Point Of Sales
POW	:	Payment Order of Withdrawal
PSL	:	Public Sector Liquidity
R&D	:	Research and Development
RP	:	Repurchase Agreement, (Repos)
S&L	:	Savings and Loans
SEC	:	Securities and Exchange Commission
SPV	:	Special Purpose Vehicle
SSC	:	Small Savers Certificates
T/E	:	Travel and Entertainment
VaR	:	Value at Risk

Introduction

".....the Necessity of forming abstract Ideas, and universal Theorems, arises perhaps from the Limitation of our Minds, which cannot admit an infinite Multitude of singular Ideas or Judgments at once, yet this Power gives us an Evidence of the Largeness of the human Capacity above our Imagination."

T. Hutcheson , 1988

Introduction

This research is about financial innovation in the banking sector of the US and the UK over the last thirty years. The purpose of this study is, to discuss the phenomenon of financial innovation, and build up a comprehensive theoretical framework by which to analyze the causes, nature and process of financial innovation, using examples from the US and the UK. We have also to add that we are going to discuss the phenomenon of financial innovation from the microeconomic perspective i.e. from the banking financial institutions' point of view. Before discussing financial innovation we have to briefly discuss certain major innovation-related issues.

It is certain that, innovation is extremely important for the capitalist system regardless of whether someone is pre-occupied with its evolution (Smith 1776) or its destruction (Marx 1848). Unquestionably, the first economist who paid particular attention to innovation's role in the economic system was Schumpeter (1912). In addition prominent evolutionary economists declared that innovation and selection characterize the dynamic interpretation of the economy; explaining that innovation destroys the existing organizational routines and creates new ones (Nelson and Winter 1974).

From another angle, the financial sector day after day becomes of paramount importance for the economic development and growth of the world. Financial innovation is crucial for any development in the financial sector (Gardener 1988). Consequently, financial innovation is considered to be the 'engine' (Merton 1992) of the economy. Financial innovation is a reflection and a cause for the structural changes observed since the 1980s (Llewellyn 1992).

The history of economic thought on financial innovation is not as deep-rooted as standard innovation theory. The current literature on financial innovation is shaped by the approaches of the pioneers Silber (1975) and Kane (1981). Both of them are extremely useful, but the former is very general and the latter is considered very narrow. Other economists such as Van Horne (1985), Miller (1986), Llewellyn (1992), and Merton (1992), concentrated their effort on the potential causes of financial innovation. Other researchers paid particular attention to classification, such as the BIS (1986) report, Walmsley (1988) or Tuffano (1990). But all of them failed to provide a more integrated and holistic approach that discusses the phenomenon of financial innovation. The only comprehensive effort was the BIS (1986) report that discussed, in considerable depth, both causes and types. But primarily, it failed to address significant areas of financial innovation such as the financial institution and successful features of financial innovation and secondly, further developments took place since its publication which showed it to be inadequate.

To be more precise, none of the above contributions managed to address the phenomenon of financial innovation under a wider spectrum, able to provide a comprehensive analytical framework, and a model. The fragmented nature of their approaches did not offer an integrated insight taking into account causes, financial institutions, types and successful features of financial innovations. They were also extremely reluctant to adopt concepts emanating from standard innovation theory. Furthermore, they did not provide numerous and in-depth examples in order to support their approaches. Finally, all authors apart from Kane (1981) and Merton (1992) omitted the dynamic perspective of the phenomenon of financial innovation. Besides, Kane (1981) discussed only a particular case of dynamic response, attributed to external reasons (re-

regulation) and Merton (1992) proposed only, a one-way, dynamic approach justifying the emergence, standardization and further development of a particular financial innovation.

Hence there is significant scope for research, in order to create a model and construct an analytical framework that will provide a holistic, integrated insight into the financial innovative process. Such an analytical framework would be better equipped to explain the innovative process than a narrow and self-limited - due to its fundamental assumptions - formal model. In a fundamentally uncertain world, involving endless multilevel equilibria (Nelson and Winter 1974), an analytical framework capturing multiple causality and dynamics is very useful. This model and framework requires also considerable supportive evidence from existing financial innovations. We made an attempt to create this model and offer the appropriate analytical framework, backed up by the relevant supportive evidence.

In order to create this model of financial innovation we follow a particular methodology. We will initially review the standard innovation theory literature, in order to extract an initial model of economic evolution and some concepts related to innovative activity applicable to all sectors and industries. Then, we will review the existing literature on financial innovation in order to create a new wide set of causes, integrate novel factors that shape the innovative process - for the first time - inside the financial institution, provide an adequate process of the emergence of innovations, a detailed and adequate descriptive and novel classification, and finally a novel set of successful features of financial innovations. We also take into account the dynamic perspective of this model and finally support it with adequate evidence from the financial sector. In order to provide the supportive evidence, we have to make a comprehensive presentation and synthesis, from the numerous financial innovations, into a coherent group and follow their development. This synthesis is in itself a further contribution.

Our model of financial innovation will provide us a unique analytical framework that will enable us to assess the potential causes of innovative activity, formulate a set of factors that shape this activity, classify accurately and detailed the innovative output and look for a set of criteria in order to have the emergence of a successful financial innovation. Our approach is not restricted to a particular set of innovations or financial system and it is not static, single dimensional or deterministic. It provides a multi-level, dynamic model, open to further evolution, applicable to any financial innovation in any financial system.

During our research, we had to make some choices, initially in relation to time and place. We decided to discuss the two most advanced financial systems of similar characteristics, the United States (US) and the United Kingdom (UK); this would allow us to identify different innovative processes arising from similar but not identical systems. We decided to cover a period of thirty years in order, primarily, to have a significant amount of supportive evidence and secondly because of the fact that, since the 1960's, significant innovations have taken place, such as securitization, NOW accounts, the massive adoption of plastic cards by banks and later financial derivatives. We had to make some choices in relation to the innovations that we decided to investigate; we investigated two predominately retail or commercial banking products such as special deposits liabilities and plastic cards and two more corporate or investment banking products, such as derivatives and securitization.

Our choices do not imply that other products such as loans or equity-related products were unimportant or of a trivial nature. We had to take some decisions, given the limitation of time and resources. The above four product *clusters* were chosen because they represent a significant part of banks' activities and exhibit very interesting innovative trajectories. These features were not abundant in the other two types of products: equity related financial products (BIS, 1986) and loans, which did not show the same innovative

activity as the already-mentioned products. We are going to investigate the phenomenon of financial innovation from a microeconomic perspective. We adopted an appropriate classification: external, internal and mixed causes to the financial institution. This is to be distinguished from the potential distinction between exogenous and endogenous causes of financial innovation, which apply rather to the context of macroeconomics and growth theories. Furthermore, as we are going to mention in the last chapter, there is scope for further research on these products in the future.

In order initially to build up the model and the analytical framework of financial innovation, and then the supportive evidence, we are going to structure our research in two parts.

The first part is divided into two chapters and provides the literature review, the model and the analytical framework of the financial innovation process. Initially, we are going to discuss the available literature on both standard and financial innovation theory. We are going to discuss briefly the role of evolution in innovation theory and Darwin-inspired evolutionary economics and we shall refer to factors affecting innovative effort and pay particular attention to R&D, sectoral differences and aspects that influence the profitability of innovation. Then we shall review the main theories of financial innovation and classification of the innovative output as well as the potential benefits and shortcomings of financial innovative activity

In the second chapter we are going to present our model and analytical framework. It is divided into four stages, causes, the financial institution, classification and successful features. We are going to include also a dynamic element in order to endow it with an evolutionary and dynamic perspective.

The second part is divided into four chapters and provides a comprehensive synthesis of four cluster of financial innovation and the supportive evidence for our model.

The third chapter discusses the emergence of special bank liabilities in the US an the UK such as NOW and Super NOW accounts, MMDA, MMMF, ATS, and in the UK CDs and interest-bearing accounts.

In the following chapter, we analyze the emergence and proliferation of financial derivatives such as forwards and futures contracts, swap agreements, financial options, swaptions, credit derivatives and Var models.

The fifth chapter discusses the securitization phenomenon in the US and the UK, and particularly SPV, credit enhancement, Ginnie Mae, PCs, CMO's, and other asset backed securities, and in the UK, MINI, HOMES.

The final chapter of the second part analyses the emergence of plastic cards in the US and the UK. The most common examples are credit cards, debit cards, smart cards, EFT/POS and ATMs.

During our conclusion, we are going to recapitulate all the supportive evidence, in the light of the analytical framework which had been developed in chapter 2. This allows us to reassess the capacity of the resulting model to provide a significant insight and capture the dynamic nature of financial innovation. At the end of this chapter, we are going to propose areas of potential future research.

In this introduction, in summary, we have discussed the theme of our research, starting from the shortcomings of existing academic work, and the scope for our endeavor. We also elaborated on the structure of our research; We proceed now, in the first chapter, to review the existing literature on theories of innovation and financial innovation.

1 Theories of Innovation and Financial Innovation

Introduction

During this chapter we shall discuss innovation and financial innovation related literature. The first part of this chapter is related to theories of innovation. We are going to investigate the different perspectives in relation to whether invention, technical change and innovations are considered as endogenous or exogenous to the economic system. By discussing its endogeneity, we will be able to understand later the factors that affect its emergence.

Then we shall enrich our insight by applying some analogies between economic and innovative activity, and the theory of evolution. These analogies highlight the evolutionary nature of the economy via innovative activity and the selection process that takes place among firms. This economic evolution differs from the natural one since it is not random; it follows a path and has a predetermined target: profitability. This profitability is not the neo-classical predetermined one; it is a much more complex concept. It is associated with the notion of survival in a continuously evolving economic context, where innovative activity is the only way to succeed.

Then we shall discuss the two main approaches of the theory of innovation: supply-push and demand-pull. The former is going to be enriched by the evolutionary economics approach in order to provide a more dynamic interpretation of the phenomenon of innovation. This interpretation requires also a discussion of the importance of firm size and market structure for the innovative effort. This discussion provides us with a plethora of concepts and theories; in order to adopt a more structured approach we shall introduce the

concept of sectoral differences and cumulativeness of the innovation. Finally we shall investigate some concepts related with the profitability and diffusion of innovation in order to better understand the factors that shape the innovative effort of a successful innovation.

The second part of this chapter is devoted to the financial innovation theories. Initially we shall discuss the first two theories that discussed the phenomenon of financial innovation and proposed a set of causes. Then we shall review other more recent but equally important contributions on causes of financial innovation. Sometimes researchers repeat already advanced causes but we will create a synthesis of underlying causes that could initiate the financial innovation. This review will provide us with a set of thirteen causes that could be subdivided into three categories that we shall use in our model. The next area that we shall discuss is the types and classifications of financial innovations in the literature. Some of these types are very general and some of these classifications are very narrow. But we are going to alter some of them and use others in order to find the most appropriate ones for our model. Finally, we shall discuss the benefits and problems that could be created from financial innovation. We are going to use the benefits as features that will make a financial innovation successful, while problems could be a cause for further financial innovations.

Part I

Chapter one

'If I had been taught in my youth all the truths of which I have since sought demonstrations... I would never have acquired the habit and ability that I believe I possess, always to find truths in proportion to the effort I made to find them ...'
Rene Descartes (1526)

1.1 Theories of innovation

During the first part of this chapter, we are going to discuss the innovation related theories. We are going to review their historic development and highlight the factors that could influence the innovative activity.

1.1.1 History of economic thought, technological change and innovation

The first section is devoted to discussing innovation's place in the history of economic thought; when it was first mentioned and whether it was perceived as exogenous or endogenous to economic variables. After a brief reference to Smith, Marx and Hicks we develop mainly Schumpeter's work and his paramount contribution, and Galbraith's complementary views. We add the analogy between innovative activity and Darwin's theory of evolution. Then we are going to discuss the 'supply-push' and 'demand-pull' theories of innovation. We conclude with the evolutionary approach to theory advanced initially by Nelson and Winter.

1.1.1.1 Smith, Marx and Schumpeter

The currently generally accepted point that innovation is the main source of enterpreneurial dynamism was not always an unanimous point. This is mainly because innovation is related with the famous 'black box' i.e. the enterprise, and it was not one of the most popular themes of classical economists such as Hume, Ricardo, Malthus or Mill (Humanidis 1995). But two very prominent classical economists, Adam Smith (1776) and Karl Marx (1848), were the first to pay particular attention to the complicated relationship between scientific progress, market conditions, diminishing returns and innovative activity.

Smith was the first to attribute two important elements to technical advance in order to connect it with economic activity: the required financial investment and the potential advantage and commercial gains that it could provide. By observing the industrial revolution and the significance of the division of labour in the process of improvement of production, he realised that the main improvements were originated by individuals *seeking truth for its own sake*. This makes it difficult for us to categorise these improvements and advances as endogenous or exogenous to the economic system, but at least he gave them a prominent place in his writings. He distinguished three types of invention and innovations: labour-emanated, specialised and technician-emanated and speculative or the combination of different components or technologies, (See appendix [A-1.1] which sumarizes the classification for a range of key thoughts.) This contrasts with Malthus and Ricardo, who considered the advancement in technology as exogenous to the economic system (Kamien and Schwartz 1982).

The first to perceive innovative activity as entirely endogenous was Marx, who discusses technological change from a different angle. He is the first to further analogise with biology and describe the economy as a *changing organism* where technological advance occurred from *within* the organism. The owners of the means of production did not merely initiate, but mostly reacted to, and took advantage of the technological change (Kamien and Schwartz 1982). Consequently, Marx considered innovation as part of the *normal* operational strategy of existing enterprises (Oakley 1985) and not as Schumpeter, who treated the innovator as an 'outsider'; capitalist enterprises were perceived by Marx as inherently innovative.

It is easy to understand why classical economists did not give much thought to the particular character of progress in the emergence of innovations. Technical advance frequently depended on the right person being in the right place at the right time. While

Galvani was dissecting frogs, he realised the electrical properties of metals, the basis of batteries. Watt's development of the steam engine began with his attempt to repair an earlier engine of Newcomen, and Bassemer's steel-making process preceded its scientific foundation. It was not until 1876 that competition among manufacturers of dyes compelled Farbenfabriken Vorm, Friedrich Bayer & Co of Elberfeld in Westphalia to hire professional chemists and establish the first industrial ***research*** laboratory. This example was followed by Eastman Kodak (1893), General Electric (1900) and AT&T (1925). As Freeman (1982) stressed, the corpus of knowledge (macromolecule and physical chemistry, nuclear physics and electronics) could never have emerged from casual observation, craft skills or from trial and error in existing production systems as was the case with many earlier technologies.

Later, Hicks in his *'Theory of Wages'* (1932), makes a serious effort to bring some insight to the occurrence of technological advance. He divided it into two components: autonomous and induced. The second takes the form of the substantial amount of technical advance that was induced by producers attempting to reduce their need for expensive factors of productions. It is obvious that producers have a significant active role in determining their technology, hence we have a clear sign of at least partial endogeneity.

Unquestionably the economist whose name is associated irrevocably with innovation is Joseph Alois Schumpeter. He accepted ideas outside the Austrian School and particularly from Walras. He placed high hopes in mathematics and empirical research. He tried to explain the development of the capitalist market system as a complicated integration of historical facts and philosophical-sociological considerations. He perceived the role of innovations as the development that breaks the stationary economy and generates an equilibrium position on a higher level.

In more detail in 1912 in his '*Theory of economic development*', he recognises economic development as a process which originates from within the system; hence the driving forces are inherent to the system. He focused on the microeconomic fundamentals in order to define these forces and identified innovation as a source of change. He defined innovation as the success of new combinations covering five cases: ***new products***, ***new production processes***, access to ***new markets***, exploitation of ***new sources of raw materials*** and implementation of ***new organisational structures*** (see appendix [A-1.1]).

He also stresses that the role of the entrepreneur is characterised by imagination, creativity and striving for power over others. His motivation is to break the circular flow of income and to pursue even temporary profits and quasi-rents[1] through the introduction of innovation. These developments destroy the old way, in other words the entrepreneur is deeply involved in this 'creative destruction', in striking contrast with the static-oriented manager whose activity is in conformity with the circular flow. The evolution of the capitalistic market is based on this destruction (Schumpeter 1942).[2]

He advocated that competition through innovation has the attribute that it is *not restrained by the firm's acknowledged rivals*. Uncertainty is fundamental and he believed that monopoly power and large size could reduce it. He predicted the gradual decline of the role of the entrepreneur and the emergence of large, management-driven enterprises[3] and that innovation was going to take place in huge research laboratories functioning in a controlled, routinized and impersonal manner.

This point was also supported by Galbraith, one of the leading 'institutionalists' who perceived the institutional structure of the US as an interconnection of ideology, politics and economics. A key factor is large corporations which free themselves from market constraints. In relation to innovation, he declared that the era of cheap invention was over (Schumpeter 1952). Hence the remaining costly inventions required significant

resources and technological expertise. Consequently they could only be undertaken with resources of the magnitude commanded mainly by large firms. He also adhered to the Schumpeterian concept of competition through innovation as the more efficient type of innovation since it is very difficult to tacitly restrain and control it.

To summarise, during this subsection, we have discussed the emergence and perception of innovation in economic thought and its place in the economic system. Smith stressed the importance of technology via specialisation and division of labour. Marx stressed its importance for the evolution of the capitalist system, and its endogenous nature. Hicks discussed the endogenous part of technological advance. Finally, Schumpeter highlighted its importance for economic change and agreed with Galbraith in their prediction that large firms are better fitted to undertake it. In the following section we will propose an analogy between Schumpeter's economic theory and Darwin's evolutionary theory.

1.1.1.2 Schumpeter and Darwin

During this section we are going to discuss the potential application of Darwin's evolutionary theory (more fully explained in appendix [A-1.3]) to Schumpeterian economics. It is possible to derive some very interesting analogies and a model to explain the capitalist system and particularly its change and evolution, by the 'creative destruction' of the system (see Hodgson, 1995 and Kelm, 1996).

Darwin proposed that the evolution of all species follows a concrete trajectory. Initially there is *information storage* by which relatively stable characteristics are preserved over time, then there is an *endogenous change* by which new variations are constantly randomly generated and finally the *selective retention* by which the frequency of some variations relative to others is increased. The final selection is based on the fittest variation

that could live long enough in order to pass its adaptive variation to its offspring. The above universally applicable trajectory led him to propose the cumulative causation theory.[4]

If we remove the particular biological content, we derive a model and a theory that could explain the process of endogenous change and identify the fundamental mechanisms of information storage, endogenous change and selective retention.

The *Information storage* takes place in business routines.[5] Like genes, they contain information about individual habits and organisational behaviour. They yield an inherent inflexibility and predictability, but also routines facilitate the daily tasks and reduce the need for limited cognitive capabilities even if they could often act as approximate temporarily rational optimisation.

The second stage of Darwin's theory is the endogenous change. By conceiving of innovation as the mechanism of *endogenous change* we could then analogise further with biology where this change is driven by mutation and recombination.[6] We can find similarities with the process of industrial mutation which incessantly changes the economic structure from within. Schumpeter's broad concept of innovation comprised all instances of 'doing things differently' and 'any change in the channels of economic routine.....arising from within the system' (Kelm 1996, p12). Innovation is a 'sui generis' task whose difficulty consists of the resistance and uncertainties inherent in doing what has not been done before. This 'genuine uncertainty' which consists in the 'unlistability of all possible outcomes resulting from a course of action' (ibid).

But despite the uncertainty, these innovations are **not** random in the same way as biological ones. We could identify many elements such as conscious rationality, intuition, perceptiveness, will and leadership embodied in entrepreneurship which provide a guided variation based on the existence of adaptive standards. These standards are the expected

profits through low costs and differentiation. Both require at least some equilibrating tendencies - a major Schumpeterian concept - in relation to the existing price (Kelm 1996).

Finally the third stage of Darwin's evolution, natural selection is associated with the *selective retention* expressed under the profit seeking goal i.e. the generated variations are not random since they are guided by the above-mentioned adaptive standards. Natural selection **is** the differential survival and reproduction and could not be judged as moral, immoral or providential; it is a pure observation or empirical fact. The existence of an active agent gives birth to the selective retention mechanism that exists taking into account the possibility of imitation and even further learning opportunities. This interaction between innovation and later imitation has the character of a *cumulative learning* process. The transmission process is biased by the adaptive standards i.e. profits plus the element of chance.

Schumpeter's competition concept of differential survival of firms could constitute an analogy with the Darwinian concept of selective retention. The absence of a central conscious agent accounts for lack of foresight and the appearance of significant scope and strong incentives for innovation and learning. An innovation could seriously threaten firms with destruction but at least some of them escape by adapting themselves to the new environment in a process of biased transmission. We have also to add that these new opportunities could be considered as *positive* externalities for existing firms.

To summarise this interpretation of Schumpeter based on Darwin, innovation could be perceived as a guided variation of routines carried out by entrepreneurs, adaptation to innovation by biased transmission to other firms and finally elimination of firms incapable of adaptation by natural selection (Kelm 1996). It is essential to explain that Schumpeter avoided using Darwin's terminology extensively for the main reason that the period in which he formulated his theory of economic change was characterised as the triumph of

positivism; the theory of evolution still lacked some definite proof (Britannica 1995). It is an indisputable fact that Darwin offered a universal framework for evolutionary theories and elaborated further the point of cumulative causation. In the following section we shall see more recent theories of innovation.

1.1.1.3 Market based theories: the 'supply-push' and the 'demand-pull' approaches

It was after the second world war that innovation began to appear occasionally in economic journals and academic papers, mainly from US-based economists where the theory of innovation drew attention to the market framework. The focus had moved from its role in the economic system to whether firms are able to determine and improve their innovativeness. Some authors discussed supply-push theories but the majority of the early post-war research focused on demand factors that could influence the innovativeness of a firm.

The 'supply-push' or 'technology-push' theories was initially advanced by Nelson (1959) and Philips (1966). This approach is partially associated also with the evolutionary approach (see section 1.1.4 below). The two main points are the advantage that large firms with large research facilities have and the importance of progress in the scientific base for the emergence of innovations. Two of the best examples were the invention of laser and nuclear power which led to numerous commercial, applications unthinkable before. The technology-push approach could be summarised in the point that the growth of the scientific basis leads to more competition in industry, but often scientific base and competitiveness are interdependent.

The main feature of the 'demand-pull' approach is that innovation is initiated from the marketing or production side of the firm, requiring a response from the research personnel. The synthesis of cortisone, transistors and celluloid in the chemical sector are

important examples of the above theory (Schwartz and Kamien 1982). This theory implies also that large firms with large marketing and research facilities have a comparative advantage.

Smookler (1966) studied the 'demand-pull' in contrast with the 'technology-push' theories. He analysed the pressure on innovative activity (or the opportunist behaviour; see Kamien &Schwartz 1982) and the patenting behaviour of large firms. He proposed the concept that the effectiveness of any innovation depends on two main factors: the number of people that use it (size and structure of the market) and their capacity to improve it. Rosenberg (1979) also adhered himself to this approach and expanded further, as we shall discuss in the next paragraph. Smookler's innovation is a two sided or coupling activity: like the two blades of a pair of scissors (Freeman 1982). It requires on the one hand the recognition of the potential needs and markets and on the other hand the technology and the result of research.

Other economists have also stressed initially the demand side in opposition to the scientists 'science push' theories by stating that 'necessity is the mother of invention'. Rosenberg (1979) cited as a very illustrative example the chemical sector's efforts in the 1970's to reduce costs, which increased significantly after the oil crisis in 1973. He claimed that innovators should know the market as Marconi knew the area of wireless communication and IBM knew the area of personal computers. He used the opposite examples for EMI in the computer business and AEI, the British firm in radar where excellent research did not match actual needs.

One of the strongest arguments for the 'demand pull' adherents came from the SAPPHO project. It tried to propose some general principles by comparing 100 pairs of innovations in the UK from 1945-1976: one successful innovation and one failure in each pair.[7] They identified three main categories: firstly factors in common to every attempt to

innovate, secondly factors that vary, but not systematically, related to failure and thirdly measures that discriminated success and failure. They also proposed that specialised rather than general contacts are important, and that the size of project team is important. Only the third question is close related with our research and the only clear answer for this was the degree of 'user-need' understood (Freeman 1982).

The more recent research, investigating innovative activity has focused in a lesser degree on the science or technological factor, and primarily on the demand factors that could initiate innovative activity. Freeman (1982) added that the apparently random, accidental and arbitrary character of the innovative process arises from the extreme complexity of the interfaces between advancing science, technology and market. Therefore, firms which monitor the advance in science and technology are better positioned, firms in close contact with customers could recognise potential markets, and a good management team is able to link these two flows of information.

During this section, we have highlighted the importance of both suppliers and potential customers in the innovative process. In the following section, we will discuss the evolutionary approach which is trying to integrate more than one aspect of this market-oriented analysis with the Schumpeterian approach, by sometimes borrowing biological analogies, and gives us the first idea about the diverse factors that we will discuss in the second part.

1.1.1.4 The evolutionary economics approach to innovation

It was mainly after the oil crisis where innovation-related areas, such as inventions, pattern and diffusion of innovation, began to be one of the most contemporary issues of economics around the world. A significant part of this 'popularity' was due to the so called 'neo-Schumpeterian' economists, members of the evolutionary economic school. They

challenged many of the fundamental assumptions of the neo-classical approach, such as profit maximisation and the predictability of economic agents' decisions. We strongly believe that, their approach could provide a significantly more ***integrated*** and ***holistic*** insight and interpretation of the economic system and its components such as innovation. This section could also be perceived as an introduction to evolutionary economic thought.

It is impossible to discuss the evolutionary approach and omit Thorstein Veblen. He was one of the most radical thinkers, stressing the important role of giant corporations and institutions (Veblen 1904). He advocated that humans naturally always tend to improve their methods of meeting their generic needs by innovating as a result of 'idle curiosity'.[8] He also proposed that a theory of innovation has to answer two main questions: is it more serviceable and is it consistent with the existing distinction ?

Two of the first evolutionary economists were Nelson and Winter (1974) who focused their research primarily at the firm level. They challenged the neo-classical orthodoxy in proposing the evolutionary interpretation of economic phenomena, by stressing the Schumpeterian evolutionary approach to understanding capitalism. They argued that the real competitive environment is characterised by struggle and motion. This is a ***dynamic*** environment where the main forces that enable the evolution and growth of the economy are innovation and selection. The continuous interaction between the single firm and its environment is the main component of their evolutionary approach.

This evolutionary approach explains the firm's behaviour as governed by a set of observable decision rules that are in direct relationship with the environment and are not by definition related to maximisation. They are not irrevocable but they are characterised by short-term stability. An important part of these decisions is related to **problem-solving** and search procedures. They interact with their environment and their competitors and one

element of paramount importance for the survival of the firm is the analysis of the selection procedure.

This approach creates an immediate place for innovation: it is a change of existing rules and is governed by the observable profit-seeking and problem-solving behaviour of firms. They observe a remarkable diversity among sectors (something we shall discuss in 1.2.1.2) and the extent that a firm decides to search and innovate depends considerably on the *institutional* and *environmental* conditions of the *particular sector* and *period.* In other words there is a continuous interaction between a firm and its surroundings.

Nelson and Winter (1982) proposed that these routines could be considered as '*organisational memories*' and have durable functional characteristics. Every time profits are below a satisfactory level, management alter these routines. By borrowing biological terminology, in accordance with the previous section, genes (routines) are subject to mutations through time. This approach does not conceive the 'variations' as random and promotes a more Lamarckian interpretation.

Winter (1986) proposed that heavy empirical evidence highlights the importance of experience and praises adaptive behaviour as the most close approach to real world-decisions. In order to express the uniqueness of every period and irreversibility of every decision, Winter did not hesitate to cite the Heracleitean point that it is not possible to step twice in the same river.[9] It is certain that this description of the economic system promotes the notion of the endogeneity of the innovative process.

In addition, Hodgson (1995a) in accordance with Witts (1991), opposed the classical mechanistic model where actions are treated as programmed and reactive and changes are imposed from outside. He also supports the uniqueness of each individual situation in direct contrast with other economists such as Koestler (1964) who have

underlined the role of metaphor in creativity. Witt perceived metaphors as useful and a juxtaposition of two different ideas acting as a ***cross-fertilisation***.

In relation to the predictability of 'rational' operating agents, Hodgson (1995a) observed that these non-linear dynamics could justify the introduction of chaos theory, which proposes to treat the world always as *indeterministic* and *unpredictable*. Novelty is considered as spontaneous and free, very often associated with innovation. But this approach raises some key issues: it does not matter if economic agents act in a random or determinate way, or there is path dependency i.e. history matters is the rule. He believes that bifurcation and 'butterfly effects' suggest and reinforce irreversibility. Any amplification of small fluctuations is able to provide endless novelty, can exhibit higher-order properties. It is obvious that this approach challenges the reductionist theory that a system could be broken down into parts and each part studied separetely. The association of innovative activity with this irreversibility is clear.

At this point, Heertje (1988) went much further, arguing that new chaos theory, complicated equation and non-linear dynamic systems could introduce maths to Schumpeter's theory and position his theory as a mainstream one.[10]

Nelson, Winter, Dosi and Witt proposed as an alternative the strong interaction between society and the individual i.e. an organicist non-mathematical formalist approach.[11] They argued against the validity of the main neo-classical assumptions that economic agents are always predictable, profit maximising agents. Innovation and selection characterise their dynamic interpretation of the economy. Innovation destroys the existing organisational routines and creates new ones. Unpredictability is also supported by the existence of endless multilevel temporal equilibria in the system.

From 1980 onwards, a plethora of articles appeared and we will have the opportunity to discuss their contribution and findings during the following sections of this

chapter. It is imperative to mention from the beginning that the adherents of the evolutionary theory (Winter, Freeman, Dosi, Nelson, Soete) did not - up to this point - manage to offer any new theory in order to explain the empirical evidence and adequately replace the neo-classical theory.

1.1.2 The factors that influence the emergence and diffusion of innovation.

After discussing the place of innovation in the history of economic thought, its importance for the survival of the firm and its role in the evolution of the economic system, we will now discuss the factors that influence the emergence of innovative activity and its proliferation and diffusion. We will not be concerned with macroeconomic aspects like national systems that promote innovation, or their impact on GDP growth. We will discuss initially the relationship between market characteristics and the emergence of innovation, then we will discuss patterns and differences observed among sectors, then later the financial aspects that could influence innovation and finally the factors that determine the success of an innovation in other words the diffusion and its profitability.

1.1.2.1 Market characteristics and innovation

We will address two different issues: the relationship between firm size and innovation, and the relationship between market structure and the propensity to innovate. It is obvious that these areas are interrelated as firm size is closely related to market structure. But in order to enhance the structure of our analysis we have to apply this distinction. Both approaches concentrated their discussion and contributions on the importance and impact of ***Research and Development*** activities on innovative output. This literature is

summarised in appendix [A-1.2], outlining contributions in the area of firm size and innovation.

1.1.2.1.1 Firm size and innovation

The relationship between the propensity to innovate and the size of the firm is probably the most frequently-discussed area of the innovation-related literature. As we will discuss later, the outcome of all these discussions is inconclusive. It is essential to mention that the vast majority of articles and papers include in their final part an industrial-policy recommendation. Since this is not the focus area of our research, we are not going to discuss it at all. Initially we are going to review the literature that defends the Schumpeterian point that large firms are better positioned than small ones and later the opposite approach. In both approaches Research and Development investment (thereafter R&D) is of crucial importance and both accept their close association with innovative output despite some objections mostly related to their limitations as a measure of innovativeness.

As we have already mentioned the first to argue in favour of large firms as major innovative institutions were Schumpeter and later Galbraith. Schumpeter highlighted the importance of big, established firms that are able to exploit their economies of scale during the innovative, and later production, process. Galbraith, observing the structure of current capitalist societies and the cost of innovation, advanced the point that only large corporations will be able to undertake innovative activity.

One of the first efforts to determine whether the size of firms determines the degree of innovation was Hambert (1963). He investigated 27 innovations that took place in the US during the period 1946-1955. The main proposition is that new inventions are usually high risk activities and the bureaucratic structure of large firms is not compatible with these activities. But in relation to *commercialised innovations*, large firms were responsible for a

higher percentage than smaller firms. He made a connection between R&D and innovative activity and pointed out that investment in R&D is associated with the large profits that characterise the monopoly or oligopoly market structures. An additional point was that big size is also a reason for better external finance opportunities. But he stressed that small firms historically count for major new developments (Williamson 1976).

Later Scherer (1965) investigated the relationship in the US between innovation and firm size taking into account *technological opportunities* and the possibility to apply the innovation over a greater output, also mentioned by Smookler (1966). Initially he did not find any significant difference between large and medium sized firms' expenditures, but later in the late 1960s and 1970s he adopted a slightly different - pro Schumpeterian - approach.[12] He went even further by mentioning the importance of the *cost spreading* principle since the higher the output the lower the cost per unit for R&D. He highlighted the point that the ratio of research over productivity of R&D is biased against large firms because the investment is spread over large outputs. He supported the argument that large firms are originators of the main bulk of innovations in the US and he sustained his point in later publications (Love 1997).

Kamien and Schwartz (1982) introduced the idea that a critical point exists between R&D expenditures and innovative activity. Up to this critical point, which varies from industry to industry, R&D is positively associated with innovative output (granting of patents). After this threshold is reached a negative relationship was observed. As Cohen and Klepper (1994) added that research and development expenditures are proportional to size, but patents are usually registered or obtained by large firms.

The importance of firm size in the innovative process is also highlighted in a survey carried out in the European Union in 1992, showing that more than 80% of large firms had reported innovative activities, in direct contrast with less than 30% of small firms.[13]

One of the first empirically based challenges to the importance of large firms in innovative activity is attributed to Freeman. Freeman (1982) makes the point, based on his historical review and his contemporary SAPPHO project; the blanket Schumpeterian hypothesis (re-enforced by Galbraith, 1969) of 'bigness wins' could not be sustained. He refers to the international SPRU[14] survey and Kleinman's (1975) research in the US in order to highlight the contribution of small and medium size to innovation output, disproportionate to their size. But he underlines the *limitations* of the R&D measurements by systematically omitting the contribution of managers, engineers and other staff taking place incidentally to their main work. He also highlights the cumulative nature of innovation and admits the importance of big corporations in particular sectors.[15]

The importance of small firms is further highlighted by Rowthwell (1986). Her point is that small and medium firms enhance national rates of technological innovation.[16] She uses Townsend's (1981) UK-based research to demonstrate the important contribution of small firms to innovative activity, especially in sectors such as mining and textile machinery, electronic capital goods and scientific instruments. She argues that we have to take into consideration entry and R&D costs as well as the age and type of the industry. She advances the point that in certain industries the structure of a small firm is *better fit* to undertake research projects. But she accepts the existence of 'dynamic complementaries' that could exist between large and small firms (as in electronics and semi-conductors).[17]

Acs and Audretsch (1988) investigated the origins of innovative output in the US using a wider sample than Scherer (1965). They based their research on data on innovation until 1982.[18] They found that R&D are positively related with patents and that innovations are positively related with R&D but at a decreasing rate.[19]

A very recent and thorough investigation of the existing literature has been made by Symeonidi (1996) on behalf of the OECD. He discusses three main topics: the links

between innovation and firm size, the arguments in favour of high concentration and large firms, and three issues related to the endogeneity of innovation.

He discusses the first issue by referring to empirical studies which totally dismiss Schumpeter's point of view (Scherer 1965) or others that more or less accepted it (Soete 1979). He mentions that only recent studies (such as Cohen-Levin 1989) control their econometric measurements for industry effect. He finalises his review by proposing that the large majority of small firms do not spend a significant amount on formal R&D research and consequently their share of patents or innovations over their *formal* expenditures are higher than the large firms one (due to the low denominator). He underlines also the existence of a certain threshold firm size where the R&D expenditure rises approximately proportionately with the firm size - always taking into account the different sectors, countries and moment in time. He concludes that the evidence is inconclusive.

His second topic is related to the Schumpeterian hypothesis that innovative activity is favoured by high concentration and large firm size due to high costs. He argues that high cost is not an absolute and unbeatable factor which prevents small firms from innovating. Simply we *expect* innovative firms to be large if the cost of R&D is high when we consider firm size and market structure as endogenous. He argues that evidence appears to exist that small firms' financial constraints act as barriers to innovation in some industries, highlighting simultaneously the importance of joint ventures on R&D projects. But he indirectly adopts Cohen and Klepper's (1994) point that indivisibilities in R&D costs could exist and that finally economies of scale and scope could possibly govern the production of innovation.[20] On the other hand, he challenges the Schumpeterian hypothesis that appropriability has a positive effect on R&D incentives by explaining the paramount importance of inter-industry variations.[21]

His third topic is recent empirical studies referring to the complications that endogeneity on both market structure and innovative activity could cause. He approaches the question of the ***first mover's*** possible advantages by underlining the importance of the *nature* of technology. The particular characteristics of every technological paradigm such as its degree of learning by doing (Foster 1986) or its organisational inertia (Swan and Gill 1993) determine the outcome of the question. The question of how and what the dominant design adoption will cause has no straight-forward answer. He distinguishes two approaches based on time, country and industry: innovation could precede (Jovanovic and MacDonald 1994) or follow (Klepper Graddy 1993) industry shake-outs.

Closely related to the impact of R&D's, Love and Roper (1997) took into account data from 300 UK manufacturing companies and introduced two other parameters that could contribute to innovative activity. These parameters are *technology transfer* and *networking effects.*[22] By investigating their data they propose that R&D, technology transfer and *networking* could be either substitute or complementary inputs for the innovative activity of the firm.

They refer to Audretsch's (1995) point that significant innovation could be incremental and just an alternative application of existing technology. The importance of ***incremental*** innovation for the improvement of efficiency over time, was also discussed in 1996 by Tidd, Bessant and Pavitt (1996). In a similar question Richardson (1996), makes the distinction that *routine* innovations[23] are treated as endogenous where radical innovations could be regarded as exogenous. But he admits that the distinction is not always possible.

During the same year Wood (1997) highlighted further the importance of Small and Medium Enterprises (SME) in the innovative process of the UK[24] and the association between R&D and innovation. He also observed that innovative activity is enhanced by the

existence of R&D and the existence of technically skilled staff using external (Government and University) generated information.

In summary, after discussing the argument in favour of large firms such as the cost of innovation, the importance of large R&D programs and the benefits from economies of scale, we elaborated more on the importance of small firms, the limitations of R&D or the patent system, and the existence of other R&D factors crucial for the innovative activity. The discussion is inconclusive since there are significant arguments and supportive evidence in both approaches. Consequently, we need more information in order to enrich our understanding of innovative activity. In the following section we shall discuss the relationship between market structure, innovative activity and uncertainty.

1.1.2.1.2 Market structure, innovation and uncertainty

At this part of our review, we shall discuss the different arguments advanced in relation to the connection between competitive and non-competitive market structures and innovative activity. During this section we are not going to encounter the plethora of empirical researches that we had in the previous section. The prevailing approach is that competition is a positive aspect despite the potential problem of *duplication*. The duplication aspect favours the existence of concentrated markets and large firms. Finally, we are going to discuss also the concept of uncertainty and how it is possible to reduce it by innovation.

The importance of competition for innovation is discussed by Geroski (1988).[25] He began his analysis by distinguishing static and dynamic efficiency.[26] The competitive environment boosts the effect of innovativeness on the static efficiency but it is very controversial to apply this statement to dynamic efficiency, especially if economies of scale exist on R&D costs.

He continues by explaining that monopoly can exercise a direct and an indirect effect on innovation activity. The indirect effect is always believed to be positive, i.e. monopoly boosts expected post-innovation returns and so increases innovativeness. But the direct effect may be negative, i.e. monopolists respond more slowly than competitive firms to a given level of expected post-innovation returns. Here again the final result is **not** possible to be pre-determined and have universal application. It *depends* on the industry's particular structure. Factors that we have to take into account are: the *barriers to entry* that new firms face, the *nature of innovations* complementary to existing ones, *complementarities* among research and marketing. His findings suggest that an increase in competition and in innovative activity are mutually reinforcing. His final argument enables him to be very critical of the Schumpeterian approach and he denies the existence of a trade-off between monopoly power and dynamic efficiency.

In a later paper, Geroski (1995) discusses the relationship between corporate performance and innovation generation. He uses 440 British firms covering a period from 1972 until 1982. He introduces the variables of growth, accounting profitability and stock market returns as measure of individual firms' success. He found little evidence for the existence of ***spillovers***[27] and the main advantages from the production of innovations are indirect for user industries. His main conclusion was that innovative activity is higher in competitive markets.

A more evolutionary and holistic view of the importance of competition for the technological perspective is also discussed by Dosi[28] and Orsenigo (1988). They discuss the relationship between industrial structure and technological innovation. They initially refer to similarities between biology and innovation by comparing innovations with *mutations* which, unlike the biological analogies, involve ***strategic behaviour***. These mutations transform the existing industrial structure.

This transformation depends on the evolutionary environment. The main characteristics of the environment are: the existing taxonomy i.e. the particular structure of the industry (Pavitt 1984), their technological asymmetries, their variety of production combinations and technological varieties (Metcalfe 1986). The final outcome depends on the different behavioural approaches of the individual sector and the balance between the two evolutionary processes; the learning and innovation process (mutation) and the competition and selection process (natural selection). The evolutionary process could present diverse dynamics and be path and behaviour dependent i.e. past actions could determine the direction and the final outcome of innovative activity. He finally advocated that competitive structures enhance the emergence of innovations.

An additional aspect of competition is extensively discussed in Sabido (1995). He adopts a combination of the Loury (1979) and Sah and Stiglitz (1987)[29] models, in order to test firm behaviour when it is possible to undertake more than one project aiming at the same innovation. He states that a competitive firm could increase its number of projects with the aim of bringing forward the expected date of innovation; he highlights that the role of timing is crucial. When *timing* matters, competitive market structure does have a positive impact on the pace of innovation even if firms are allowed to undertake several projects.

The relationship between R&D and innovation output is already investigated by many researchers. Economists advocating the importance of large firms or highly concentrated markets highlight the importance of R&D for the innovative activity. R&D and potential duplication are favouring this approach.

The main research that favours large firms and concentration was made by Cohen and Klepper (1996). They investigated the propensity to perform R & D and they referred to prior published papers that indicated that large firms do not undertake higher R&D

expenditure. At this point they introduced a new parameter, cost spreading, and focused particularly on the business unit level. This new approach could support the general argument that large firms indeed have an advantage in spending on R&D and they refer to four main results emanating from their data: the likelihood of performing R&D rises with firm size, R&D and firm size are closely and positively related within firms, R&D rises proportionately with firm size in most industries and the number of patents or innovation per R&D expenditure declines with firm size.

They proposed that market structure is also very important since an oligopolistic market tends to reduce the *duplication* problem in research and indirectly promote previously unprofitable and more risky projects which will increase the industry's rate of technological change. Adding that, the observed diversity of R&D capabilities in the real world enables small firms to coexist with large ones and they are able to survive if they possess distinctive research skills and even to exceed large firms' productivity of R&D.

A similar problem from the point of view of reduced competition was discussed by Poyago-Theotoky (1996). She uses a mixed duopoly model and limited appropriability of research results. She proposes that, due to the *free-rider* problem, privately-owned firms tend to underinvest in R&D, where public firms invest more than the private ones and overinvest in Nash equilibrium situations.

A concluding point could be related to the ***causality*** question as to whether market structure leads to innovation or the opposite. Symeonidis (1996). He refers to Shrerer (1967) who found a weak relationship between concentration and patents. This relationship was enhanced when others, like Kamien and Schwartz (1982), introduced research intensity as an explanatory variable. But even this weak relationship fluctuated considerably from country to country and from sector to sector. He concluded that there was little evidence of a relationship between R&D research and concentration. There is

even less evidence of a positive relationship between innovative output and market structure and finally that industry's particular technological opportunities explain better the above mentioned intesectoral and country variances.

After discussing market structure we could discuss some aspects applicable to all market structures. A very detailed analysis on factors like information, science, technology and uncertainty that we have to take into account in investigating market structure and innovation is included in Dasgupta and Stoneman (1987). Initially they discuss the notion of information. They make clear that its acquisition does not eliminate uncertainty but it is conceived as a signal which allows us to update the probabilities of various possible events. It is considered as a non-homogeneous commodity. They explain the priority rule that governs any scientific research. This rule encourages the *effort* and the *achievement* i.e. 'winner takes all' by promoting the public disclosure of new findings. This approach makes firms undertake risky investment in order to capture the unique prize.

They also refer to Arrow's (1962) themes of ***appropriability***[30] of innovation's benefits and lack of experience in order to assess the market value of the project. They suggest that information input could be perceived as a fixed cost of production and as a factor that affects the choice of investment projects and allocation of research funds. In competitive market structures they observed an adverse phenomenon of under-investment and a duplication of research effort. They also agree with Arrow on the point that economies of scale exist for low levels of information since they perceive it as a fixed cost and competition is not intensive at all.

The information for the project's uncertainty is further discussed by Kort (1996) where he discusses the firm's irreversible decision to undertake a self-financed research project and the level of uncertainty involved. He introduces the self-finance parameter by adopting the Kamien and Schwartz (1982) view, i.e. risky projects are expensive to finance

and self-financing firms show an abundant reluctance to disclose information.[31] Consequently significant *duplication* could take place.

The crucial factor about which market system is better, is related to the existence of ***spillovers*** i.e. one firm's research activity could have a positive impact on another firm's innovative activity and consequently an adverse effect on R&D activities. It was advanced by Aspremont and Jacquemin (1988) that co-operation via Research Joint Ventures (RJV) could enable the firm to internalise these externalities by cost reduction advantages for high values of the spillover parameter and for non-collusive product markets. We are obliged to distinguish between information (perfect substitute) spillovers and technological (less perfect substitute) spillovers.

The reduction of the uncertainty factor and Research Joint Ventures (RJV) are also discussed by Goel (1994). He analyses the concept of joint research and uncertainty under a duopoly regime in order to avoid wasteful duplication, since he believes that any research involves lack of information about competitors' resources and timing. This paper was also influenced by the emergence of legislation favouring Research Joint Ventures.[32] He concluded that, under a co-operative regime, the rapidity of innovation could cause 'crowding out' effects or a potential increase in the first partner's share will lead to a parallel shift of the second one (see also Fraja and Silipo, 1996).

To summarise, during this section, we discussed the importance of market structure for the emergence of innovation. Competitive structures tend to favour innovative activity but the duplication problem blurs the total dominance of that view. Uncertainty is fundamental for all market structures but especially for competitive ones, and the existence of spillovers and RJV could possibly reduce it. In the following section we turn to discussing sectoral differences in innovative activity.

1.1.2.2 Sectoral differences

The debate over whether large or small firms innovate more or whether R&D expenditures are related with innovativeness could be significantly more clear if we introduce the fact that there are other differences between firms. One of the most commonly cited concepts in the discussion of innovative activity is the variability observed between the different sectors of an economic system. This variability enables researchers to divide them into categories and highlight the role of *cumulativeness* in the innovative activity.

A very analytical review, covering 2000 significant innovations in the UK from 1945 until 1979 is made by Pavitt (1984). This paper made a significant contribution to the classification of inter-sectoral characteristics of innovations which was later adopted and extended by many other researchers (Dosi 1988, Geroski 1988, Freeman 1990). He mainly discussed the nature of these differences and adhered to the partially endogenous and cumulative perception of innovation.

He agrees with Nelson (1981) and Rosenberg (1976) that the neo-classical theory in relation to innovation has two important limitations: it considers as exogenous the production of technology and innovation and it does not reflect the considerable complexity of the nature of innovation. He uses the above mentioned data to try to build a body of both empirical and theoretical knowledge that could offer some insights into the nature of innovation and sectoral differences.

Initially he discussed the nature of inputs that enable the emergence of innovation. He identifies three types of input either coming from the same firm (intra-firm), from another firm or emanating from public infrastructure. He encountered some difficulties in measuring and allocating the relevant information because the notion of pooling and communicating of information is very vague and difficult to evaluate.

He then discussed the characteristics of the innovative firm. Again the different sectoral particularities affect the relative importance of innovation used inside the sector calling it *process innovation* and outside, or *product, innovation* (see appendix [A-1.1] on the classification of innovations). Where some sectors mainly use the first category (manufacturing) others devote their resources to the latter (chemical, electronic, electrical and instrument engineering).

After this stage he proceeds to his widely-accepted taxonomy of firms; it is based on the assumption that the characteristics of an innovative firm, due to the cumulative nature of innovation, are determined by its past i.e. its principal activities. His criteria could be summarised as: the sources of technology, user's needs and the means of appropriating benefits. Based on these criteria he distinguishes three main categories: supplier-dominated, production-intensive[33] and science-based[34] firms.

We are particular interested on the supplier-dominated firms which can be found mainly in areas such as manufacturing, agriculture, house-building and professional, ***financial*** and commercial services. They are small and their ***in-house R&D*** and engineering capabilities are ***weak***. The presence of the financial sector in this category will influence the place of R&D in the framework to be developed in the next chapter.

He argues that the relative importance of product innovation in a sector is positively associated with R&D and patent intensity and negatively associated with proxy measures of the scale and complexity of its process technology such as the capital-labour ratio. His taxonomy could also enable us to better understand diversification both in terms of R&D and technology and explanations of firm size and industrial structure depending on the type of sector.

Pavitt (1980) had already proposed that institutional innovations in education and training systems could explain some observed national discrepancies in productivity via

accumulated know-how, skills and innovative capabilities. He concludes his article by explaining that this taxonomy should be used bearing in mind the variety of possible interpretations and avoiding any generalisation, again because of the variety of characteristics.[35]

The existence of sectoral patterns among firms provides us with a significant clarification of competing approaches which we have already considered. This variability enables us to divide firms into three different types and for each type, R&D has a different significance. Undoubtedly this approach highlights further the importance of *cumulativeness* and enables us to further *endogenise* innovative, and partially scientific, activity and progress. In the following section, we will discuss further the sources of this diversity in innovative activity.

1.1.2.3 Sources of innovative diversity

The source of the already observed inter-sector and inter-firm diversities of innovative activity could be explained by the cumulative nature of innovations as we have already mentioned and other particular characteristics such as appropriability, flexibility or even location.

Dosi's (1988) is one of the most important contributions on the sources and effects of innovation. He studies the allocation of research resources and the distribution of innovations among sectors and countries. He explores the factors that determine innovative activity and the particularities of every sector and their impact on the propensity to innovate. He is also interested in the relationship between innovation and industrial structure.

He analyses some data from 1960 to 1983 on R&D expenditures in the US in different sectors. He finds that 10% is devoted to pure research, 25% to applied research

and the rest 65% to development. The main part of pure research is financed as expected by the Federal government and other non-profit institutions and only 20% by private firms. It is remarkable that government finances also almost half of applied research and development costs. The main problem with published figures on R&D costs is that they do not capture the 'learning by using' improvements embodied in people and organisations.

He defines innovation as mainly a *problem-solving* procedure. This solution involves a discovery or creation element. This element includes a general knowledge bases and information drawn from experience and the specific unmodified capabilities of the innovator. He underlines the fact that the innovations that consist of a technological trajectory are strongly selective, finalised on precise directions and cumulative in the acquisition of problem-solving. It has been observed that '*innovative avenues*' (Sahal 1985) provide the main historical pattern of the main technological change.

Dosi disagrees with Arrow (1962), in his persistence on the importance of scientific base, and gives a preponderance to the ***in-house*** accumulated knowledge of the firm in contrast with the ***general 'stock' of knowledge*** and argues that technological search is a cumulative phenomenon supported also by Teece (1986). An important contribution on the relationship between science and innovation is also part of this paper. Dosi argues that science is directly related to the emergence of the technological paradigm. *Science*[36] is not considered as completely exogenous and its link with innovation goes both ways (see also Rosenberg, 1979, and section 1.2.1.2). Also exploring the incentives to innovate introduces the notion of ***appropriabilty*** (see latter section 1.2.5) as the business and legal context that increases or decreases the propensity to innovate. An additional element is the trade-off between public and private aspects as externalities closely related to the innovative process. All the above factors enable Dosi to adopt Pavitt's (1986) taxonomy and to identify some sectoral patterns that persist over time.[37]

Then he discusses the intersectoral differences in innovative activity. Referring to the crucial question of relationship between size and innovation, he makes three comments: there appears to exist a roughly log-linear positive relationship between firm size and R&D expenditure, the technological characteristics of each sector determine the distribution of innovating firms, and even taking into account firm size, it is remarkable that there exists an unexplained interfirm and intrasectoral variance in terms of R&D investment and innovation output.

In order to explain these differences, he highlights that every technological paradigm presents a trade-off between flexibility and economies of scale. Each firm's position is also affected by the *cumulative* and tacit character, at the firm level, of past innovations and its behavioural approach on other strategic issues such as for example its policy to innovate or imitate. These differences are directly related to the asymmetries observed among firms and explain the observed variance noted above, in terms of R&D investment and innovation output among firms. If we add to these factors the particular sectoral context consisting of the set of technological opportunities, the *cumulativeness* of innovative capabilities and the appropriability conditions, we have a plausible explanation for the empirically observed inter-sectoral asymmetries and the nature of each technological paradigm.

A final point for the source of innovative activity from a different view was made by Auderetsch and Feldman (1996). They discussed the relationship between location of innovative firms and R&D spillovers in small business in the US.[38] They investigated whether there is a cluster of innovative activity.[39] They propose that the key concept is the importance of new economic knowledge for firms, resulting from R&D at the industrial or university level as well as skilled labour. Industries using information related to new

economic knowledge tend to be more spatially concentrated than others and spillovers effects tend to be significant.

To summarise, during this section we introduced many factors, such as the *cumulative nature of innovation*, *technological characteristics* or *appropriability*, that could explain the variability among different firms and sectors. In the following section, we will discuss the diffusion and profitability of innovations in order to understand the additional factors that shape innovative effort.

1.1.2.4 Diffusion and profitability of innovation

During this part of our review we will discuss the factors that affect the acceptance and diffusion of an innovation. Then we will discuss briefly the factors that determine the profitability of an innovation. These concepts could provide us with significant insight about the factors that shape the innovative effort of a firm. Before these two main areas, we are going to discuss very briefly the relationship between internal organisation and innovative activity.

The first economist who referred extensively to this area was Arrow (1971) when he highlighted the importance of ***organisational innovation***. He mentioned that truly among man's innovations, the use of organisation to accomplish his ends is among both his greatest and his earliest. Usual organisational innovations are refinements in cost accounting, work scheduling, personnel and collective bargaining procedures. The initial response of rival firms and financial analysts is to ignore it, partially because reorganisation[40] is a common reaction by firms that are experiencing adversity.

Before discussing any source related with the diffusion of innovation, we have to take into account Rink and Swan's (1979), research on the relationship between R&D and the final launch of a product. They found that 70 to 90 percent of projects will never

manage to pass to the next stage. Survivors from this stage will enjoy a rate of success of 50 to 70 percent as marketable products. In other words less than 15 percent of projects succeed in reaching the market. Later in 1996 more optimistic researchers calculated that, depending on the industry, the percentage of successful ideas reaching the market place ranged from 5% to 70% and proposing an accepting standard of 38%.[41]

Now, we are going to discuss the diffusion of new technology. Freeman (1988) provides a considerable literature review on diffusion and discusses its effects and its importance for long waves. He begins his article by underlining the importance of diffusion of innovation for all schools of economic thought but surprisingly it was not the topic of many researches. He makes the point that in many cases it is more important in order to make rapid technical progress to *apply new technology* efficiently than to *invent* it. He refers also to Ray's (1984) research where he discovered that the UK was among the first nations to introduce a process innovation but often the last to diffuse it through the potential adopters.

Freeman distinguishes four main types of innovation: the ***incremental*** which occurs more or less continuously and just enhances the production function[42]; ***radical*** innovation, which are discontinuous events showing a sigmoid pattern; the new technology systems which are 'clusters' of interrelated innovations[43] and changes in the techno-economic system which cause fundamental transformations (see appendix [A-1.1] for a comparison with other classifications of other innovations). He also refers to the main argument that a new technological paradigm should exercise a downward pressure on cost and increase productivity.[44]

He remind us that the initial theory about diffusion of innovation came in the 1950s with Griliches (1957) who described its typical pattern as an S-shaped curve, introducing the classification of 'pioneers', 'early adopters', 'late adopters' and 'laggards' in relation to

the timing of the innovation's adoption. They frequently used the same terminology for the beginning and spread of innovation as for an epidemic disease. We are going to see that this approach was challenged later by Soete (1986). During the 1960's Mansfield (1961) gave a considerable boost to the diffusion topic by introducing into the decision making process the concepts of profitability, scale of investment and communication among early and later adopters. Mansfield's approach was later criticised by many researchers such as Stoneman (1976) and Gold (1981) on his *ex-ante* calculation of potential profitability omitting other non-economic aspects of adoption such as managerial attitudes.

Others such as Mahajan and Paterson (1985) used a statistical model in order to explore more the shape of the diffusion curve, paying particular attention to the inflection point and summitry. Before Mahajan and Paterson the majority of mathematical approaches were very simplistic, such as for example the binary form of innovation (i.e. adopt or reject it), innovations were assumed to be independent, the size and boundary of potential adopter was finite. Mahajan and Paterson (1985) started to incorporate possible interactions among the above factors.

Soete (1986) devotes a section to inter-firm diffusion of innovation. He mentions that the mathematical theory on epidemics could explain the 'retardation hypothesis'. Firms' decision whether to adopt or reject an innovation is determined by uncertainty and lack of information. Both of them are reduced by observing early adopters. The diffusion curve has a logistic S-shape which is quite similar to the Schumpeterian (1939) industrial growth pattern of sectors. Freeman (1982) explained that this similarity is explained by the observed 'clusters' of innovations that could shape the industry's and economy's growth.

The S-shape could also be explained by Rostow's (1978) theory of stages of growth: take-off, rapid growth, standardisation and decline similar to the 'product life cycle'. But the simple epidemic and mechanistic approach is not adequate to explain the

diffusion of innovation. Metcalfe offers his own model which takes time into account, and remedies the static nature of, Rostow's theory (which does not take into consideration parallel changes in the environment). He also make allowances for incremental innovations and explains 'retardation' on the basis of the existing investment commitments due to previously adopted innovation (Soete 1986).

In 1998 one of the first researches on technology diffusion in the UK happened to refer to the financial sector.[45] Gourlay (1998) approached his analysis by highlighting the importance of research spillovers especially in the information technology areas.[46] He is critical of the 'epidemic' description of innovation diffusion by introducing such aspects as compatibility, interrelatedness, co-development and network effects.[47] He conceives Automated Teller Machines (ATM) as both a process and product innovation[48]. He proposed a set of findings: institution size, profitability and demand deposit growth played a positive role in the diffusion of ATMs from their introduction in 1972. Banks that had already adopted other novelties were displaying higher learning-by-doing effects. No relation was found in support of the labour-saving theories. Finally, adopters' expectations and pricing were positively related to the earlier adoption of ATMs.

A further insight on the process of seeking and diffusing innovations could be provided by the literature on network externalities. Network externality is when the 'utility that a user derives from consumption of the good increases with the number of other agents consuming the good'(Katz and Shapiro,1985). These externalities could be the result of a direct[49], or indirect nature[50] or due to the existence of post-purchases services.[51] Katz and Shapiro (1985) proposed that these externalities lead to demand-side economies of scale where the expectations of consumers are a significant factor for the quantity and price of the product sold. Whether a firm prefers to offer compatible products depends on its size.[52]

Positive network externalities are closely related with the already noted concept of spillovers.

Another significant author, Economides (1991), adopted the same approach.[53] Later, Economides (1995), proposed that the holder of a novel technology could enhance profitability if he shares it with other competitors by charging a fee or even a subsidy in the case where very strong externalities were observed. Innovators' profits could increase when the network effects are stronger than their reduction due to competition[54] since very often the innovator's ability to achieve the necessary output for the creation of these externalities is limited. We could add that consumers' expectations shape their demand curve and the existence of competitors could shift the consumer demand curve upwards, consequently increasing the equilibrium price and quantity (Economides 1996). In relation to financial matters, credit cards, financial exchange networks and the stock market are the typical examples of network externalities (see further chapter 6).

Profitability is closely related to ***appropriability*** of the innovation. The concept of appropriability is discussed in depth in Hippel's (1981) article. He discusses the empirical observation that, in some industries, product users are the source of innovation where in others the manufacturers are, from the angle of who will appropriate the benefit.

He uses the notion of functional relationship (Peck 1962) as expressing the firm that will appropriate the benefit from the innovation. He introduces the notion of innovators' potential benefit from *non-embodied* and *output-embodied* knowledge.[55] These two notions yield a different benefit to the innovator, the first by the sale or licensing of the knowledge and the latter from the incorporation of the knowledge in his productive procedure.

The ability to appropriate benefit from the non-embodied knowledge is closed associated with the existence of *patents* and *trade-secret legislation*. Patents could grant

selective licenses, excluding all competitors, or license all applicants (the most common form, based on Taylor and Silberston's 1968, findings). But patents are not always easy to use as a mean of protection. Firstly, although the patentee has the right to exclude others from using his invention, it does not give him the right to use it himself if such use would infringe the patents of others. Secondly the patent system places the burden on the patentee to detect an infringer. Thirdly the patent covers only the means and not the end as such. On the other hand trade secrets can be revealed by reverse engineering or accidental disclosure and again the innovator has to prove that the competitor has discovered the secret through unfair or dishonest means.

The possibility to appropriate benefit from output-embodied knowledge is derived by his ability to establish an industry-wide and firm-level ***quasi-monopoly*** with respect to his innovation. The industry-wide quasi-monopoly is established by raising significant entry barriers to potential competitors. This is something very difficult since innovations are spread very quickly and all competitors could benefit from the new lower costs. The firm-level quasi-monopoly is established by patents, trade secrets and the long response time required in order to imitate the innovation. The last concept of response time is determined by the length of the customer decision cycle, the learning curve of the competitor and the size and indivisibility of the plant.

A third approach is recommended by Hippel (1982), where he discusses the possibility for the would-be innovator to have different functional relationships. His point was that during the time or even simultaneously, it is possible for the innovative firm to hold *different functional relationships* (user, manufacturer), in order to capture the benefit from the output-embodied innovation knowledge. The last approach is considered the most fitted one in order to appropriate the benefit of the innovation in the many cases.

A further contribution is included in Teece (1986) who discusses the profitability dimension of an innovation. He refers to the different factors that determine who will receive substantial profits from the acceptance of an innovation: the innovator, the followers or imitators, or firms that have related capabilities that the innovator needs. Three main factors generally affect the answer to this question; the existing regimes of appropriability which will enable the innovator to appropriate or not the profits; the characteristics of the dominant design paradigm which will be accepted as standard; the complementary assets such as marketing, distribution or after-sales support or even new complementary products such as software for computers. These assets could be distinguished as *generic, specialised* and *cospecialised assets.*[56]

To summarise, during this section we have discussed the reasons that influence the shape of the diffusion of innovations such as ***research spillovers, duplications*** and ***network externalities***. We discussed also aspects that influence the profitability of innovation and especially the ***appropriability*** of innovation's benefit.

1.1.3 Summary

Technological change, invention and innovation are not frequently encountered in classical economic thought. Smith and Marx were the first ones to pay attention but it was Schumpeter who gave these concepts the attention they deserved. He proposed a remarkable set of types of innovations that cover every kind of innovative activity. The economy is perceived as a changing organism. The enterpreneur is the agent of change by initiating innovative activity. This activity is usually a new combination that prevails over the old way, or a creative-destructive process where the system continuously generates new routines, where only a few successful ones, manage to survive. Borrowing Darwinian terminology these *mutations* are not random generated, but are *biased transmitted* towards

a specific goal or *adaptive standard* while final selection is taking place. We have to adopt a more integrated approach taking into account the particular characteristics of the sector.

We investigated what influences the innovative process. Initially we discussed firm size and then market structure. The evidence is inconclusive. The importance attributed by Schumpeter and Galbraith to large firms could be sustained only if we consider *R&D* as indicative of innovative activity, or as an expensive cost and we introduce the cost-spreading principle. But small firms do not engage in formal R&D and face financial constraints, but are responsible for radical innovations. Probably competitive market structures are beneficial for innovations, but they could create duplication and 'free-rider' adversities for innovative activity. The significance of R&D for the innovative effort could be better understood if we take into account that innovation has in most cases a *cumulative nature,* and significant *diversity* was observed among sectors in relation to innovative activity.

A significant factor that affects the innovative activity, is the available *in house* and *public information* and their relationship. Other factors shaping the innovative effort are, *Research and Development,* c*umulativeness*, *routines, technology*, *research spillovers*, *network externalities* and *appropriability,* should be considered as factors that influence and shape the innovative activity of a firm.

What emerges from the literature on innovation is the complexity of the causal powers behind innovation. The scope for different causal patterns between sectors has been established. We turn now to consider the particular causes of innovation in the financial sector.

1.2 Theories of Financial Innovation

During this section, we shall discuss the theories of financial innovation, the classification of financial innovations and problems and benefits emanating from financial innovative activity. Hence we shall refer to many academic contributions related to financial innovation which provide us a significant part of the information required to built our model of financial innovation (2.1). A common feature of all these contributions is that none of them provides us with an integrated and holistic view concerning the phenomenon of financial innovation. Consequently, common limitations of the following contributions are the lack of: a plethora of potential causes, insight of factors shaping the financial innovation process, detailed classification of the innovative output, successful feature of financial innovations and finally an evolutionary and dynamic model of the phenomenon. A further significant limitation is the lack of any connection with standard innovation theories and concepts. Initially, we are going to discuss the pioneering theories of financial innovation.

1.2.1 The pioneering theories of financial innovation

In this section, we will discuss the literature in financial innovation. Initially we will review the pioneering theories of financial innovation of Silber (1975) and Kane (1981). They were the first to introduce to the academic terminology the notions of ***constraints-induced*** innovations and the ***regulation dialectic*** phenomenon. These two theories are mentioned in almost every article on the subject that we have encountered during our research. For this reason we are going to devote the following sub-sections of this chapter to them.

1.2.1.1 Silber's theory of financial burden

Silber's (1975) basic hypothesis, emphasising the microeconomic framework of financial innovation. It could be summarised in the phrase that *firms face some financial constraints and try to remove or lessen their burden.* Silber uses the word firm for financial institutions. These ***constraints*** could be ***self-imposed***, market -imposed or ***government-imposed***. He believes that the 'raison d'etre' of every firm is to maximise its utility taking into account existing constraints. He expressed an institution's behaviour as a simple linear programming model of optimization where firms maximise utility subject to a number of internal and external constraints.[57] Self-imposed constraints usually are the firm's liquidity requirements and the specific allocation of their asset portfolio. Market-imposed constraints affect the arsenal of tools that the firm uses and the market structure (competitive or oligopoly, perfect or imperfect capital markets) in which they participate.

Silber defines the particular conditions that will enable the emergence of a financial innovation (dividing them into instruments and practices), such as the arrival or imposition of an exogenous constraint. He discerns two kinds of constraint: a possible reduction of firm's utility, hence a new tool is required to bring it back to its previous level of utility ('*adversity innovation*')[58] or the cost of adhering to an existing constraint, becomes 'abnormally' high ('*success innovation*').[59]

He considers as the main historical causes of innovation by US banks as a response to a reduction of their utility or adversity innovation: the interest rate ceiling, where banks tried to endogenize exogenous items of their balance sheet (Certificate of Deposit, Eurodollars and bank-related commercial paper); the decline in the markets for particular assets (introduction of term loans from commercial banks during the 1930s); a declining growth rate of sources of funds (new products in order to attract new funds) and an increase of the risk of a particular asset or of all assets due to the economic environment (interest

rate risk and the shift from the 'administered' interest rate in the 1960s to the floating prime rate of the 1970s).

On the other hand, examples of 'success innovations' are the extensive use of cost-reducing information technology and elaborate new finance theories in the financial sector and several new products designed to cope with the rising yield of assets in order to attract new funds (see appendix [A-1.3], summarising Silber's contribution in comparison with other contributions).

He proposes that the three possible ways a financial firm could innovate are: by endogenizing an exogenous item of the balance sheet, introducing an existing financial instrument from another country or industry into the firm's portfolio and thirdly as the mixture of the above two ways, taking the form of a modification of an existing instrument.

Silber (1983), provides us with four different types of financial innovation. Initially he repeats his microeconomic theory and approaches the welfare impact of financial innovation. Then he presents a survey of financial innovations that took place from 1970 till 1982 and allocates them to four main categories: cash management, investment contracts, market structures and institutional organisation. During his classification, he uses his already mentioned constraints as the *main* exogenous reason(s)[60] that had initiated these financial innovations.

He concludes that his model could explain around 60% of all innovations that took place during the period. He highlights the leading role of *technology* and *legislation* the initiation process of innovations (see appendix [A-1.3]). He finally concludes that these two main constraints have led to increased economic benefits via a reduction of costs, a better allocation of risk, and circumvention of outdated regulation. The result has been an increase in the economic welfare of the system.

Silber's contribution thus focus in primarily on the concept of financial burden that firms could face. This burden reduces the utility of the firm and consequently financial institutions innovate. The importance of Silbers theory is that, by using the concept of financial burden, he provides us with a wider **spectrum** of potential reasons contributing to the innovating process. He offer us causes to innovate **exogenous** and **endogenous** to the firm. His classification into adversity and success innovations as well as the four types of innovations are of lesser importance for our research. We are going to discuss in the following section the idea of a regulative dialectic.

1.2.1.2 Kane's theory of regulatory dialectic

A different perspective is expressed by Kane (1981) who argues that the most prominent and significant factor which initiates the financial innovation process is regulation. Kane (1997) had already introduced the concept of ***regulatory dialectic***. This concept describes the cyclical relationship between regulation and firms. He conceives the political process of regulation and the economics of regulatee avoidance as opposite forces where both try to maximise their utility subject to the constraints imposed by the other party. It is a typical Hegelian[61] endless interaction of regulation, regulatory avoidance or alternatively called 'loophole mining' and re-regulation.

He uses his model to explain most of the evolution that took place in the US during the 1960s and 1970s. The main force is the regulative dialectic between the federal banking regulation and the ***exogenous*** market forces such as technological change, changing banking environment and increasing uncertainty about future financial developments.[62] He approaches innovation as an arbitrage instrument trying to take advantage of regulation lags. Innovation takes the form of product substitution in order to circumvent regulation -

sometimes by just rearranging contracts and by just simply moving along different financial systems.

He defines regulation's burden as a form of taxation imposed on banks. Banks' main concern during the 1970s was to avoid it.[63] In order to attract customers despite the regulative burden, they used a mixture of means initially covering non-monetary benefits to indirect monetary benefits and at the end mainly monetary advantages. But on the other hand regulators developed their own defences and adopted new approaches resulting in the emergence, in the late 1970's and early 1980's, of a re-regulative action.[64]

Kane (1988a, 1988b) analysed his theory in more depth, where he explained in details his association and acceptance of the Hegelian concept of *thesis* (regulation), *antithesis* (loophole mining), *synthesis* (re-regulation), using examples from the US banking environment of the period 1960-1985. A final point is that the final synthesis is going to be a new thesis and the process could go on infinitely.

Kane's contribution is essential for the better understanding of the existence of a **dialectic** between financial institutions and exogenous factors. This permanent evolution under the process of thesis, antithesis, synthesis provides us with a connection with the evolutionary approaches that we discussed in the previous chapter. His persistence with regulation as the main exogenous factor is justifiable on the grounds of his research material and does not shadow his contribution. In the following section we will discuss three other important contributions in relation to the types and additional causes of financial innovation.

1.2.2 Additional causes of financial innovation

In this section, we will examine other major approaches which had a considerable contribution and provided us with additional insight into the causes of financial innovation.

These causes are predominately ***external*** to the financial institution but some of them are ***internal*** ones too. External causes are related to ***volatility***, ***regulation***, as well as ***government intervention***, ***transaction costs***, ***disintermediation, competition*** and ***institutional requirements***. The ***internal*** causes are associated with ***cost structure*** and ***institutional preferences***. This literature is summarised in appendix [A-1.3], which compares different explanations for financial innovation and appendix [A-1.4] presenting BIS influenced contributions.

One of the first researchers to provide a more detailed analysis of the causes of financial innovation, apart from the general financial burden and regulation was van Horne (1985). His main contributions were the plethora of causes of financial innovation and the introduction of ***dual causation***[65]. These potential causes were: *volatility in inflation* and *interest rates*, regulatory changes, *tax changes*, *technological advances*, changes in the level of *economic activity* and *new academic work* on efficiency and inefficiencies. He uses a partial list of innovations from the period 1978-1984 and distinguishes between *product* and *process* financial innovation. He argues that the main cause of product innovation is the volatility observed in interest and inflation rates, and for process innovations the main cause is technological advance.

A further contribution highlighting the above causes and introducing three additional causes was made by Miller (1986). Miller investigates the concept of the 'most successful innovation'. He describes as revolutionary the last twenty years' innovative developments. He mentions the time-series identification/definition of innovation as the unforseeable (surprise) part of aggregate economic data. But he does not conceive the generation of an innovative activity as a random or pure-luck phenomenon, as he admits that many instruments existed before their massive proliferation. He also considers taxation (the motive for the most successful innovations) and regulation (Kane's 'regulatory

dialectic') as the main reasons but also, to a lesser degree, the increase in *academic qualifications* of the managers of business institutions. He also observes that in the US financial system, the *government* has itself introduced and even *backed* some financial innovations.[66]

He cites four examples of innovation where, even if the initial reasons have ceased to exist, they continue to grow in a substantial degree.[67] He then provides the answer to his initial question: financial futures are the most successful financial innovation and their 'sand in the oyster' was the abandonment of the Bretton Woods system of fixed exchange rates. His choice is supported by the facts of: their volume, their contribution in *filling the spectrum*, *reduction of transaction costs* and initiation of other innovations adding, that the possibility of cash settlement was a further step that contributed to their immense success.

His major contribution consists of the success and future of financial innovation. In order to provide an answer, he analyses the particular reasons that triggered innovative activity twenty years ago. He does not accept regulation and tax as sufficient reasons since they always existed. He advances the argument that it was a coincidence of economic and technological developments and remarkably old and costly regulation, summarising that innovative activity was like a 'snake bursting through its old skin'. For these reasons he believes that it is possible to slow down the rate of innovation, but that progress will continue since there are still financial areas such as real estate and financial markets competition that are not so developed or offer only a few financial products.

The existence of imperfections, the reduction of transactions costs and the positive developments for the functioning of the market are advanced by Levich (1987). His paper focused mainly on the impact of financial innovation at the global level. He argues that *market imperfections* cause financial innovation and he divides them into: policy-related (or man-made) and behavioural (natural) barriers. These *imperfections* encourage the

segmentation of the capital market, the 'Law of One Price' does not apply and these profit opportunities act as an incentive to innovate. He divides the reasons that encourage innovation into *demand side and supply side*. In the former category belong the volatility of asset prices, exchange and inflation rates, the change of international wealth patterns and the globalisation of industrial markets and the new financial model applied by the specialists. The latter group consists of advances in telecommunications and computer technology, increased competition and regulatory pressure.

Gardener (1988) discussed financial innovation in the UK, and introduced the concept of temporary monopolies. In his paper, he refers briefly to the sources and causes of financial innovation in the UK and mainly discusses the impact of innovation on the banking sector. He considers financial innovation as the 'engine' that stimulated changes in the British banking environment as in the form of *de-regulation*, foreign banks' entry and diversification of activities. He investigates the causes of innovation by referring to three main theories: first Veblen's struggle between technological progress and institutional resistance; then Kane's regulatory dialectic applied especially to the US; and thirdly the BIS approach of demand and supply side theories. He highlights the role of technology as part of every cited theory and adds the importance of *profit opportunities* and *temporary monopolies* as main reasons for innovative. He pronounces financial innovation as the 'lifeblood' of the capitalistic financial system and very crucial for the risk-sharing function of banks and the risk-taking capacity of the whole economy.

During the same year the causes of *desintermidiation* and *globalisation* were advanced, by Artus and Boissieu (1988), who proposed a new integrated approach taking into account the existing theories. They observed that the phenomenon of financial innovation is not so uniform in all OECD countries. They identified five factors that are

closely related to the emergence of financial innovation: financial deregulation, marketization, *disintermediation*, securitization and *globalisation.*

Another significant approach was made by Walmsley (1988) who added and highlighted the causes of *competition* and supply-induced innovations. His first contribution is the table, covering the period 1957-1987, of the most significant financial innovations. His second contribution is that, except for the typical distinction of product and process innovations, he distinguishes two types of innovation: aggressive and defensive ones.[68] He also adopts the BIS taxonomy of innovation. He identifies three main sources of innovation: intense *competition* among financial institutions, regulation and the impact of technological advances and information technology applications. He refers also to the example of *supply induced* innovations from governmental and semi-governmental sources such as the SEC or the US treasury[69]. His final points are related to negative aspects of financial innovations.

A further contribution was made by Ross (1989) by introducing the marketing factor and institutional preferences, as a potential cause of financial innovation. In a remarkably original article, he introduced factors such as *marketing* and *institutional arrangements*. He concentrates his analysis on securities. He distinguishes two classes of innovation: new securities and markets, and new dynamic strategies. He points out that institutionalisation is the main feature of the financial system and distinguishes two kind of institutions: the transparent and the opaque ones.[70] It is also possible that institutions have different preferences than individuals. Financial innovation could accommodate the needs of particular institutions and occurred even in cases where the market is complete. He explains the typical life cycle of a new product and highlights the role of high fixed marketing costs. Marketing costs are associated with the design, sale and post-sale services, as well as the training of potential users. These costs could facilitate the *standardisation* of

the product and enable their amortisation from the innovative institution. He considers his work as complementary to Miller's (1986) approach of taxation-regulation and Merton's (1988) theory of transaction costs as being of considerable importance for innovative activity in the sense that innovation occurred as a response to the constraints, and marketing costs that could decisively shape the new institutional structure and future innovations.[71]

Another probably simplistic approach, but illuminating in relation to its narrow horizon was made by Flood (1992). His main contribution is the identification of two aspects of *imperfect markets.*[72] He tries to understand what makes innovation successful and consequently to investigate the causes of financial innovations. He adopted as the fittest way to measure the degree of success the trade volume of the instrument. He compares a futures contract on bagged Canadian silver coins - introduced by IMM in 1973 - and market index mutual funds - introduced by Vanguard Group in 1976. Both were redundant i.e. their price movements were closely tracked by the price movement of other securities hence there were substitutes. But the *transaction* and *liquidity* cost made the difference since capital markets are not perfect i.e. frictionless. The former instrument ceased to exist in 1974 due to the lack of liquidity and increased costs while the latter one had a tremendous success.[73] Except for the elaborate presentation of these examples, Flood also refers to Merton (1984) where he has illustrated that innovative institutions extensively use the trial and error approach when they launch a new product.

Arestis and Howells (1992), observing the high growth in the financial activity, connected it with financial innovation. They proposed technological changes, deregulation and competition as potential causes that boosted financial innovation activity. They also introduced the concept of cost of intermediation[74], as a complementary explanation, to the growth of financial activity. Additionally, they highlighted the *complex* and partly *circular*

interaction among these factors and divided them, to 'exogenous' and endogenous' to the financial system.[75] Their main purpose was not to discuss the phenomenon of financial innovation but to refer to its significance for the growth of financial activity and ultimately to the problematic monetary policy in the UK in the 1980s.

A minor contribution related to a regulation feature is made by Mishkin (1992), where he observes the considerable amount of new financial institutions and instruments which had emerged during the last twenty years in the US. He identifies financial innovation as the main cause of this change and adopts the simple analytical approach that a change in the economic environment will stimulate a search for innovation. He adopts four causes of innovative activity, three of them already mentioned in the financial innovation literature; first, changes occurred in market conditions such as interest rate volatility and a drop in brokerage commission. Hence in order to avoid or reduce risk banks offered Variable Rate Certificate of Deposits (1977), Adjustable Rate Mortgages (1975) and Derivative products; secondly, the considerable advances in technology which permitted the proliferation of credit cards and securitization; thirdly the effort to avoid existing regulation such as reserve requirements and restrictions on interest rates banks offered NOW, ATS accounts and Overnight RPs. Finally *re-regulation* occurred during the same period as the Monetary Control Act of 1980 and the Depository Institutions Act of 1982 and acted as a cause of further innovative activity.

He concludes by analysing the future of financial innovation in relation to two spectrums and variables: interest rates and inflation. If the former are going to show a remarkable fall then some financial instruments such as options and futures are going to disappear. If the latter declines then deposits are going to be increased.[76] It is obvious that Mishkin has adopted a more simplistic approach in relation to the future perspectives of innovation.

The same year, Miller (1992) advanced a further cause of financial innovation: *economic growth.* He presents the main reasons that affected innovative activity, mainly in the US, the last twenty years. His approach has a lot of similarities with his 1986 article. He advances four main reasons: the move to floating exchange rates, the information and computer technology developments, the world's *economic growth* and regulatory and de-regulative action. He then addressed the question whether this wave of financial innovation had a positive or negative effect on the economy and investors.

The demand for more complete markets and further aspects of imperfect markets are discussed by Merton (1992, 1995). He initially defines the efficient allocation of economic resources via financial intermediaries as the primary function of the financial system. He considers financial innovation as the 'engine'[77] that causes the improvement of the 'real' economy. He investigates the motives for financial innovation and, in accordance with Silber and Kane, finds three main motives: a response to the *demand for more complete markets*, a *reduction of transaction costs* and *increased liquidity* and a reduction of 'agency' costs[78]. He finds all these three consistent with his view that financial innovation improves economic efficiency. He believes that during periods of high volume of financial innovation a *'spiral effect'* takes place: a new product introduced for a niche market becomes standardised and moves from intermediaries to the market. Their cost due to size and competition decreases and new customised products emerge and improve the completeness of the market. The system is dominated by large institutions and dynamic trading demands further changes to infrastructure[79] in order to accommodate it.

A more balanced approach, highlighting the causes of innovation and especially the importance of both *initiators'* and *users'* preferences, was advanced by Llewellyn (1992). He adopted a different approach from Silber (1975) and Kane (1981) in order to study this phenomenon and proposes the interconnection between the financial system and

innovation. He believes that financial innovation observed during the 1980s should be viewed as both a reflection and partly as a cause *of structural change*. He argues that the financial system and financial innovation are interrelated and should be investigated in conjunction i.e. in order to assess financial innovation systematically, we must assess its influence on financial system efficiency. He is the **only** one to spend some time discussing the difference between standard innovation and financial innovation.

He begins his analysis by highlighting the difference between innovation in industry and the financial sector: first, research costs concerning financial innovations are low; second there are not protective patents; thirdly it is affected and shaped by regulatory forces; and finally, it is designed not only to meet the requirements of the customer but reflects also suppliers' constraints. The nature of financial innovation has a dual characteristic: it creates new instruments, techniques and markets and unbundles and reassembles separate characteristics of existing financial instruments.

He increases considerably the list of potential causes due to the international character of his research. He defines the seven main forces that initiate the financial innovation process as: the increase of wealth, *alterations in portfolio behaviour and preferences of users or suppliers*, changes in the market environment, policy (exogenous) changes, *spectrum filling* and technology. He concludes his paper by discussing the impact of financial innovation.

The restrictions of banks' balance sheets and the paramount importance of disintermediation are highlighted by Davis (1993). In his brief paper he initially explains the reasons behind financial intermediation[80] and explains also the uniqueness and importance of banks for the financial system. Then he discusses only two types of financial innovation that took place during the 1980s in the retail banking sector: securitisation and wholesale banking. The main reasons for the former are interest rate volatility, *restrictions*

on bank's balance sheets and *disintermediation* which deprived retail banks of fund. The latter was facilitated by the existing economies of scale and the expertise of banks in screening and monitoring. He concludes by proposing that the characteristics of bank intermediation enabled some of the recent developments in the banking sector.

The importance of demand and the cost structure of financial instruments was advocated by Merton, Tufano and Mason (1995) who discuss the particular causes that initiate the innovation of securities. The components of an innovation are marketing cost, manufacturing costs and taxes and regulation related costs.[81] Any actual change in one of these components makes profitable a previously uneconomic/unprofitable product. Financial institutions are able to exploit *economies of scale* and *scope*. Hence innovative activity is expected to be higher in these institutions.[82] Apart from the cost structure, changes in demand could initiate innovations. The current stage in the life cycle of firms and macroeconomic shocks such as in the 1970s are the main factors which shape the demand for financial instruments and innovations. They also point out that we have to take into consideration many interrelations and interactions among *cost structures and demand.*[83] Finally they add that the *evolutionary nature* of innovation has proved the importance of learning and experimentation as crucial components of successful innovative instruments and institutions.

The importance of competition was further discussed by Ford and Mullineux (1995), who consider two particular financial innovations: the payment of implicit interest on cheque accounts[84] and the Automated Telling Machines (ATMs) and Electronic Fund Transfer (EFTs) (see latter chapter 6 below). The reasons behind these two innovations in the UK, were *competition* between traditional banks and other financial institutions like building societies[85] and technological improvements like the magnetic strip.

The interaction between supply and demand as well as cost structure are further discussed by Blake (1996). He analyses both financial innovation and the process of financial intermediation using econometrics. His approach is in accordance with Silber's (1975) and Kane's (1981) supply-side-induced, and Miller's (1991) demand-induced innovation. He proposes that external factors such as technological developments, the business cycle and regulation affect the process and act as shadow prices. He believes that changes in both the *demand on (*investors' tastes) and the *supply* (institutions' cost structure) side could cause an innovative action. He proposed the concept that financial instruments present both internal characteristics (Merton et al, 1995) such as return, risk, divisibility, liquidity, and external ones such as delivery system and institutional strategies.[86] Every change in this balance, is the reason behind any innovative action, referring to the observation that whenever shadow prices (i.e. cost of compliance) increases, innovations occur in large numbers.

During this section, we have discussed a plethora of reasons that could cause and influence the innovative activity of financial institutions. Causes ***external*** to the firms such as ***regulation***, ***volatility***, ***disintermidiation*** or ***government intervention***, and ***internal*** to the firm such as ***cost structures*** and ***institutional preferences***. We can also observe some causes that could be perceived as ***both*** internal and external such as ***liquidity enhancement***, ***transaction costs*** and ***institutional requirements***. In order to refine a framework of financial innovation, we need to consider how to classify the different types of innovation encountered in this literature. The following section includes the most important types and partial classifications of financial innovations and further contributions based on this classification.

1.2.3 Types and classification of financial innovation

During this section we shall discuss the types of financial innovation and advance further particular classifications of the innovative activity that financial institutions undertake. We are going to discuss extensively especially the BIS classification of financial instruments as well as other contributions. The purpose of this section is to understand the possible ways of classification of financial innovation. We believe that a common shortcoming of these classifications is that they do **not** offer us a detailed account of the nature and characteristics of an innovative output. This literature is summarised in appendix [A-1.5], presenting a table of types of financial classifications.

The first to mention a potential classification of financial innovations was Veblen. He and his fellow travellers and adherents such as Lawsons (1990), and Carter (1989)[87], strongly believe that the private entrepreneur is the source of innovation in his pursuit of pecuniary gains. Financial innovation is divided into product and process. *Product innovation* is a new form of financial instrument (Walmsley 1988). In Veblen's analysis the main new products are related with the corporate finance sector, such as corporate securities or stock shares - reflecting the goodwill of the firm - and preferred stocks which transferred ownership of assets to their holders. These securities enabled in subsequent years the reorganisation and coalition of new industrial corporations. *Process innovation* is a broader conception of financial innovation, related to new practices and structures like 'rocket scientists' who develop new products or the SWIFT payment system.

Another classification was proposed by Silber (1975); after he proposed a distinction similar to Veblen's, between instruments and practices[88], he discussed adversity and success innovation. An adversity innovation is defined as an innovation that emerges in order to circumvent a barrier that is imposed on a financial institution. A success

innovation is an innovation that emerges in the case that the burden of adhering to an existing cost becomes high. It is obvious that both concepts are associated with Silber's theory of financial constraint. Later in 1983, by observing the financial innovation activity during the 1970s in the US, he proposed four particular types of innovation: cash management, investment contracts, market structures and institutional arrangements.

Meanwhile in 1981, by reviewing banking products the same period as Silber, Kane identified three types of financial innovation: non-monetary, indirect monetary and monetary. All were the direct result of regulation-imposed restrictions on the payment and interest rate applicable to different types of deposit in the US (see latter chapter 3 below).

Two new classifications were proposed by Niehans (1983) as well as a more deep analysis of a particular structural financial innovation. He discussed the emergence of multinational banking and its causal relationship with financial innovations. Multinational banking could also be a financial innovation by itself. He divides all banking products and services in three categories.[89] He proposes two types of innovation: adaptive ones, consisting of the development of new ways of bundling the basic services[90], and technological ones related to the storage, retrieval and transmission of information.[91] He finally believes that international banking exists mainly for four reasons: different regulation environments, economies of scale[92], imperfections of the market for information[93] and potential diversification of political risk.

One the first and most accurate classifications of financial innovation after Silber and Kane, was undertaken by the Bank of International Settlements. This classification was adopted by many researchers who provided further contributions in relation to the innovative process such as a complementary classification or factors that influence the emergence and the success of financial innovation.[94]

The most organised attempt to discuss the phenomenon of financial innovation was undertaken by the Bank for International Settlements (BIS, 1986). The BIS was preoccupied with the geometrical expansion of financial innovations during the 1970s and 1980s. In order to investigate them, they introduced a taxonomy of financial innovations based on their intermediation function. They divided them into five main categories: *risk transferring (price/credit), liquidity-enhancing*, *credit-generating* and *equity-generating*. They implemented this taxonomy and presented a two-part table consisting of *'On'* and *'Off'* balance sheets instruments.

The BIS[95] proposed that such powerful long-lasting forces as technological advance and global financial integration support the innovative effort. Innovative actions are also supported in the micro-environment (firm-institution) by the *institutionalisation* of Research and Development activities. The latter resulted from the general acceptance that a stochastic relationship exists, between output and amount of resources committed to the process.[96]

Later Walmsley (1988) proposed a further classification. He identified two types of financial innovation: *defensive* and *aggressive* ones. An aggressive one is an innovation that is introduced in response to a perceived demand. A defensive innovation is any innovation caused by changes in the environment and transaction costs. We are going to elaborate more in the following chapter about further aspects based on this classification.

The same period Artus and Boissieu (1988) proposed four other types of financial innovation: cash management procedures, new financial instruments associated with the financial intermediation function, new instruments introduced to existing capital markets and instruments introduced to new capital markets.[97] They also draw a distinction between innovations initiated in the public or private sector; the latter are unquestionably in the majority.

A related classification applicable to corporate banking activities, was proposed by Vinal and Borge (1988). They observe innovative activity in the European corporate banking sector. They divide corporate finance instruments into four categories: special debt instruments, debt-equity hybrid instruments, special equity and risk covering instruments[98]

Finally Tuffano (1990) proposed six types of financial innovation, applicable mostly to investment banking innovative activity. He divides his data into six main product categories: mortgage-backed (3), asset backed (2), non-equity linked debt instruments (28), equity-linked debt (8), preferred stocks (13) and equity products (4). For all these products the six large investment banks account for 76.3 % of new underwriting.[99]

During this section, we have discussed the main classifications that have been proposed for financial innovation. The initial classifications of ***process*** and ***product*** have been expanded by ***defensive*** and ***offensive***, adversity or success and ***on*** or ***off*** balance sheet. In order to better define a financial innovation, we have also to separate its properties such as the enhancement of ***liquidity***, ***the generation of debt*** and the ***transfer of risk***. In the following section, we move on to consider the consequences of innovation. We shall discuss the benefits and problems of financial innovation in order to be able to define the successful features of a financial innovation and potential shortcomings.

1.2.4 Benefits and problems of financial innovation

During this section, we will discuss the potential benefits and problems for financial institutions and the financial system emanating from the emergence and diffusion of the financial innovation. We are going to encounter concepts such as ***first mover advantage***, ***better risk management*** and fund allocation as well as ***huge exposures***, ***systematic risk*** and ***inadequate information***. The main reason that we discuss the problems that could emerge is that they could act as potential causes for further innovative activity in a ***dialectic***

and evolving environment that we shall investigate in the following section. In appendix [A-1.6], we summarise the benefits and problems of financial innovation.

The importance of financial innovation for efficient financial markets, the potential *temporary abnormal profits* and needless regulative intervention was advocated by van Horne (1985). He perceives as the most important contributions of financial innovation the increase in markets' operational efficiency and the enhancement of markets' completeness. He believes that innovation generally takes place when inefficiencies in the financial sector offer opportunities for profit by exploiting temporary monopolies and charging high prices. He defines as we have already mentioned, six main reasons that contributed to the proliferation of financial innovation activities during the last twenty years.

He then discusses the notion of excesses that are taking place during the innovative process and the cost (dislocation of human and physical capital) of these excesses. In more detail, he observes that sometimes innovations - calling them balloons - that do not contribute either to efficiency or to completeness could stay for a considerable time in the markets before disappearing due mainly to excesses on the demand or supply side.[100] He believes that the market always *clears* and he is opposed to the corrective intervention of a regulatory agency. He concludes that the existence of uncertainty will maintain innovative activity and highlights the importance of new analytical tools in order to obtain better insights in the financial environment.

The idea that regulation could be partially helpful and facilitate the innovation through protection for the first mover is discussed by Anderson and Harris (1986), who adopted an econometric approach. They analyse oligopolistic industry under a continuous-time model where the imitative institution could be disadvantaged. In other words, the features of this model are: small number of firms, *first mover's advantage*, competition is taking place through product development, regulation causes time retardation and higher

costs and it is approached as a two-player (institutions) game. Their findings could be summarised as follows: leading institutions generate an informational externality and competition could discourage innovative activity and encourage *imitative behaviour.* Conventional patterns are not perceived as a remedy because a weak patent regime could arbitrarily prevent innovations. Slight *regulatory lags* tend to encourage innovation and allow the market to pronounce on the imitative or innovative nature of the product.

The existence of *first-mover advantage* in particular financial products and positive complementarities are discussed by Corkish et al (1997). This very recent research analyses the case of a successful innovation in the UK: the introduction of futures contract in London in 1982 in the London International Financial Futures Exchange (LIFFE) and the reasons for their success. These were their correlation with the underlying market (where the future contract was based) and volatility, as well as the existence of first mover advantage due to the liquidity that it offered. An interesting finding was that the existence of competitors in the form of securities or exchanges could act as *complementary* goods and enhance further futures success.[101]

The importance of intangible assets such as know-how and reputation, and lower potential cost, but the rejection of the existence of first mover advantages in investment banking, is proposed by Tufano (1990). He investigates 58 innovations that were undertaken by investment banks from 1974 to 1986. It is the first attempt to bring some empirically-backed insights to how much it is worthwhile to innovate. He initially highlights the observed diversity of development costs, ranging from $50,000 to $5 million.[102] He adds that these potentially high costs are not the only consideration since we have to take into account the *intangible assets* involved in any launch of a new product as commitment and reputation. On the other hand patents are almost impossible to be granted. He then addresses the question why a firm should innovate and how the innovative firm

behaves. He rejects the usually advanced theory - especially for industrial innovation - that the first mover exploits monopolies (van Horne 1985) and charges a higher price than later entrants. He shows that they charge even lower prices but due to that, they manage to capture a higher market share. The large captured market shares enable them to become even larger. They do not capture the whole of the market because other non- economic reasons intervene.[103]

Innovative investment banks can afford to charge lower prices and amortise their initial outlay because they enjoy *lower costs*[104]. But he was not able to prove the existence of a 'spillover' effect in the banks' innovative activity. Instead he presents, as proof, the explanations provided by managers about the way they exploit the intangible advantages of their innovative actions in order to obtain a comparative advantage in relation to their competitors.[105] Finally, strong links between underwriting and trading were observed and bankers believe that innovating signals their abilities better than any advertising.

The risk enhancement element is advocated by Miller (1992). He accepts as the main positive effect the enhancement of *risk management.* He highlights that innovation was blamed for the increased stock market trade volume, the observed high volatility and mainly for 1987 stock crash. He makes crystal clear that the empirical evidence does any support any of these accusations.[106] He concludes this issue by declaring that the only complication worth mentioning is the hegemony of large institutions in the stock market. At the end of the article he re-addresses (Miller 1986) the question of the future of financial innovation and adds that the expected slow down is also supported by the fact that there are not many new finance theories in academic circles. He predicted that it is more likely that institutions and structures are going to change much more than instruments. These changes will be in more close contact with the cost of existing technology than the development of new technology.

The same risk enhancement aspect combined with positive developments in liquidity, cost and profits are discussed by Allen and Gale (1994). They discuss the issue of financial innovation by referring to the benefits of innovation and then citing briefly the main theories of financial innovation. The main benefits deriving from financial innovation are: the increase in *risk-sharing opportunities*, the avoidance of regulations and taxes, the reduction of transaction costs and *increased liquidity*, the reduction of *agency costs*, the capture of *temporary profits* and considerable changes in prices of financial products. Then, they refer to the theories of Silber (1981), van Horne (1985), Miller (1986), Walmsley (1988), Conrad (1989) and Merton (1990). A major contribution of this book is inclusion of a brief history of financial innovation from ancient times until the 1980s.

According to Levich (1987), competition, integration and market reliance are the positive aspects of innovative activity. The effect of innovation is allocated into three main categories: related to financial markets, international financial relationships and macroeconomics effects. The first category includes the *reduction in transaction* costs, *better risk transfer*, *increase liquidity,* improved funding in opportunities for riskier credits *and greater competition.* The second includes enhanced capital mobility, greater integration and greater similarity across countries in cost-risk relationship. The final category includes reduction in discretionary national monetary policy and greater impact of monetary policy on exchange rates. His final comment is that the recent wave of financial innovation has increased the reliance on the market mechanism and monetary intervention could not use the traditional tools.

The aspect of efficiency and its improvement through financial innovation was discussed by Llewellyn (1992). He assesses the impact of financial innovation by enumerating the benefits related to the allocative and structural efficiency of the financial system: The *cost of intermediation* has been reduced, it is easier to match portfolio

preferences, funds are allocated in a most efficient way, it is easier to price and distribute risks, it has expanded and changed available assets and liabilities portfolios, it has increased the bulk of specialist services and it has increased the efficiency of the payment system. Then he discusses the problematic issues of monetary control mentioned already by Akhtar (1983): supervision and prudential policy (BIS, 1986), the lack of experience in managing an new financial instrument (Mayer and Kneeshaw, 1988), the potential exposure of this instrument (Kohen and Santomero, 1980) and the final question, whether it is accurately priced or not (Mayer and Kneeshaw, 1988).

Finally, he does not share Vinals and Berges' (1988) scepticism in relation to the potential benefits from innovation for the financial system. He concludes his article by pointing out that the emergence of financial innovation is not random and its positive impact could be assessed in relation to the increase in the efficiency of the financial system.

Profitability combined with the enhanced hedging abilities are discussed by Artus and Boisseau (1988), who review Silber's (1975) and Kane's (1981) theories of constraints and regulation theory adding the Desai and Low (1987) complementary approach of *'filling the gaps'*.[107] Finally they mention the Porter and Simpson (1980) theory of thresholds and reversibility.[108] The former defines a particular level such that when holding costs of an instrument exceeds it, financial innovative activity is automatically initiated. The latter emanates from observation of the considerably long-lasting nature of many financial instruments.

The effects of financial innovations could be focused on four areas: macroeconomic consequences, the banks' *profitability* and structure, the effectiveness of monetary policy and as a better hedging instrument for risk and interest volatility. They conclude that financial innovation is not responsible for financial crisis. They foresee many new financial

products as an alternative to the reducing reliance and confidence of investors on traditional financial instruments.

Finally the conditional reduction of uncertainty aside from enhanced risk management is discussed by Bhatt (1986). He discusses the relationship between financial innovation and reduction of uncertainty. Due to the uncertainty about any future event, borrowers and lenders face different risks. Borrowers face the risk of the particular project, and the lender faces two types of subjective risk about the project and about the willingness of borrowers to repay. Financial innovation such as personal guarantees or short term credit, and the specialisation of dealers in one type of asset, could reduce this subjective risk without increasing the cost. But it requires trust and confidence in the system, a stable environment and freedom from regulation, experimentation of financial innovations.

Since we mentioned above Vinal and Borge (1988), we have to discuss their scepticism about the real improvements in financial market. They observe innovative activity in the European corporate banking sector and discuss its impact on the 'real' economy and in particular on investment. They admit that it is very difficult to approach this question because relevant data are not available and there is not any conceptual framework to use. They refer to the papers of Levich (1987), van Horne (1985) and the BIS (1986) report. In order to define the reasons that contribute to innovation, they introduce the notion of 'zero sum game' i.e. innovations that do *not* either *lower cost* or spread the risk better and that are bound to disappear. They define their possible contribution in three main areas: availability of new external sources of finance, cheaper sources of finance and better financing of working capital and risk coverage. Then they discuss the impact of innovation on firms across Europe. They found out that only a few financial instruments reduce the cost of capital and their impact is negligible. Firms rely even more on internal

finance and intermediate external finance than ten years ago. Finally *accessibility* to new types of finance is *not increased* for the main bulk of firms.

A view related to the increased risk taking and exposure of financial institutions was expressed from Walmsey (1988). He concentrates his attention on the potential risks of these financial innovations. He observes the significant increase in trading volumes and interconnections among the different institutions which result in a higher exposure. He underlines the negative impact of innovation on monetary control of the economy and emphasises the *over-leveraging* of, particularly, US firms. He also advances the argument that high fixed costs - a direct result of advanced and complicated information technology - could be justified and *amortised* only by *large volumes* of trade and is considerably facilitated by significant high volatility. He finally adds that the new financial structure and applied hedge theory are not capable of minimising significantly the systemic risk that institutions face.[109]

The increased amount of transactions and complementary instruments used could create further duplication problems and decrease the efficiency of instruments. Pesendorfer (1995) develops an econometric model that, under certain assumptions, could explain financial innovative activity. He adopts Merton's (1991) three motives for financial innovation i.e. better allocation of risk, and reduction of transaction and agency costs. He assumes a simple model where financial intermediaries issue financial instruments against standard securities which act as collateral. These financial instruments are less known and more tailored to the particular needs of the customer (retail and institutional market) hence there is not an established market. Institutions should pay marketing costs in order to sell in the retail market since it is not as educated and specialised as the institutional one. At this stage, he assumes proportional set-up and marketing costs per customer. His three conclusive points are that: phenomena of *'redundant'* securities could be observed[110], an

inefficient level of innovation occurred when there exist *complementarities* among innovations; and depending on the price level, there are many equilibrium levels of innovation. The latter also suggests the point that the smaller the marketing costs, the lower the utility indeterminacy observed.

A further complication in the usage of advanced instruments is related to potential limitations of the models used to price them. Conrad (1989), is the first to analyse a very sensible and controversial phenomenon. She *challenges the assumption* that share price is not affected by the introduction of the corresponding option, which is one of the fundamental assumptions of the Black and Scholes derivatives pricing model. She uses data, covering the period 1974-1980, on securities and their respective options prices. She observes that there is a permanent increase in the price of the underlying security before the introduction date - not the announcement - of the option. This permanent increase, around 2 percent, is probably related to anticipated purchases of the security by market-makers in order to build inventory and hedge against future transactions in the option. This price effect is also accompanied by a reduction of the security's volatility but has no effect on the systematic risk of the security.

A further contribution on this issue was made by Detemple (1990) who deals with the same financial instruments as Conrad (1989). He also *challenges* the redundant element of Black and Scholes' derivatives pricing model. The incompleteness of the market is related to the discontinuity of the connection between new information and pricing adjustment, hence it is impossible to replicate with dynamic strategy all possible pay-offs (Black and Scholes' fundamental assumption).

We conclude our discussion by presenting a more general argument, unquestionably related to the large exposures that financial institutions take, combined with lack of adequate controls or lack of information about the real nature of the instruments involved.

Raines and Leathers (1992) provide a very illuminating approach to the impact of financial innovation on financial markets. They underline the main characteristics of the 1980s as *massive speculation*, the *accumulation of debt*, the crisis in banking/thrift institutions and the numerous cases of price manipulation. They refer to Veblen's theory (1904) of financial markets (*The Theory of Business Enterprise*). In his view financial markets incorporate a dual tendency towards collusive stability and resurgent periods of financial instability (see Carter 1989 and Lawsons 1990). He describes the financiers' behaviour as trying to maximise pecuniary gains and favouring financial peace and stability. The latter is in full accordance with the concept of collusive oligopoly - few large institutions administered financial markets. But in the quest for high pecuniary profits, *epidemic financial instability* is created through financial innovation and new waves of competition. The last two phenomena could occur simultaneously (during the 1980s) or independently (during the 1920s; only new waves of competition). After this instability new forms of collusive agreement, backed by a new institutional framework, are established usually when using the latest introduced financial innovations (for example from 1880 until 1930).

During this section, we have discussed potential benefits and problems from financial innovation. Benefits are associated with ***abnormal profit opportunities***, ***intangible assets***, ***better risk management***, or more complete markets. Potential problems are the amount of ***risk undertaken***, excesses, ***inadequate information*** and ***systematic risk***. In the following chapter, we shall propose a model of financial innovative activity, incorporating elements from the current chapter.

1.3 Conclusion

During the discussion of the innovation related theories we adopted the evolutionary perception of economic activities as a set of endless guided variations. These

variations are based on the R&D activities and existing business routines. Factors that shape these variations are the particular sector's cumulative characteristics, technological public and in-house developments, research spillovers, network externalities, appropriability and strategic objectives.

Then we discussed the pioneering theories of financial innovation of Silber (1975) and Kane (1981). They provided us with the idea of the financial constraint that firms face and the existence of a dialectic relationship between causes and institutional responses. Then we elaborated more on the potential causes of financial innovation by reviewing many related papers. We found many reasons that caused financial innovative activity over the last thirty years. We will incorporate these causes in our proposed model. Then we discussed the types of financial innovation and potential classifications. We encountered many different types but many of them were very narrow (Kane 1981) or very general (Silber 1975, Niehans 1983). Most of the classifications we reviewed were perceived as appropriate for particular types of financial innovation or instruments. We will adopt two of them (BIS 1986) and alter a third one (Walmsley 1988) as more suitable for our model. Finally, we discussed the benefits and problems that financial innovation could cause. The benefits enable us to understand the reasons or features that make a financial innovation successful. The problems could act as further cause for financial innovative action.

Endnotes of theories of innovation and financial innovation

[1]Or economic rent i.e. the difference between price and prime-variable costs.

[2] Schumpeter (1939) justifies the observed fluctuation of the capitalist system as the appearance of swarms or bursts of entrepreneurs and innovations. He proposed four phases in each cycle: upswing, recession, depression and recovery and three types of cycle: the Kitchin cycle (3 years) characterised by inventory accumulation and de-accumulation, the Juglar (8-11 years) related to individual innovations and the Kondratieff (50-60 years) related to major innovations.

[3] In the same source, we could find a similarity in his perception for the future of large organisation with Hicks (1932).

[4] Darwin (1838), was influenced by the Scottish School beliefs that complex phenomena could arise as unintended consequences of the actions of many individuals and particulary by Malthus' (1798) idea of 'the struggle for existence'; the phenomenon of crowding and struggle and the process of continuous natural selection. In contrast with the neo-classicals he accepts the existence of 'inferior parts' as a reason for struggle and improvements. The existence of diversity is seen as playing a positive and energising part in the system and essential to the vitality as a whole. He argued that 'evil is in the world to move us not to despair but to activity'. Veblen agreed with Darwin in his point about cumulative causation i.e. a blind scheme in which there is no trend, no final term, no consummation, an endless process without finality or goal. Biologists accept the possibility of group selection and accordingly, the methodological individualism so important for neo-classicals is rejected.

[5]For evolutionary economists such as Nelson and Winter (1982) people act following routines. Because it is often very difficult to act optimally (time-information), routines guarantee a satisfactory performance, not necessary in a maximising one. A routine could also be an implicit contract. There are general routines (all accounting departments in firms) and particular routines ('de la maison'). They could change for external or internal reasons.

[6]The factor of sexual reproduction does not correspond to any economic phenomenon, hence we cannot derive any analogy.

[7] Failure was defined as an unsuccessful attempt to make any profit.

[8] Something that Schumpeter and other neo-schumpeterian did not accept.

[9] Apart from uniqueness, another major disagreement lies on the super-optimazation, of the neo-classical approach, due to unlimited and perfect information. The last two points even Lucas and Arrow (1986) admitted when they described the seven steps of the Classic Defence argument. But they do not define and explore the important phenomena that lie beyond these limits and investigate the nature and timing of the adaptive process.

[10] We have to remind ourselves that even Leontief and Friedman stressed the possible limitations of mathematical formalism and its potential damage to economics. Formalism does not allow for creativity, change from within and interaction with the environment (Lawson 1994). But we could always bear in mind that these type of mathematical simulations are still useful (Dosi 1993) because they enable researchers to argue against neo-classical global profit maximisation and propose simple decision rule like mark-up pricing.

[11] As Winslow (1989) said the individuals are not given i.e. as the society cannot exist without individuals, they do not exist prior to the social reality (Hodsgon 1995a).

[12] He investigated the US market structure and found that the 500 largest firms are related to the main bulk of innovative process (Acs 1988).

[13] See Evangelista et al 1997 who refer to the Community Innovation Survey in 1992 collecting data from 42000 European firms.

[14] The Science Policy Research Unit (SPRU) participated in the survey that took place in the 1960s by OECD. It Investigated the same categories as the SAPPHO and they found similar results except the electronics sector.

[15] He advises firms to establish a minimum nominal yearly expenditure - depending on the sector - in order to follow, at least a defensive strategy.

[16] She pointed out that at the same time they create new jobs and yield regional economic regeneration.

[17] Small firms could provide the radical innovations that large firms are able to expand in large scale production.

[18] They claim that their data are significantly better than before due to the computatization of the US Patent Office which provided them with data including patents, renewals and innovation from the US Small Business Administration.
[19] The innovative activity is negatively related with concentration and unionization. Finally they sustain Winter's (1984) point that small and large firms face different environments in relation to their innovative activity.
[20] He also found that the evidence related to the positive effect of diversification on firm's innovative projects is inconclusive but makes an allowance for technologically related areas.
[21] Hence he also considers it as an open question.
[22] Their empirical results deviate from the typical Schumpeterian case: the Kamien and Schwartz (1982) observation of the existence of a critical point in the association between R&D and innovation, Acs and Audretch's (1988) theory that small firms are more innovative than large, and finally Geroski's (1990) point that in the UK there is little evidence of causation between actual monopoly power and innovative activity.
[23] He believes that firms that do not undertake routine innovations could earn normal profits and stay in the business.
[24] He covered innovations emanating from 600 firms, during the period 1986-1995, except from 1991. He divided all firms in six categories in accordance with the amount of employees.
[25] The 'raison d'être' of this article was to explain the positive elements of the abolition of barriers among the EU nations but I believe that its points enable us to have a more general view of the relationship between competition and innovation.
[26] Static efficiency is related to the exploitation of given technology where the dynamic is related to the efforts to push further the technological frontiers.
[27]He also challenges any significant relation between productivity and innovation
[28] We are going to discuss, Dosi's contribution in depth, in the section on 'Sources of innovative diversity'.
[29] Sach and Stiglitz advanced the theory of non-tournament i.e. a model that assumes that firms undertake several parallel projects aiming at the same innovation and having a cost-reducing impact at the process. (see also Beath 1992).
[30] Initially mentioned in the 'Demand pull' theories of innovation.
[31] He adds also that, Guerard Bean and Andrews' (1987) research proved the lack of statistical significance existed between R&D and external funds.
[32] The National Co-operative Research Act of 1984 which promoted the RJV in the U. S.
[33] Production-intensive firms are related to the increasing division of labour and simplification of production tasks. Their main representatives are food production, metal and manufacturing, shipbuilding and motor vehicles. They devote a considerable part of R&D to process innovations and present high vertical-integration characteristics The production of a significant part of their own process innovation characterises the mechanical and engineering firms, but they mainly focus on the creation of product innovations destined for other sectors.
[34] The science-based firms are considered to be located in the chemical and electronic/electrical sectors. Their R&D expenditures are very high and they usually produce the technological paradigm that defines the technological trajectories.
[35] It should be also tested further - covering all sectors - extended and modified in order to cover other areas.
[36] Rosenberg (1982) argues that research is expensive hence the allocation of R&D investment has to follow a certain direction. Usually these directions are determined by economic and technological factors i.e. they set the 'agenda' for research. At this point he clarifies that technology is a codified set of experiences and knowledge. The growth of technology is much more cumulative, and interactive with new scientific knowledge.
[37] He divided these sectors into four categories supplier dominated, specialised suppliers, scale-intensive and science-based.
[38] The data comprises 8000 commercial innovations introduced in 1982 in the US.
[39] Allowing for the fact that industrial production in the US is indeed concentrated in less then ten states.
[40] The importance of organizational structures for the innovative activity is extensively discussed in Shrivastava and Souder (19870 paper. The paper includes a review of the relevant literature and three models of organizational structures and their impact on the innovative activity: the stage, process and task dominant models.
[41] Tidd, Bessant and Pavitt (1996) highlighted the diversity of sectors and cases.
[42] It is possible to identify them by observing the change in the coefficients of input-output matrix.
[43] They could be related with more macro changes as the consumer policy changes for the purchases of durable products in 1950's in capitalist societies.

[44] But from the 1960's the actual rate of productivity has declined. He argues that the main reason is the structural crisis of adaptation of the techno-economic paradigm resulting in an uneven sectoral development. It is imperative to explain that industries' massive production (Fordist style) and energy intensiveness, based on the previous paradigm, have reached their limits on productivity gains, i.e. diminishing returns to further technical advance along existing trajectories (Wolf's law). On the other hand the new paradigm, i.e. information technology, is not yet affecting all the economy, hence its cost reduction advantages, have not been fully exploited.

[45] It covered the diffusion of Automated Telling Machines (ATMs) during the period 1972-1992. We are going to discuss in depth the ATMs in the 'Plastic card' chapter (six).

[46] Sakurai (1996) and Papakonstantinou (1996) in accordance with the EU Green Paper on Innovation (1995) and the Cabinet Office 'Realising our Potential' (1993) discussed the importance of research spillovers in the innovative activity.

[47] Discussed by many other authors as Ayres (1991), Stoneman (1994) or Saloner (1995).

[48] Process due to the novelty of using the demand deposits and product because it expands the spectrum of services provided with the 24 hours access.

[49] The purchase of a telephone is a typical example.

[50] The purchase of a hardware and the later creation of compatible software, is a typical example.

[51] In the case that their availability and quality depend on the amount of sales.

[52] Large firms prefer not to offer where small firms with analogous networks prefer to offer compatible products. They also discuss whether or not side payments exist and whether their existence could influence the joint adoption of a standard or the unilateral construction of an adapter- usually from a small firm.

[53] He proposed a model based on intense competition, predicting higher profits when products are not compatible.

[54] Without being necessary that the innovator is a quantity leader

[55] Benefit from output embodied knowledge is achieved through in house use of the innovation in order to enhance its products. Benefit from non embodied knowledge is achieved through the sale of its non embodied knowledge to third parties.

[56] Generic is general purpose assets not tailored to the innovation, specialised assets are unilateral depended between innovation and the complementary assets and co-specialised assets have a bilateral dependence, like specialised repair facilities for a particular type of machines.

[57] External constraints are government intervention and competitors. Internal constraints are the self imposed liquidity ratio and other internal regulation that prevent the firm from reaching its own target.

[58] The typical example is a regulation imposed in the bank by the monetary authority such as interest ceiling on time deposits in U.S in the 1930s.

[59] In this case a reduction in firm's utility is considered as 'abnormal' in accordance with historical data and firms decide to act against this constraint. A typical example is an increase in a particular type of cost such as personnel.

[60] These are: inflation including level of interest rates, general price level and tax effects, volatility of interest rates, technology, legislative initiative, internationalization and other.

[61] Hegel's dialectic could be summarised in the process of thesis, antithesis, synthesis. It is a dynamic approach in contradiction to any permanent static equilibrium, if we take into account that the synthesis becomes a fresh thesis and the process is perpetuated.

[62] A typical example is the US deposit institutions in the 1960s and 1970s. The exogenous factors are the technological change and changing market environment which forced banks due to the uncertainty they faced, to move quicker than regulation.

[63] A very detailed demonstration of the regulatory approach is included, (Kane 1981), summarising the substitutes that banks created as a response to particular regulation.

[64] Re-regulation took a considerable time for many reasons: firstly the bureaucratic regulative bodies require substantial amounts of information before deciding to act, they had to take into account the impact of their approach for the welfare of their regulatee, and very often any re-regulation is enforced and supervised by a separate agency in a gradual way.

[65] More than one causes could initiate the innovative activity.

[66] In the particularly political sensitive area of housing, the government has pioneered innovations. We will discuss them in depth, in the 'Securitization' chapter.

[67] The Eurodollar market due to US restrictions, the swaps due to British government exchange restrictions, deep discount bonds by US corporations or zero bonds due to tax complications, financial futures due to the exchange and interest rate volatility.

[68] Aggressive innovation is the introduction of a new product or process in response to a perceived demand. A defensive innovation is a response to a change to internal or external factors.
[69] The Securities and Exchange Commission in the 1970s pressed for development towards the centralisation of the market making process and trading. The US Treasury in 1984, in order to manage the raising of huge amounts of debt launched two new products: the twenty years bond with a 5 year call period without withholding tax and the first zero coupon paper i.e. the Strip.
[70] Mutual funds are considered as transparent where insurance companies and Saving and Loan are considered as opaque. Pension funds are positioned in the middle. In opaque institutions the agency costs or the monitoring, bonding and control costs, are the most severe.
[71] He develops a model that highlights the importance of financial institutions in running the marketing networks.
[72] Imperfect is conceived in contrast within the perfect competition assumptions of no transaction costs and liquid financial markets.
[73] A possible explanation of the tremendous success could be the transaction cost associated with fixed commissions and providing an incentive for pooling of transactions. An additional reason could be associated with less costly monitoring.
[74] They mentioned that a possible explanation could be associated with Goldsmith's (1969) approach of 'rotation' and 'offset' ratios. These ratios measure the degree of divergence and volatility between surplus and deficit units.
[75] Using as an example the connection between deregulation and technological development.
[76] Due to the Fisher effect (equation which connects the inflation rate with interest rates) and this fall in interest rates would lower the 'tax' on deposits imposed by reserve requirements and reduce banks interest on wholesale and eurodollar market and focus more on deposit business.
[77] It is the second time that we encounter the description of financial innovation as an 'engine'. The first encounter was in Gardener's (1988) paper where he describes financial innovation as an engine of change in the British banking system.
[78] The cost of monitoring an investment.
[79] The expansion to round-the-clock trading, combined with powerful information technology leads to tailored products and very sophisticated hedging and risk strategies.
[80] Since banks can pool risk and diversify easier than individuals given the fixed cost of acquiring information.
[81] Marketing costs are incurred in order to identify and educate buyers and sellers, manufacturing costs are related to creation and engineering of the financial products and other transactions associated with the launching and running of these products.
[82] The regulative implications also boost further the scope for cost reduction and products such as synthetic CMO's and amortizing interest rate swaps were launched by banks.
[83] Increased volatility and broadening of potential markets could provide further scope for innovation. Furthermore, development related to the nature of potential investors could also enhance innovative activity.
[84] It is the case that banks do not charge their depositors for writing cheques and the administration of their account.
[85] Particularly, after the Building Society Act in 1986. We shall discuss it in depth in the following chapter on special banking liabilities.
[86] As part of the standard function of a financial intermediary: the processing of information, the transformation of maturities accompanied with the provision of liquidity and the transformation of risks.
[87] The above three papers discussed Veblen's theory of financial instability. This theory is not related directly with our research but indirectly through the institutionalist approach and the importance of large (financial) institutions for the smooth functioning of the economy.
[88] An instrument innovation is associated with Veblen's product innovation and practice innovation is associated with Veblen's process innovation. Except from these two, van Horne (1985), used the process, product classification.
[89] The first type consists of exchange of present money against future money, the second is bringing together borrowers and lenders and the third one is the execution of payments.
[90] They are in principle reversible when the cause ceases to exist but, taking as example the Euromarkets (inflation and interest rate ceiling), their disappearance takes much more time than their emergence.
[91] The main cause of these innovations is the reduction of transaction costs.
[92] But the causal relationship is not clear.
[93] Transmission of information is cheaper and easier within than between firms.

[94] Some of these reasons could be perceived as causes but since all these causes are already mentioned in the previous chapter (section 1.1, we integrate them in this section primarily because these researchers accept the BIS classification and then because they advanced attributes that financial innovation should include in order to be successful.
[95] The BIS is itself considered as a very illustrative case of financial innovation (Summons 1993).
[96] Reminding us the literature and discussion on the impact of Research and Development activities for the innovative process in chapter one (section 1.1).
[97] In accordance with Schumpeterian definitions of innovation (see appendix [A-1.1]).
[98] Vinals and Borge's (1988) classification is the following:

Special debt instruments	***Debt-equity hybrid instruments***
-Variable rate loans	-Convertible bonds
-Floating rate bonds	-Bonds with warrants
-Note issuance facilities	-Prets participatifs
-Zero coupon and Junk bonds	
-Leasing	***Risk-covering instruments***
Special equity instruments	-Swaps
-Euro-equities	-Futures/forwards rate agreements
-Venture capital	- Options

[99] The quantity is measured by the market value at the time of the offer, the price is the underwriting spread i.e. investors payment minus the issuers proceeds.
[100] An illustrative example is the explosion observed in between 1982 and 1984 of instruments capturing the 85% tax exemption of dividend income. In 1984 the Tax Act reduced considerably the demand for these products.
[101] Remind ourselves the existence of positive network externalities on the financial markets. In our case the existence of other instruments or markets increases the demand for financial instruments for hedging purposes and could also be explained by Merton's (1992) already mentioned spiral effect.
[102] This investment included: payment for legal, accounting, regulatory and tax advice, time spent educating issuers, traders and investors, computer systems for pricing and trading, capital and personnel commitments to support market making, plus the annual average investment of one million dollars for product development.
[103] These barriers could be long-standing client relationships, distinction among firms, clients' preference for multiple underwriters and market makers.
[104] Lower prices could still generate profits through lower cost and these innovators are called inframarginal competitors.
[105] They use their knowledge of the buyers to set up secondary trades and become the dominant market makers. The active market making provides could then provide low cost information about the preference of investors for future underwriting and market making.
[106] He associates this criticism with the intransigence of the economic doctrine of Physiocracy. The two developments wrong blamed, for the crash of 1987, are, the Index Futures for stock market volatility and Index Products.
[107] This approach perceives a theoretical spectrum of all products based on liquidity and return. Each product is positioned in this spectrum, the 'filling the gap' theory investigates the reduction of distance between this points/products.
[108] In accordance with this theory, there is no incentive to innovate unless the opportunity cost of holding traditional financial products or employing existing financial technology exceeds a certain threshhold. This threshhold is related to the maximum interest rate for the preceding period.
[109] The buidt-up of large positions and the program trading practice act as factors of instability.
[110] New combination could just be linear combinations of existing securities but still improving the utility of economic agents.

Chapter two

*'**Entropy**: (Clausius 1865) It is a measure of disorder or randomness in a physical system. It took its name form the Greek word 'Τροπη' which means transformation. Based on the second law of Thermodynamics, the entropy of the universe is constantly increasing.'*
(Philosophy Encyclopaedia)

2 Model of Financial Innovation

Introduction

In the previous chapter we discussed the main theories of innovation and derived an evolutionary and dynamic approach, combined with some important concepts such as routines, in-house and public available technology, spillovers, appropriability, network externalities and strategic objectives, as well as an evolutionary process justifying the emergence innovative activity. We also discussed theories of financial innovation and derived potential causes, classification, benefits and shortcomings of financial innovations.

During this chapter, we will propose a model designed to ecapsulate the financial innovation process and to provide an analytical framework that offers significant insight into the process. This model combines elements from both sections of the previous chapter, on theories of innovation and financial innovation. It consists of four stages before the successful emergence of a financial innovation. Each stage offers additional information and enhances further our understanding of the particular innovation. It both synthesises and extends elements from the existing literature.

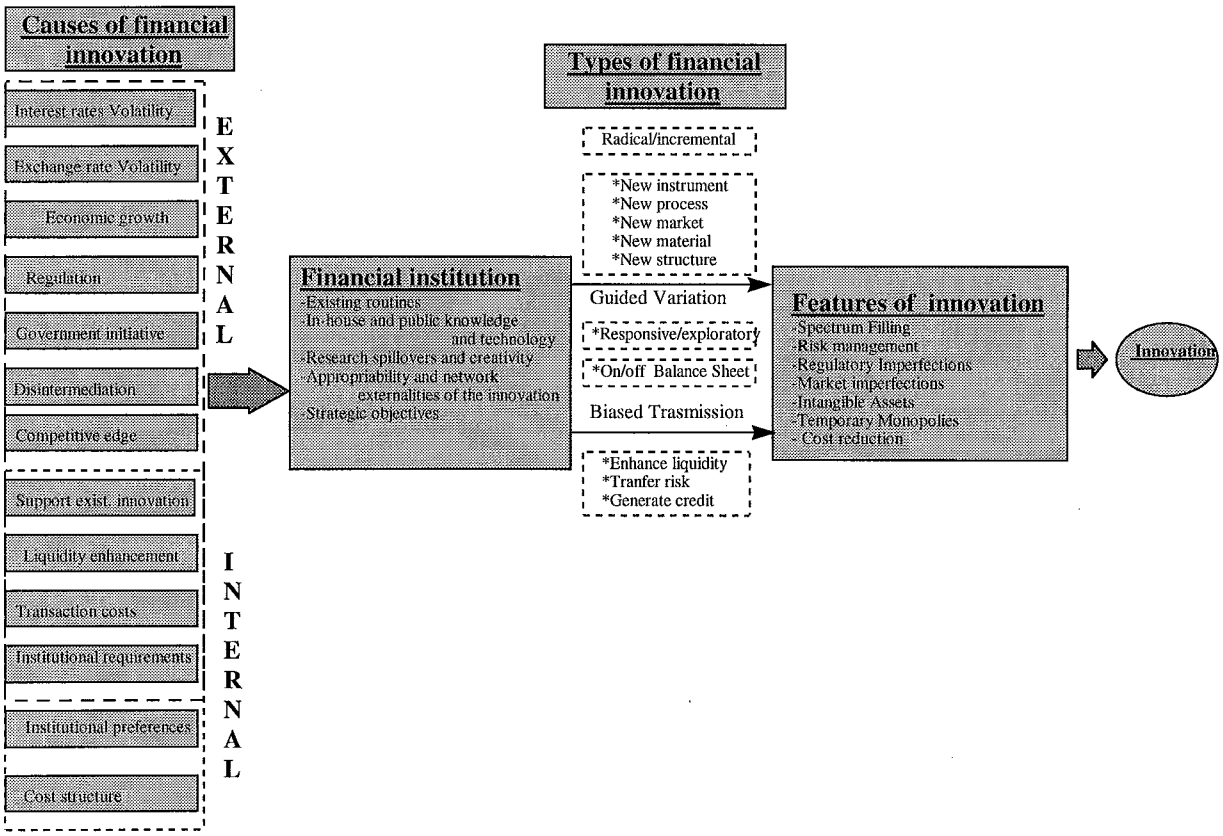
The first stage addresses the causes of financial innovation allocated into three groups. The second stage is the factors that initiate and shape financial innovative activity inside the financial institution. The third stage is the types and classifications of financial innovations, necessary in order to describe accurately any financial innovation. Finally, we discuss the features of selected or successful innovation in order to provide a holistic view of the phenomenon. This holistic view is further enhanced by the dynamic and evolutionary nature of our model. Shortcomings and limitations of existing innovations, could initiate the financial innovative process.

2.1 Factors causing financial innovative activity

During this section, we shall discuss the first stage of the model of financial innovation process consisting of the causes of financial innovation. It is essential in order to create an analytical framework to understand the causes that initiate the financial innovative effort.

The first stage of the model is the set of causes that could initiate innovative activity. We divide these causes into two main categories, the ***external*** and the ***internal***. Between them there is a sub category of causes that could be both external and internal. Significant contributions of our model are: the plethora and diversity of potential causes for innovation and the proposition that *more than one* causes could initiate financial innovative activity. We are not going to include technological advance, a very often cited cause of financial innovation, for reasons that we are going to explain in the following section.

Model of financial innovation



The *external causes* of financial innovation are seven. The order does not indicate the importance attributed to these causes. The first two are associated with volatility, of interest rates and exchange rates. *Interest rate volatility* was proposed as a cause by van Horne (1985), Minskin (1992) and Davies (1993). *Exchange rate volatility* was discussed mostly by Miller (1992). Another cause that it is frequently cited is the increase of wealth and *economic growth.* The most prominent supporters are BIS (1986), Miller (1992) and Llewellyn (1992). We then identify *regulation* as the most cited cause of financial innovative activity. Almost all the prominent researchers perceived regulation as a very common cause of innovation: among others Silber (1983), Kane (1981), van Horne (1985), the BIS report (1986), and Miller (1986/1992). Mishkin (1992) proposed and elaborated also the concept of re-regulation which Kane first observed in his 'regulatory dialectic'. *Government initiatives* - apart from regulative ones - is a further cause of financial innovation. The most important advocates of this cause were Miller (1986) and Walmsley (1988). The *disintermidiation* that characterised the financial systems at the end of the 1970s and mostly in the 1980s and 1990's was mentioned by many authors. Artus and Boisseau (1988), Arestis and Howells (1992), Davies (1993), Ford and Molluneux (1995) were the most important contributions on this cause. Finally, *competition* or the quest for a *competitive edge* was very often directly or indirectly mentioned. The most direct adherents of this cause were the BIS report, Walmsley (1988), Arestis and Howells (1992), Ford and Molluneux (1995), where Llewellyn (1992) and Merton et al (1995) described it as changes in the market environment demand requirements.

The following set of four causes could be perceived as internal or external depending on the particular case of financial innovation. The first is, providing *support to existing innovations.* One of the contributions of our model is the introduction of this new cause. As we are going to discuss in the following chapters, financial institutions could

initiate innovative activity in order to support existing innovations. Second is *liquidity enhancement* advocated by Levich (1987), Flood (1992) and Merton (1992). Then *transactions costs* were directly supported as a cause by Allen and Gale (1984), Miller (1986), Flood (1992) and Merton (1992) and indirectly by Llewellyn (1992). Finally the *institutional requirements*, which could be associated with regulation or competitive pressures or the deliberate decisions of the institution was advocated mainly by Ross (1989), Llewellyn (1992) and indirectly by Davies (1993) through restrictions on banks balance sheets.

The third set of causes are considered as internal to the firm. There are two types of internal causes: institutional preferences and the cost structure of financial institutions. *Institutional preferences* were advocated mainly by the institutionalist Ross (1989) and Llewellyn (1992). The *cost structure* was advocated by Merton et al (1995) and Blake (1995).

During the first stage of our model, we have discussed three types of causes that are able to initialise the innovative activity. All of them are considered as endogenous to the financial system since we perceive the financial system as consisting of three elements: providers of financial services, buyers of financial services and regulatory bodies. In other words we adopt a functional relationship i.e we do not segment our approach only to recognised banks or official designated banks, but we tend to cover a more wide financial spectrum of analysis where banks operate. These three sub-categories are external, internal and potentially both internal and external to the financial institution. As we shall discuss in the coming chapters, it is possible that more than one cause is initiating the innovative activity. In order to enrich further our insight on the phenomenon of financial innovation, we are going to propose a set of factors that are internal to the financial institution and shape the financial innovative activity.

2.2 The innovative process in the financial institution

The second stage of our model analyses the factors that influence and shape financial innovative activity inside the financial institution, in order to enhance our understanding about financial innovations.

We are going to use many concepts from the theories of innovation, discussed in the previous chapter. This "cross fertilisation" between concepts emanating from the standard innovation theory and financial innovation is one of the contributions of our model. During this section we are going to encounter concepts such as existing routines, in-house and public knowledge, technology, creativity, appropriability, spillovers, network externalities and strategic objectives.

The key concept is that the most commonly cited cause of financial innovation, technological advance, is not treated as a potential cause but we incorporate it, inside the financial institution. When we incorporate it, we do not perceive it as endogenous to the institution. We propose that the level of technology available both internally and externally is going to be taken into consideration during the design of the innovation. In other words, technology could shape or facilitate the innovative process but it is not a single cause by itself. The financial sector belongs to the supplier-dominated industries (Pavitt 1984). The characteristics of this sector is small firms, with small in-house Research and Development and engineering abilities.

The first concept is the existing routines of the financial institution. We adopt the evolutionary approach that firms use internal *routines* (Hodgson 1995a, 1995b) in order to function. These routines could facilitate the daily management of the institution. Any kind of routine could act as a barrier towards any novelty. Learning and experimentation are crucial for the innovative activity of institutions (Merton et al 1995). It is also connected

with the expertise (Tuffano 1990) or know how (Davies 1993) that is crucial to financial institutions. Part of these routines is the academic qualifications of the managers (Miller 1986). They are also part of the important economies of scale that large financial institutions present and enhance further their innovative activity (Davies 1993, Merton et al 1995).

Then we discuss the concepts of in-house technology, knowledge and externally available technology, the general stock of knowledge. The emergence of innovative activity depends on two elements, the available *in-house knowledge* or *technology* and the general stock of knowledge. The internal part is endogenous (Hicks) and aiming at cost reduction. The technology available in a financial institution could be cumulative (Pavitt 1984). The introduction of technological applications in order to reduce the cost was discussed by many researchers and especially in cases where an institution's utility was reduced or in cases where the cost of adhering to an existing burden surpassed a certain threshold (Silber 1975). The paramount role of *technology* is highlighted by many researchers such as Miller (1986), Mishkin (1992), Ford and Molluneux (1995) only to mention a few. The *public stock of knowledge* could be used in institutions' innovative process through R&D (Dosi 1988). The importance of new advanced academic work was supported by van Horne (1985) and Levich (1987).

The third set of factors consists of research spillovers and creativity. The institutionalisation of R&D activity is a fact observed by BIS (1986). *Spillover* could create a problem of 'free rider' (Poyago-Theotoky 1996) and reduce competition (Kort 1996) hence patents (Dasgupta and Stoneman 1987) and protective regulation could be introduced in order to enhance innovative activity. Spillover is essential especially in information technology applications (Kort 1996, Gourlay 1998). A further characteristic is

creativity, as Smith first mentioned; the entrepreneur *seeks his own truth* Hodgson (1995) refers to the difficulty of including it in a formal model.

Then, we discuss the concepts of appropriability and positive network externalities. *Appropriability* should be taken into consideration since patents are weak or non-existent (Tuffano 1990, Llewellyn 1992). But positive regulation could exist (Corkish et al 1997). Financial institutions under conditions of weak patent protection or appropriability could capture benefits by producing complementry goods (Hippel 1981).

The appropriability of an innovation could be enhanced by *network externalities* as discussed by Economides (1995) or positive complementarities as supported by Corkish et al (1997). Positive network externalities could increase significantly the predisposition of institutions to undertake innovative activity or adopt existing innovations.

Finally, we discuss the element of strategic objectives. The *strategic objectives* could be associated with both demand (users) and supply (institutions) characteristics (Llewellyn 1992 and Blake 1996) as well as their technological abilities (Smookler 1966) that strategists take into account when formulating their plans. It is also essential that innovators have a good understanding of their potential market (Rosenberg 1979).

During this section, we have discussed concepts and aspects that are to be taken into account by the financial institution during the process of generating innovative output. These aspects are related to internal characteristics, to available knowledge and aspects surrounding the potential financial innovation such as spillovers, appropriability, complementarities and positive network externalities. In order to provide a more enhanced description of financial innovation, we are going to discuss in the third stage of our model the potential classification of financial innovations.

2.3 Types of financial innovation

The third stage provides an analytical classification of the types of financial innovation. It is not possible to discuss the phenomenon of financial innovation without having a detailed and enriching way to classify the innovative output.

We are going to divide them into five types and sub categories (see the model in section 2.1). Our classification is based on different prior, altered and novel classifications. The purpose is to provide a very detailed and accurate description or classification of any financial innovation.

During the discussion on classification of financial innovation we encountered many different allocations. In our model we do not use all of them and we are making some alterations that could enable us to better classify them. We do not use the classification that was proposed by Veblen (1896) and Niehans (1983) since it is too narrow. Silber's (1975) classification is considered as covered by our own. We avoided Kane's (1981), Silber (1981), Artus and Boisseau (1988), Vilas (1988) and Tuffano (1990) since their classification are perceived as important only for particular types of financial instruments. Finally Walmsley's (1988) categories are modified and expanded.

Before discussing the types and sub-categories of financial innovation we could analogise with biological concepts. Financial innovative activity could be conceived as similar to the innovative activity in industry (Hodgson 1995). Financial innovation is a mutation of existing routines of doing a task or producing a financial instrument. These routines could be applicable also in the relationship between the different properties of a financial instrument i.e. risk, return and liquidity. These mutations are not random; they are *guided variations* towards the goal of profitability. Hence it is a *biased* not a random *transmission.*

Our first classification of financial innovation distinguishes between *radical* and *incremental* innovation. We do not propose a middle category as Freeman (1982) did, since we believe that these two types are sufficient. A radical innovation is an innovation that leads to a series or cluster of further innovations based on the initial archetype. An incremental innovation is a financial innovation that adds a further characteristic to an existing innovation. Incremental innovation could be endogenous to the financial firm (Richardson 1996) and the result of learning-by-doing improvements (Audretesch 1995). Product differentiation could be perceived as routine innovations (Knight 1967). The majority of innovations are incremental (Audretesch 1995).

The second classification is similar to Schumpeter's types of innovative activity. It is considered the most detailed and enables us to encompass all types of financial innovation. A financial innovation could be a *new product* or *instrument*, a *new process* of doing a task or providing a service, a *new market* in which financial instruments could be sold, *new materials* or *inputs* and *new organisational* structures. This classification is considered as the most appropriate because of the disintermediation and deregulation process. The banking industry used new inputs in the design of their products, expanded to new markets and created new organisational structures or departments and on the other hand potential competitors emerged from other previously separated areas of the financial system.

The third classification was inspired by Walmsley's (1988) classification of aggressive and defensive financial innovations and Silber's adversity and success innovations. But we are going to propose an alternative distinction between *responsive* and *exploratory* financial innovations. Responsive innovations are considered to be any innovation where the initial cause is associated with any burden that the financial institution faces. The vast majority of existing financial innovations belong to this category.

An exploratory innovation is considered any innovation that does not appear as a response to a burden, but due to the willingness of the financial institution to acquire a competitive edge, as firms do in other industries. This type of innovation is extremely rare but is going to be significant in the future, because as disintermediation is taking place in the financial sectors, many particular aspects of the sector based on the particular nature and existing barriers will cease to exist. Hence financial institutions will have to behave like other non-finance firms and use their own R&D - already observed by BIS (1986) when it referred to a trend of institutionalisation of R&D activities in financial institutions - in order to acquire competitive advantages against existing and potential rivals. An innovation is by nature a novelty, hence uncertain by its nature, and some critics could immediately disregard the concept of 'exploratory' as a tautology. If we define the word innovation as 'make changes', this could provide us a reason to elaborate more on the concept of 'exploratory'. The key elements of exploration are inquiring and investigating and we apply the concept of exploration, in the sense that there is not any specific reason to undertake it except for the quest for market share and profits, like non-financial firms do.

The fourth classification is similar to the BIS (1986) report. We divide financial instruments into *off* and *on balance sheet*. This classification is not directly applicable to all of Schumpeter's five types of innovation. It is mainly related to financial instruments but indirectly we could apply it to other types of innovation by elaborating further and expanding the concept of the balance sheet. In other words whether the cost or return of this innovation is included directly in the balance sheet, it is automatically off balance sheet.

Finally the fifth classification is derived partially from the BIS classification of financial instruments. It allocates them in accordance with their ability to *enhance liquidity*, *transfer risk* whether in the form of *price* or *credit* risk, and to *generate credit*. We omit the

fourth type i.e. generating equity because, as we mentioned, in the introduction, it is not in the scope of our research. As we mentioned this classification is applicable mainly to financial processes or instruments. Due to its narrow use, we are going to call it a sub-category.

During this section we have discussed the five types and sub-categories that describe better and more accurately the financial activity of a financial institution. We are going to use them in order to define financial innovations more precisely. In order to achieve that, we also had to alter some of the existing classifications and provide a new type of classification. An additional aspect that enables us to better understand the financial innovation phenomenon, concerns the features which lead to its success. We turn now to fourth stage of our model.

2.4 The features of financial innovation's selection

During this section, we will discuss the features that a financial innovation should have in order to pass selection and emerge as a successful innovation (see model in section 2.5.1). The difference between a variation that survives and an unsuccessful mutation is whether the innovation has any of these features. Sometimes, a financial innovation could present more than one of the features.

The first feature is *spectrum filling.* A financial innovation should fill the spectrum of intermediation in order to be successful. The spectrum of intermediation is determined by the relationship between risk, return and liquidity. Every financial instrument has these three characteristics. Any new combination is an additional place on this spectrum. This approach was supported by Miller (1986) and Llewellyn (1992).

The second feature is *enhanced risk management.* Better risk management could be associated with the 'filling the spectrum' approaches. This approach was discussed by

Levich (1987), Vinal and Borges (1988) and Gardener (1988). It is also possible to associate with a conditional reduction of uncertainty as advanced by Bhatt (1986).

The third feature is *regulatory imperfections*. A financial innovation could address or target regulative imperfections in the form of regulation or taxation loopholes. The main advocates of this theory were Kane (1981), Levich (1987) and Davis (1983).

The fourth feature is *market imperfections*. This approach is discussed by Levich (1987) and Flood (1992). A financial innovation could target the imperfections of the market in relation to liquidity and transaction costs.

The fifth element is related to *intangible assets*. A financial innovation could provide the innovator institution with the expertise or the first-mover advantage, which can be perceived as a positive externality. Tuffano (1990) proposed this element after conducting a survey of investment banks.

The sixth feature is associated with *temporary monopolies*. Temporary monopolies could be extremely profitable. The first author to discuss this issue was Gardener (1988). These monopoly opportunities could be associated with the first-mover advantages that were proposed by van Horn (1985) and Corkish et al (1997). This approach was also encountered in Dasgupta and Stoneman (1987). In oligopolistic market structures, the closest application of the concept of temporary monopolies could be materialised under the dominant or barometric firm price leadership (Sloman 1998).

Finally, the cost reduction feature, is associated many times with existing innovations and we are going to investigate its potential application as a successful feature. It could also be associated with the general point that financial innovation reduced the cost of intermediation (Arestis and Howells 1992) and (Llewellyn) or transactions costs (Allen and Gale 1984).

The process of financial innovation could be understood as an evolutionary process. As we mentioned in the previous section, it is possible that some problems created by financial innovations could be the cause for further innovations. These problems are detailed in appendix [A-1.6] and are associated with the reduced accessibility of firms to financial innovation due to their high cost (Vinal and Borges 1988), problematic monetary control (Kane 1981, Mishkin 1992), limited information for pricing of advanced financial products as financial options (Conrad 1989, Detemple 1990) and the large exposures to systemic risk (Walmsley 1988, Raines 1990). Some of these in addition with other *unanticipated shortcomings* of existing innovations, could act as directly or indirectly causes for further. This dynamic approach is a further contribution of our analytical framework.

To summarise, during this section we have discussed the features that a successful financial innovation should include. These are related to the innovation's properties as filling the spectrum and better risk management, imperfections either market or regulative or due to tangible (temporary monopolies) and intangible assets. Sometimes it is conceivable that an innovation has more than one of these features. Apart from this structured presentation of potential successful features of financial innovation, a further contribution of our model is going to be its dynamic dimension. We shall discuss, in the following chapters the dynamic aspect that our model offers and the potential shortcomings or unanticipated features of financial innovation which could be addressed through new innovative activity. Before that, in the following section, we discuss in general terms how to operationalize our model, and outline the significant contribution of our model.

2.5 How does the model work?

During this section, we shall provide a generalized example in order to illustrate how our model can be applied further and make the case, that it is sufficiently comprehensive to allow us to understand the causes, nature and development of further financial innovations. The structured presentation of these factors is one of the most important contributions of our conceptual framework.

A financial institution could face a "burden" related to an internal or external reason. This "burden" could also be combined with other additional factors and jointly act as a cause for the initiation of the innovative activity. This activity is going to be shaped and influenced by some factors. The potential innovation can be based on existing routines (usually the case of incremental innovations), taking advantage of publicly-available technology and mostly the institution's technological capabilities, and could use theoretical and academic knowledge. It can use previous research as a component as well as the creative abilities of the specialized staff of the institution. The structuring of the innovation will try to maximize the appropriability of the potential benefits and could hopefully present some positive network externalities. Finally strategic objectives such as institutions plans or experience could also shape the design of the innovation. The output of the innovative activity could lead to a radical or incremental innovation. This innovation could be either a new financial instrument, process, market, material or organizational structure and be classified as responsive to a particular "burden", or based on R&D developments, or potential demand. It could also be "on" or "off" balance sheet and either enhance liquidity, transfer risk or generate credit. This innovative effort could remind us of business "variations" that target particular goals. Whether the innovation in question manages to address these goals determines its success or failure. These goals are related with the filling

of spectrum of intermediation, enhancement of risk management, takes advantage of regulatory or market imperfections, confers intangible assets or temporary monopolies or reduces costs. It is possible that unanticipated complications or shortcomings of this innovation will force financial institutions to further innovate in order to address them.

The importance of our model consists in providing, for the first time, a model encapsulating the financial innovative activity which includes also dynamic elements that could encompass and explain further innovative developments. Previous academic work by Silber 1975, Kane 1981, van Horne 1985, BIS 1986, Llewellyn 1992 and Merton et al 1995 did not provide so many potential causes. It highlights the existence of dual causation for the initiation of financial activity. Furthermore, it is the only model to provide so many institution-related factors, as shaping innovative activity. A further novelty is the adoption of concepts related to the standard innovation literature. It provides also a much more detailed classification than the BIS report (1986), Walmsley (1988), Vilas (1988) or Tuffano (1990) and propose a new definition of financial innovation. Finally it is the only model that explains the features of a successful financial innovations and expand further Kane's (1981) and Mishkin's (1992) regulatory dialectic into a more dynamic and evolutionary approach. In order to support this model, we considered comprehensive information on four clusters of financial innovations; that in itself is offered as a contribution not included in previous academic work.

Our model could be extremely useful to any researcher involved in the financial sector. Whatever the degree of evolution of the banking system (Chick 1989), our model provides a significant insight into the financial innovative process and an holistic view of the phenomenon. The initiation, emergence, shaping and survival of the financial innovation is described by a coherent and structured way, combined with an evolutionary and dynamic perspective. This insight was further enhanced by new definitions (factors

shaping the innovation and types) and concepts (successful features and dynamic nature) that enriched our model. It is extremely important in a financial world where uncertainty is inherent in the system (Shackle 1967, Schmidt 1996), that analytical frameworks are created, which capture multiple causation and the dynamics of phenomena as important as the financial innovation for the financial system.

During this section, we have illustrated how of our financial model might be applied to any financial innovation and suggested ways in which it represents an advance on existing literature.

2.6 Conclusion

During this chapter, we proposed a conceptual and descriptive model of the process of financial innovation. Our model is discussed in four stages. The first stage presents a set of thirteen factors that could cause financial innovative activity. These causes could be external to the institution such as volatility of exchange and interest rates, economic growth, regulation and government initiatives, disintermidiation and competitive edge. They could also be both external and internal, such as supporting existing innovations, liquidity enhancement, transaction costs and institutional requirements. Finally they could be internal such as institutional preferences and cost structures. An additional novelty of our model is that it is conceivable for a particular financial innovation to have *more than* one cause.

Then, we discussed the different factors that shape the financial innovative process inside financial institutions. These factors are existing routines, in-house and public knowledge and technology. Financial innovation is also shaped by the existence of spillovers, appropriability and other externalities as well as by the strategic objectives of the institution. A significant contribution of our research is the adoption of these concepts

related to the standard innovation theory and their incorporation in our model of financial innovation.

The third stage of our model focuses on the types and classification of financial innovative activity. We propose the distinction between radical and incremental innovations and we adopt, slightly modified, Schumpeters's five types of innovation. Then we could classify them as responsive or exploratory, on or off balance sheet. Finally we use the BIS (1986) classification applicable to only two financial instruments and processes. The contribution of this stage is that it provides a uniquely accurate and detailed way to classify financial innovations, as a result of our selection, alterations and novel types of classification. These financial innovations could be perceived as mutations or variations of existing routines; not random, but targeting a particular goal, profits and consequently considered as a biased transmission process.

The final stage discusses the features of a successful financial innovation. These features are associated with the properties of the innovation, the potential intangible and tangible (temporary monopoly) advantages and exploitation of imperfections, both regulatory and market. The evolutionary dynamic of our model is supported by the continuous interaction between causes and innovations and the possibility of initiation of further innovative activity from the shortcomings or unanticipated problems of existing innovations. In the second part, we are going to discuss in detail four clusters of financial innovation, in order to provide the supportive evidence to our model of financial innovation. We are concerned to assess how far the model can in fact encapsulate and illustrate all aspects of a wide range of actual innovations.

Part II

Chapter three

'An answer raises new questions'
Prolegomena, Any Future Metaphysics, E. Kant, 1781

3 Special liabilities of banks

Introduction

In the previous chapter, we developed an analytical framework which we can use in order explain the emergence of any financial innovation in the banking sector. In this chapter we are going to discuss some financial innovations that banks in the US and in the UK created in the liability side of their balance sheet, as the first of four applications of the model.

Initially, we will refer briefly to monetary history and the background to this cluster of innovations. Then we will discuss the resulting financial innovations that took place in the US. The first innovation to discuss will be the Negotiable Order of Withdrawal (NOW). Then we will discuss other financial innovations that took place in the wider financial sector as a response to NOW accounts, such as MMMF, CMA, ATS and other innovations. The following section will refer to the legislative intervention that enabled the introduction and proliferation of Money Market Deposit Accounts (MMDA) and Super NOW accounts. and enabled banks to better compete with other financial institutions.

In the second part of this chapter, we will discuss the monetary history of the UK and banking liabilities that presented similar characteristics to those listed above for the US. The innovative effort in the UK was not as intense as in the US. The main financial innovations were the Certificate of Deposits and interest bearing sight accounts.

During this chapter we will refer to the causes of these financial innovations, explain factors that shaped their development, classify them and finally explain their features that contributed to their success and thus investigate whether these financial innovations could be explained by our model.

3.1 United States

During the first subsection, firstly we will review the money and banking history of the US. It is essential to review this history because many reasons behind the initial financial innovation are related to the US banking history, and particularly to regulative interventions. Then we are going to discuss the first innovative deposit account, the Negotiable Order of Withdrawal (NOW). The following section discusses other financial innovations that took place after the NOW accounts. These products were intended to offer similar services and offer challenging alternatives to their customers in order to increase their returns and avoid the negative effects of high inflation. Then we review two other important innovations: the Money Market Deposit Account (MMDA) and the Super NOW account. The purpose of this discussion is to identify the causes and characteristics of this particular innovative process in the US.

3.1.1 A Brief Monetary History of the US

During this section, we will discuss briefly the money and banking history of the US since it is imperative to have some of these developments in mind in a chronological order to understand the financial innovations in question.

From the beginning of the US system, banks seeking to circulate notes required a corporate charter either from the State or Federal authorities. The charters were individually negotiated and had a duration of ten to twenty years. Notes from different banks enjoyed different degrees of acceptance, reflected in the different discounts applied in the 1800's. In 1838 New York was the first State to apply the free banking approach and during the next two decades this approach was enforced in the form of brokers' publication of discounts for thousands of banks. This market discipline was enhanced by technological changes in the communication (railroad) and telecommunication (telegraph) areas.

Discounts were based on more objective criteria and discounts for new entrants were reduced. In 1864 the Congress applied a tax on the State issuance of notes causing a reduction of State banks from 1500 to 250. State banks, in order to substitute for the loss in notes, introduced *demand deposits*.

Later, the gold standard was adopted in 1900, and in 1913 the Federal Reserve Board (hereafter the Fed) was created.[1] In 1927 in accordance with the McFadden Act, State supervisors were responsible for supervising financial institutions and were able to prevent interstate expansion. In 1933[2], after the Crash, in accordance with the Banking Act (the Glass Steagall Act), commercial and investment banking were separated[3] and the Federal Deposit Insurance Corporation was created (FDIC). At this time a significant *innovation* was the *multifunction banks*, which used to circumvent the Act, since banks were considerably constrained through different legal forms.

Regulation Q, emanating from the same Act, prevented banks from offering interest on current accounts and applied a Fed-originated ceiling for time deposits. The Bank Holding Company Act in 1956 enabled the Fed to supervise any company owning more than one bank.[4] Regulation Q ceilings were raised in order to realign with market rates in 1962-1964, but during the period 1965-1969 market interest rates moved above the *Regulation Q* ceiling.[5] The issuance of securities considerably influenced the monetary aggregates through money creation and upward movements in interest rates (Sylla 1982). In 1969 the Bank Merger Act tried to reinforce the State supervisory controls since significant efforts were (and continue to be) made in order to circumvent regulation by using holding companies.

In the following years State regulation proved more flexible and responsive to market realities than federal regulation, by allowing the launch of Negotiable Order of Withdrawal (NOW) accounts in 1974, Money Market Mutual Deposits (MMMD) in 1982

and super NOW accounts in 1983. In 1975 monetary policy targeted money growth rates as a means to reduce inflation. The dual nature (State or Federal) of supervision allowed banks the choice of regulation they preferred to be subject to. During the period 1965-1989 the assets and number of State banks increased (Sylla 1982)

In 1980 the Depository Institutions Deregulation and Monetary Control Act enabled the gradual abandonment of regulation Q, completed 1986. It also enabled banks to accept NOW deposits from individuals and non-profit organisations. The novelty of the MCA was that the Fed was applying reserve regulation according to the type of deposit[6] and not to the type of institution and they authorised for the first time thrift institutions such as Savings and Loans as well as Credit Unions to diversify their assets.

Retailers located at the other end of the intermediation spectrum were offering some infant financial products already from 1911. But at the end of the 1960s and during the 1970s bank regulation offered them significant space to expand in the financial sector.[7] In 1981, the financial activity of the ten largest non-financial firms equalled the top five banks financial activities. After 1982 and the introduction by the banks of Money Market Deposits (MMD) accounts the situation became more balanced (Graddy 1985).

But it was not only retailers that were entering the financial intermediation area. Banks' customers i.e. commercial firms discovered alternative ways to raise finance, such as the extensive use during the 1980s of the corporate paper and bond market.

In 1982 the Garn-St Germain Act[8] allowed depository institutions to offer MMDA and Super NOW accounts under certain conditions and authorised the acceptance of NOW accounts from the Federal and local governments (Rasche 1987). Thrift institutions were allowed to offer this type of accounts consequently to diversify their liabilities. During the same year, the Fed accepted that, due to massive financial innovation, the relation between money growth - especially M1 - and inflation is blurred and interest targeting is adopted.[9]

In 1988 international risk-based capital requirements were adopted and in addition to tighter regulatory standards caused the credit crunch in the 1990s.[10] Increased reporting requirements could increase the marginal costs of banks.[11] During the 1980s the number of banks fell from 14,435 to less than 12,000. Especially after 1985, the number of failed banks as well as the number of mergers was considerably increased.[12]

In 1994 the Riegle-Neal Interstate Banking and Branching Efficiency Act permitted interstate branching. By the end of 1990s, it was predicted that the banking system of the US was going to be dominated by three types of institutions, megabanks, superregionals and community banks.[13]

This brief monetary history highlighted the importance of *regulation, disintermediation,* and *competition* as key components of the US banking landscape. These factors could act separately, combined or even as a part of a *dynamic dialectic.* We turn now to discuss specific innovations which have proved part of this landscape, starting with NOW accounts.

3.1.2 Negotiable Order of Withdrawal - NOW accounts

During this section we will discuss the introduction and proliferation of Certificates of Deposits and Negotiable Order of Withdrawal accounts in the US. These innovations and especially the second, altered the banking accounts landscape of the US.

Regulations that were restricting banking activity were reserve requirements and restrictions on interest rates payable on deposits (Regulation Q).[14] Banks initially in the mid 1960s - were forced to find alternative sources of funds such as Eurodollars, i.e. dollar borrowed by banks outside the US, or bank commercial paper issued by a bank's parent holding company (Hitchins 1997). On the liabilities side Eurodollar markets also offered a solution: banks in order to avoid Regulation D[15] attracted deposits in the form of

Eurodollars (Graddy 1985). The famous 3-6-3 rule of the last 30 years, was seriously challenged by these developments.[16]

During this period an important innovation took place in 1961: the Negotiable Certificate of Deposits (CD) or large deposits that earned unregulated interest. This innovation was caused by the desire of banks to circumvent regulation on interest rates. It is a financial instrument, responsive to regulation, on the balance sheet and it could not be classified as a radical one. Negotiable CDs were issued for minimum deposits of $100,000 for a period of one to six months with interest payment at the end of the maturity and subject to lower reserve requirements than checking accounts.[17] This innovation primarily took advantage of a *regulatory imperfection* and circumvented the interest rate ceiling since they were not considered as demand deposits. The active secondary market existed for CDs (since they were classified as time deposits) and was perceived as a further innovation. This development significantly *enhanced liquidity.* The existence of a secondary market, immediately provides the basis for *positive network externalities.* They were mainly used by institutions as a substitute for commercial paper and banker's acceptances. In other words they were shaped by the *institution's preferences.* A further aspect of this instrument was the potential *filling of the intermediation spectrum.*

Rising inflation and interest rates from the end of the 1960s to the 1980s further increased the financial burden of regulation on the banks. The monetary authorities did not allow banks to pay interest on checking accounts[18] and they set an upper limit for time deposits. As inflation was rising the public was also demanding an inflation premium embedded in the interest payments it was receiving for their deposits. Due to the regulation of interest payments, banks had to offer a plethora of diverse non-pecuniary services to their clients such as checks, safe deposit boxes or even radios or coffee machines (Kane 1981).[19] Banks were also involved in non-price competition based on their branche

network, longer office hours or merchandise premiums. It was argued by many researchers that this type of competition does not promote efficiency and even that the cost of rising deposits is higher than in the case of free competition.[20] Meanwhile during that period depositors were offered significantly higher yields from alternative placements in securities or mutual funds[21] or by joining a Savings and Loans institution (Sylla 1982).

Before 1970, Savings and Loans institutions were not allowed to offer demand deposits. In order to circumvent these barriers[22] they had to offer a product that technically was not classified by the Fed as a demand deposit. In 1970 a mutual savings bank initially in Massachusetts[23] and later in 1972, in New Hampshire, offered its depositors the ability to withdraw money by using a check.[24] This financial instrument was called a Negotiable Order of Withdrawal or NOW account. Technically they were savings accounts that required 30 to 90 days notice before any withdrawal. The institution was paying the legally acceptable 5.25% and 15 cents was charged for each withdrawal. In other words, it was a *radical-regulation* induced *financial instrument, on* balance sheet, *enhancing the liquidity* of depositors.

Initially the banking commissioner prohibited these accounts, but in 1972 a ruling of the State's Supreme Court overruled the prohibition and interest paying NOW accounts appeared in New England.[25] This development put commercial banks in a disadvantageous position since they were already forced by regulators to pay less interest on savings and time accounts than thrift institutions (Kimball 1977).[26] It is worth mentioning that initially the larger mutual Savings banks introduced NOW accounts[27] in a similar way to other process or product innovations, having a significant advantage of better *in-house technology* available (Basch 1982). Early adopters were also banks with high loan/deposit ratios and increasing incomes.[28] External or environmental conditions that probably promoted the proliferation of NOW accounts were the degree of oligopoly and the location

of headquarters.[29] In other words big, aggressive and innovative savings banks probably enjoying *economies of scales* and accommodating at the same time their *own preferences* or *requirements* led the introduction process and their quest for large market share.

In October 1973 Congress allowed NOW accounts in mutual Savings banks, commercial banks, S&Ls and co-operative banks in only two States - Massachusetts and New Hampshire.[30] In 1974, 236 institutions in Massachusetts and 41 in New Hampshire were offering NOW accounts (Gibson 1975). We have to realise that NOW accounts were not as novel a line of product for commercial banks, to the same extent as for Savings banks. It was a product that had attributes of two existing products: demand and time deposits. Many banks feared that NOW accounts were just going to be mainly a conversion of existing lucrative demand deposits (Basch 1976).[31] Many commercial banks did not offer NOW accounts[32], and preferred to offer more attractive checking accounts[33] or offered them under unattractive conditions in terms of minimum balances or service charges (Basch 1983). It was observed that larger banks offered NOW accounts sooner, but in less competitive markets commercial banks delayed in offering them. Faster growing banks during the period attracted more NOW accounts - a higher ratio of NOW to total deposits - than slower growing banks (Basch 1976). In other words, large banks and competitive structures favoured the introduction of NOW accounts.

An analysis of the impact on commercial banks of these accounts in Massachusetts and New Hampshire during the first years of their introduction was less significant than one could have expected. During this period, they enjoyed temporary monopolies due to the regulative barrier preventing other institutions from other States offering this type of account. Initially it was estimated that banks' demand deposits were not eroded and their after-tax earnings were reduced only by 2.5% and 5% during 1974 and 1975 respectively.[34] A recent analysis calculated that the reduction was significantly higher, at 3.4% and 11.3%

respectively (Kimball 1977). The reduction for the lowest-earning commercial banks was even worse, at around 19% and 24.3%. It was observed that many small commercial banks preferred not to offer or to delay considerably the introduction of NOW accounts due to many reasons, one of them being the *lack* of appropriate *information technology*.[35] This caused a reduction in their profits of 8.6 % and 12% in 1974 and 1975. Commercial banks lost 3% of their demand deposits in 1975, but comparing total deposits figures, they did not lose in nominal deposits but their total deposit growth declined (Kimball 1977). But it was believed that commercial banks that introduced NOW accounts defended their market share more efficiently than other financial institutions. This fact provides us with a potential *appropriability* of benefit aspect of these financial instruments.

Some complementary observations in relation to the amount of NOW accounts that commercial banks had on their balance sheets, were associated with free drafts, causing higher amounts and numbers of average balances. It was also observed that banks which offered NOW accounts for a long period experienced lower average balances but a higher number of accounts than banks that did not offer from the beginning this type of accounts (Bash 1976). Four main pricing tools were used by financial institutions in relation with NOW accounts: free drafts, interest rates applicable, transaction charges and minimum balance requirements. The last was the least uniformly applied tool of commercial banks in the 1970s (Simonson 1980).[36] All of them could be perceived as *routine* or *incremental innovations*, part of the *differentiation strategy* of the bank.

In New York, in 1974, a similar type of product was offered, called Payment Order of Withdrawal (POW), which did not pay interest.[37] More than 400 out of the 485 mutual savings banks in the US were located in New York. The acceptance by the regulatory bodies of this innovation could change considerably not only the mutual savings presence but the whole banking landscape in the US. After the 1973 Act, it was recommended to

allow nationwide financial institutions to offer NOW accounts, but it was only in 1979 that the State of New York authorised NOW accounts. The POW financial instrument is a typical example of a non selected *mutation* due to unsuccessful features i.e. *regulation imperfections.*

In 1980 the Depository Institutions Deregulation and Monetary Control Act allowed all banks to offer NOW accounts. But regulation was still shaping features of these products, the Depository Institutions Deregulation Committee (DIDC) was regulating interest rates (until 1986), and only households and not firms or institutions were allowed to have NOW accounts.

Research that took place in 1982 by Morgan reported some preliminary results based on the introduction of NOW accounts in four States.[38] Despite and allowing for differences amongst States, it is possible to observe some common tendencies. Large commercial banks offered better terms (prices)[39] than medium size banks. In case where branching restrictions or reduced competition by thrifts was applied, terms were not as good as in the opposite case. Finally, financial institutions, having in mind the experience of Massachusetts and money market rates, offered conditionally free drafts. These findings mainly support the better positioning of large banks and the existence of research spillovers emanating from the past experience of similar innovations launched by other financial institutions.

In the first two years of nation-wide introduction, the balances of NOW accounts increased from $17.4 billion in 1980 to $81.8 billion in 1982 (see table [T-3.1] on the US monetary aggregates of the period). In 1983 the DIDC authorised Super NOW accounts for a minimum deposit of $2,500 which were not subject to any ceiling regulation. NOW accounts are defined as *other checkable deposits* and constituted a component of M1[40] whose composition is also shown in table [T-3.1]. As we could observe in the same table

from 1989 they surpassed total demand deposits. The sum of NOW, Super NOW and credit union Share Drafts were classified as *other checkable accounts* and they are subject to the highest reserve requirement ratio.[41]

To summarise and in accordance with the terminology used in our model (2.1), during this section, we have discussed the paramount importance of NOW accounts, as the first of a *cluster* of financial innovations that we will discuss in the following sections. We identified causes related to *regulation* and *institutional preferences*. We encountered familiar concepts such as *positive network externalities*, *technology appropriability* and *research spillovers* and *strategic objectives* such as defending market share. We observed *incremental on*-balance-sheet innovations, *responsive* and *enhancing liquidity,* and the innovation's features, such as *filling the spectrum*, and *regulatory imperfection*. When the particular innovation failed to address these features (POW), it did *not* survive. We finally observed also, a *dynamic response*, when the DIMNC Act (1980), created a further innovative action (Super NOW) that will be discussed in the section (3.1.4). But in the next sub-section, we shall discuss additional innovations that took place after the emergence of NOW accounts.

3.1.3 Innovations launched after NOW accounts

During this section we will discuss financial innovations that took place in the **wider** financial and intermediation sector. These innovations are either *instruments* or *processes* which were related to the initial introduction of NOW accounts.

Financial institutions nationwide, in order to offer as much services as possible and at the same time incentives to their customers to stay loyal or even attract new customers, launched many new products during the 1970s. Some of them mainly targeted households, others targeted corporations.

The first innovation that clearly targeted households was the Money Market Mutual Funds (MMMF). In 1974 financial institutions other than banks or thrift institutions - not targeted by the regulation - offered the opportunity to customers to have a liquid bank account backed by shares and investments from a larger pool of funds and receive interest payments on their deposits. The initial minimum deposit was $5,000 but was later reduced to less than $1,000.[42] The financial institution invested the money in short term marketable securities.[43] It was also possible to write checques for a minimum of $100. This financial instrument was *not* a *routine* or *incremental* innovation for these financial institutions, and required considerable *in-house technological* abilities. Taking into account the concept of providing *liquidity* to existing and new markets, it is even possible to perceive it as an *exploratory* innovation. This *exploratory* innovation was caused by market conditions, was considered as both a *product*-(access to cash) and a *process*-(linking with mutual funds) innovation targeting *regulatory imperfections* and *filling the financial spectrum* of customers of these financial institutions.

The MMMFs became extremely popular during the late 1970s and mostly during the 1980s [44] (see table [T-3.2], including a column illustrating the proliferation of MMMF accounts). The proliferation of MMMF during the 1980s, could be illustrated if we compare their total amount in 1980 and 1990 in relation with M1 with a unique exception in 1983 when MMDA were introduced (see section 3.1.4). In 1980 they were 13% of M1 and in 1990 they presented 55% of M1 (see table [T-3.1] and [T-3.2]). At the end of the 1980s, due to *disintermediation*, other institutions began to offer Money Market Accounts at very competitive rates due to the lower cost base.[45] In 1980, MMMF were included in M2.[46] The MMMF raised funds nationally since restrictions on interstate banking were not applicable and institutions that were offering them linked them with other mutual fund and securities services (Keeley1985).

In 1977, the Cash Management Account (CMA) was introduced by a brokerage house (Merill Lynch). It combined three different services: a money market mutual fund, a credit line and a securities account. The minimum balance required was $20,000, an unlimited number of cheques and there was not any minimum amount for each cheque. Due to the minimum balance this product was not a close substitute for households' demand deposits but for corporate time deposits accounts and CDs.

A response of banks to NOW and the above-mentioned innovations was launched in 1978, when banks were allowed to offer the Automatic Transfer Service (ATS) to their customers. This service connected a savings and a deposit account. Whenever a check or any standing order was impending on the current account, the bank transferred the amount from the savings account. Hence current non-interest bearing accounts were kept at a zero or minimum balance and customers were receiving interest on the main bulk of their deposits in the form of saving accounts. Initially one third of banks opposed this novelty as costly or similar to NOW accounts, but later they were widely introduced (Mingo 1979). The introduction of ATS made the opportunity cost of holding non-interest accounts extremely high if we take into consideration that the money market rates were in two digits (Simonson 1980). This service was offered to corporations as a component of a cash-concentration financial product. The ATS was caused by both *regulation* and *competition* factors and could be perceived as a *responsive off*-balance sheet, *process* innovation that *enhances the liquidity* of the depositor. The emergence and proliferation of this financial *process* innovation was facilitated by *technological improvements* and related *cost reductions.*

Due to *disintermidiation* in the 1970s the dominance of thrift institutions in the housing market was seriously challenged by the banks. Hence, in order to attract deposits and defend their market share, thrift institutions launched Money Market Certificates

(MMC) in 1978 and Small Savers Certificates (SSC) in 1979[47] (Hadjimichalakis 1995). The MMCs were a six month time deposit of a minimum of $10,000 or $20,000 for seven to thirty one day certificates. The SSCs had a maturity of thirty to forty eight months. Later in 1981, the All Saver Certificate was launched with significant success due to its tax exempt status (Mahoney 1987) All of these *financial instruments* were *responsive*, *on* balance sheet, *enhancing liquidity* and *incrementally* based on the structure of CDs. Their main function was to exploit *regulatory imperfections* (including taxation), *fill the spectrum of intermediation* of these financial institutions and shaped by *strategic objectives* such as to maintain or increase their market share.

Galloping inflation had a direct influence on the willingness of corporations to use non or low interest bearing accounts. Banks were pushed by other banks' competitive activity to innovate in order to offer their clients products that maximised the interest payments received. The Cash Concentration system directed all payments into one bank account that was idle, or where a minimum balance was applied, until the arrival of the check, then an automatic transfer[48] from the central interest-bearing account took place. Another new product was the Lockboxes which were post boxes such that checks payable to a firm were directly mailed and immediately credited to the firm's account.[49] Cash concentration systems are conceived as a corporate development of ATS.

Repurchasing Agreements (Repos or RPs) offered depositors interest without sacrificing liquidity. The banks sold Treasury bills to the customer for a short period, and had the obligation to buy them back.[50] It is important to mention that in the case that the RPs were backed by government securities they were not subject to any reserve requirements and could better accommodate particular institutional requirements and preferences. They were introduced in 1970 but their proliferation took place at the end of the 1970s (we could find Repo figures in table [T- 3.2]). Repos were a substitute for

Certificates of Deposit or Treasury bills. These financial instruments or process, apart from *liquidity enhancement*, also include an element *of better risk management.*

To summarise this section, and referring to our model (2.1), we have identified causes of further innovations in bank liabilities such as *competition* and *regulation.* We analysed the importance of *technology* and we encountered *on* and *off* balance sheet, *exploratory* and *responsive*, *process* and *instrument* innovations, mainly *enhancing* the *liquidity* of the depositor. Finally, we highlighted the importance of *regulatory* and taxation *imperfection, filling the spectrum* and *better risk management.*

3.1.4 Money Market Deposit Accounts - MMD accounts and Super NOW accounts

During this section, we will discuss further innovations encouraged by changes in regulation but also shaped by other factors.

Money market mutual funds accelerated growth and drained customer deposits from banks in 1977 (Federal Reserve System). Money Market Deposit Accounts (MMDA) and Super NOW were the response partially to ATS and mainly to the Money Market Mutual Funds. The St Germain Act of 1982 allowed banks and thrift institutions to offer their depositors MMDA from October 1982 and Super-NOW accounts from January 1983. Both of them were authorised to pay unregulated interest on savings accounts that required initially a minimum balance of $2,500 and were insured by the Fed. If the remaining balance was less than the minimum amount, the interest payment was the same as on a NOW account. The amount of checks drawn and balance maintained were subject to regulation. MMDA allowed up to three drafts but unlimited transfers made by Automated Teller Machines.[51] The MMDA had a tremendous success from the first years of their introduction (see table [T-3.3], including details on the proliferation of MMD accounts).

On the other hand Super-NOW accounts allowed unlimited amounts of drafts or transfers. The MMDA and Super NOW were caused by *disintermediation* and backed by relevant *legislation* (re-regulation) and their target was to maintain the competitiveness and market share of banks by *filling the spectrum of the intermediation* function. They were *responsive on*-balance-sheet *financial instruments*, *enhancing the liquidity* of the deposit. Initially, large banks with extended ATM networks had a competitive advantage.

As we have already mentioned, the monetary authorities perceived Super-NOW accounts as transaction accounts and consequently part of M1, whereas MMDA, due to its limited draft facilities, was perceived as not a transaction account and therefore only a component of M2 and not subject to the same reserve requirements.[52] This distinction had significant implications since the excess reserves applicable to Super Now accounts (equal to 12 percent) could justify a different cost and consequently a different pricing due to this *regulative imperfection* (Tatom 1983).

There were two key questions in the debate about their impact on monetary aggregates and their interpretation. First, what was the source of the transferred funds or the 'source of shift'[53], and second did different reserve requirements on different types of accounts tempt banks to favour the proliferation of a particular type of deposit. The first response is that personal MMD accounts were not subject to reserve requirements.[54] Hence the introduction of MMDA could have an influence similar to MMMF in the 1970s [55] through a potential increase in the M2 multiplier caused by lower reserves. On the other hand, Super NOW accounts seemed not to influence monetary aggregates, their multipliers or their velocity of circulation in the way that had already been observed with NOW accounts (Tatom 1983).

Important research tried to provide further insight into the source of funds of MMD accounts. It was found that the main sources of funds in the *first years* were the large

Certificate of Deposits (CDs), small time deposits (see table [T-3.3] on US banking liabilities) and MMMFs (Keeley and Zimmerman 1985). In other words the first two were directly related to *competition* or *institutional preferences*, also taking into account the different reserve requirements[56], and the third one to *disintermidiation* causes. MMMFs did not show any tremendous reduction - less than $40 billion or less than 20% for the first year - and then resumed their upward trend (see table [T-3.2], for MMMF accounts), an indication of *appropriability* of the benefit. This fact was perceived as a sign of low sensitivity of holders to interest rate changes but we have to bear in mind that providers of MMMF incorporated significant additional services into the existing product.[57] These additional services could be perceived as *routine* or *incremental* innovations.

MMDA were very interest rate sensitive and attracted large amounts of funds. But as they became established, depositors became less interest rate sensitive due to switching costs (Keeley 1985). Consequently they captured a significant amount of funds destined for MMMFs since they offered significantly higher returns.[58] A survey in 1983 identified the first patterns in the pricing of MMDA and Super NOW accounts. They perceived these accounts as quasi-fixed factors[59] and bankers adopted a more 'offensive' or market-penetration strategy offering high interest rates (Rogowski 1984). During the first year MMDA deposit rates were considerably reduced to around 8.5% while the MMMF returns were fluctuating around 8% during the same period. Super NOW accounts offered *consistently lower* returns than MMDA.[60] They offer comparable services with NOW accounts and similar characteristics; this is an indication that the design of Super NOW and MMDA was based on *existing routines* (NOW accounts). Reasons associated with these lower returns could be the *higher* reserve requirements and a fear of potential *cannibalisation* of existing NOW accounts.[61] It was observed that thrift institutions were offering higher rates than banks. Finally the size of the institution did not affect the rates

offered for both products. It is obvious that they also took into account the experience of NOW accounts in New England where the majority of institutions offered conditionally - in terms of minimum balance and penalty - no charges on drafts and accounts. As we have already discussed for NOW accounts, this an incontestable consequence of *research spillovers.*

Banks and S&Ls faced considerably higher costs due to large networks and the additional services they used to offer.[62] In the late 1980s banks reduced their MMDA interest rates and MMMFs offered higher interest than before. The result was that at the beginning of the 1990s they had approximately the same amount - $300 billion each (see tables [T-3.2] on MMMF proliferation and [T-3.3] on MMDA proliferation). It is worth mentioning that while weekly data did not support the argument of substitution between MMDA and MMMF, monthly data provided more impetus to the substitution theory (Keeley 1984 and Lown 1987).

In 1983 the DIDC removed the ceiling on small time deposits (less than $100,000) for thrift institutions. The already mentioned Depository Institutions Deregulation and Monetary Control Act enabled thrift institutions to offer NOW accounts and the Garn-St. Germain Depository Institutions Act of 1982 offered them almost the same asset-liabilities choices as banks already had.[63] An illustrative fact is that in the 1960s banks controlled 34% of financial assets compared to only 23% in 1990.[64] In order to attract deposits in this new *disintermediation* era, thrift institutions and banks offered higher returns, at least initially, undermining their profitability and even solvency despite the fact that their assets and liabilities increased almost fivefold in twenty years (see table [T-3.4] on expansion of banks'assets and liabilities). The arrival of MMDA and Super NOW accounts also resulted in a further mismatch between short term liabilities and long term assets.

A concluding research took place in 1987, discussing the retail deposit pricing policies that financial institutions applied in different States (Mahoney 1987). In accordance with our already mentioned point, thrift institutions tended to offer higher rates on all accounts and especially on longer-term ones. Thrift institutions showed a higher increase in their time and savings deposits than MMDA deposits (see table [T-3.3]). Similar increases reduced the dependency for banks on CDs and on the other hand depositors shifted from CDs to MMDA.[65] Financial institutions applied very diverse pricing policies and it was a common feature to follow for a short period an offensive policy on a particular financial instrument, and then to move back and offer the same interest rate as their competitors. It is obvious that *strategic issues* in relation to the pricing policy and the *institution's preference* were factors which shaped the proliferation of these financial instruments in accordance with our model of financial innovation (2.1).

To summarise this section, we have discussed causes of financial innovation related to *regulation* or regulation-enhanced *competition* due to *disintermidiation* and *institutional preferences*. It is possible to observe more than **one** cause that initiated the innovative activity. We sustained the importance of *existing routines*, *technology, research spillovers*, *appropriability* and *strategic issues* such as market share and *cannibalisation*. The important aspects of a successful financial innovation in this case are associated with *regulatory imperfection* and *filling the spectrum*. We turn now to consider similar types of innovation in the UK. In particular we want to see whether they were the result of the same types and causes as in the US, and had the same characteristics.

3.2 United Kingdom

In this second subsection we will discuss the case of the UK. Firstly we will review the money and banking history of the UK. During this discussion we will notice a remarkable

inconsistency in relation to the measurement of monetary aggregates, indicating two things: a lack of ability to manage the economy through the targeting of monetary aggregates, and it would seem, financial innovative activity of a lesser degree and lower magnitude than in the US. The very existence of a cartel-oligopoly situation in the commercial sector until the end of 1980s acted as a potential barrier to financial innovation activity. We will discuss then innovative activity in the UK and try to clarify its underlying causes and show the consequences.

3.2.1 A brief Monetary History of the U.K

Here we will discuss the money and banking history of the UK in order to understand the potential difference between the US and the UK in terms of innovation in special liabilities.

The central institution in British monetary history, the Bank of England was established in 1694 and in 1844 became the only issuer of bank notes and creator of money in United Kingdom.[66] At the end of the 1940s half of the currency used in international trade was British pounds and the biggest bank in the world was Barclays Bank.

In the beginning of the 1960s, the new Special Deposits scheme was launched in order to restrain the credit-creation ability of banks and consequently their assets and liabilities. In the following years these restrictions[67] were enforced several times. Initially the restrictions affected only banks, and Non Banking Financial Intermediaries (NBFI) were free to expand their credit assets. Later they became applicable to other financial institutions such as non-clearing banks and finance houses. During the 1960s researchers established the existence of a stable relationship between short-run money demand and interest rates.[68] At the end of the 1960s for the first time explicit mention was made of monetary aggregates (Artis 1981). But even at the end of the 1960s the monetary

authorities suspected large evasions by banks of monetary control and the impact of restrictions was doubtful (Gowland 1982).

In 1971 the Competition and Credit Control (CCC) Act re-introduced the use of interest rates as a tool of monetary policy and quantitative restrictions were abolished. A very important novelty was that cartel arrangements for commercial banks were abolished.[69] The M3 aggregate for broad money was constructed in 1970 and became the main target of monetary policy during the 1970s (see table [T-3.5] which details the different monetary aggregates for the UK). In 1971 the M1 aggregate for narrow money was created. In 1973 direct controls such as credit ceiling, were re-introduced under the name of Supplementary Special Deposits - as extra cash reserves for marginal deposits - this time the liabilities of banks were targeted. This approach was termed as the 'Corset' and its purpose was to constrain the growth of Interest Bearing Eligible Liabilities (IBEL) of banks, especially when their reserves were tight.

During the 1970s the Bank of England systematically helped banks to be above their ratio of 1.5% of 'cash'to eligible liabilities and it was criticised as a lender of 'first resort loans'(Griffith 1980). In 1976 the monetary authorities adopted the clear targeting of the money supply. But again serious evasions by the banks were suspected in the form of not 'traceable' actions. As a partial response in 1977 a *new* definition of broad money (M3) was introduced and DCE ceased to be important.[70]

Finally in 1979 Exchange controls were abolished and the Banking Act formalised the supervisory role of the Bank of England.[71] The abolition of exchange controls brought equality between the offshore and onshore interest rate of sterling and enabled a more efficient use of funds.[72]

An extensive review of monetary controls was undertaken by the Bank of England and the Treasury in 1980. Liquidity became a very serious issue and appropriate

measurements comprising the monetary assets of the private sector appeared as PSL1 and PSL2[73] which initially offered an undistorted picture of current liquidity[74] and took into account NBFIs such as building societies. The Bank of England announced the Medium Term Financial Strategy (MTFS). During the same year the 'Corset' as well as the reserve asset ratio were abolished, hence interest rates became again the only available tool of monetary policy. But unlike 1970 the demand function for money was no longer predictable (Artis 1981) [75] and the authorities had to commit themselves to targeting the money supply (Artis 1991). In 1979 and 1980, the monetary authorities published explicit target growth rates.[76] This policy was not entirely new, since it was already applied in 1968-9 and 1976 (Arestis et al 1993). In 1980 the monetary authorities published a measure of PSL1 which included the estimated holdings of commercial bills in order to provide a more accurate idea about the liquidity of the economy. Furthermore PSL2 took into account building societies' deposits.

In 1981 the cash requirement was reduced to 0.5 % and the informal guideline against mortgage bank lending ended (Congdon 1991). Commercial banks began to pay interest on current accounts. In 1982 M2 was introduced in order to identify the *transaction* balances[77], recognising the importance of building societies and short term savings. M1 could not capture the new blurred area of short time and sight deposits since it was distorted by increases and reductions not related to transaction needs but emanating from interest rate movements. M2 was considered as better equipped to capture transactions balances. During the period 1980-1986, M1, M3 and PSL2 were targeted.[78] The Building Society Act in 1986 enabled building societies to offer unsecured loans and checking accounts to their customers. In 1987, PSL1 and PSL2 were renamed M4 and M5 and in 1988 M3 ceased to be of primary importance.[79]

A lot of research was undertaken in order to demonstrate whether the monetary authorities were able to have an effective monetary policy. The key question was whether their assumptions and approaches were correct: particularly whether the demand for money is stable and predictable. An unquestionable fact was that velocity for M3 fluctuated and was decreasing during the 1980s. Taylor (1986) proposed that, where the monetary authorities take into account the impact of financial innovation and inflation effects, it was possible to have a stable and predictable demand for money. Others like Arestis, Mariscal and Howells (1995) were more critical of the effectiveness of the tools of monetary policy (short-term interest rates), given institutional developments and the continuous changes in targeted monetary aggregates.

During the 1980s the monetary authorities began to pay attention to the control of the monetary base for the first time.[80] At the end of the 1980s the authorities targeted inflation directly using the interest rate as a tool and M0 as a relevant aggregate (see table [T-3.5] on monetary aggegates) but without targeting any particular larger monetary aggregate. In 1990 the United Kingdom joined the Exchange Rate Mechanism (ERM) of the European Monetary System. Currencies in the ERM were not allowed to fluctuate freely in relation to a basket of currencies. In August after speculative attacks on the British pound, the British government withdrew the pound from the ERM. During the 1990s the monitoring of MO[81] and M4 became the main policy. M4 is perceived as an 'information variable' along with a range of other variables since 'experience shows that the relationship between broad money growth and inflation is complex and variable'(Salmon 1994) .[82]

During this section, we have discussed the relative lack of restrictive regulation in the UK, at least of the magnitude of the US. We have observed the inability of the monetary authorities to control any monetary aggregate, expressed by the plethora of monetary aggregates and policies used and followed all these years. This inability provides

us with sufficient reason to believe that financial innovation took place in the UK too. We are going to discuss it in depth in the following section.

3.2.2 The particular behaviour of British banking liabilities

In this section, we will discuss the financial innovative activity in terms of their liabilities that took place in the UK. We are going to investigate two main financial instruments: Certificates of Deposit and interest-bearing demand accounts.

In the UK financial institutions tried to circumvent, and reduce the effectiveness of regulatory restrictions. Like in the US, Certificates of Deposits (CD) were available in the UK too. The first sterling CD was offered in1968 in accordance with the Finance Act of 1968.[83] But despite the fact that all commercial banks were not allowed to offer CDs a tremendous success was achieved (see table [T-3.6], illustrative of the proliferation of CDs). A secondary market existed and discount houses were the main players. CDs were a product that was subject to regulative restriction in the 1970s. The 'Corset' regulation could be circumvented if a bank was able to persuade its customer to buy a commercial bill instead of a CD. A commercial bill 'accepted' from the bank was hence secure and liquid. The only factor in consideration was the competitive rate the bill had to offer. The same process could go in the opposite direction and a customer could be persuaded to issue a commercial bill instead of requesting a loan[84] (Pepper 1993). In other words they applied a policy of increasing *off*-balance sheet activities. The introduction of CDs by British banks was caused by *two main reasons*: *regulation* and *institutional preferences*. The aim of these *responsive*, *liquidity-enhancing* and *on* balance sheet *instruments* was to provide higher returns to the depositor and better *risk management* for the institution. Their initial aim was not to take advantage of any regulatory imperfection since there was no related legislation.

Later due to *regulation* (the Corset), they were used like their US homologue, in order to reduce the regulatory burden.

Under this logic of minimising their financial burden and avoiding the negative and costly consequences of the Corset, banks also used techniques that inflated their balance sheets before the introduction and wound them down during the period of control (Artis 1981).

In 1973 a strange situation occurred: customers were borrowing money in order to lend back to a bank. The overdraft rates were lower than deposits rates because of the unwillingness of banks to increase their overdraft rates.[85] It was estimated that around 600 million pounds were borrowed under this conditions and distorted M3 aggregate. A further increase in lending was already taking place from the beginning of the 1970s when a tax loophole enabled borrowers to buy CDs and resell them before their maturity without having to pay any tax[86] or even use them as security for a loan and offset the interest on this against tax. The estimated amount of CDs purchased for this reason was twice the above figure i.e. more than 1 billion pounds. We thus observe that CDs also proliferated due to taxation reasons and by targeting a *regulative imperfection*.

So in the United Kingdom commercial bills and off-balance sheet activities were used in order to circumvent regulation, and CDs created some distortions in the monetary aggregates.

But other reasons prevented the emergence of financial innovation in the same way as in the US. The British financial system is characterised by compartmentalisation i.e. brokering, insurance, banking activities and mortgage-granting were activities undertaken by distinct financial institutions, such as commercial banks, building societies, insurance companies and stockbrokers firms. All these institutions were forming institutional groups which were mainly self regulated.[87]

British banks from the 1950s through the 1960s and even in the 1970s presented a form of cartel that applied more or less uniform pricing (see table [T-3.7], including the different applicable rates in the UK). The fact that five big high street banks accounted for almost 80% of deposits among them considerably helped the formation and functioning of this cartel (see table [T-3.8], presenting the concentration of the British banking system). They were setting minimum commissions, fixing interest rates and the Bank of England was exercising its influence through Bank rate (Artis 1991). Price competition was avoided and the Bank of England was willing to provide liquidity to the system every time it was required. The system began gradually to change at the end of the 1960s when banks began to offer other services such as credit cards and mortgages. In the 1970s the CCC dismantled the cartel, at least officially, and building societies began to enter the market having the advantage of lower costs.[88]

Commercial banks lost a significant amount of their deposits and responded in the 1980s by offering explicit interest payments on current accounts[89] and entering the mortgage market.[90] We have to remind ourselves that there was not any restriction on paying interest on sight deposits. They applied this policy deliberately and unilaterally since commercial banks had a monopoly of sight deposits until 1986. Then, due to *desintermediation*-related developments, they had to protect their market share by offering high interest payment.

The process of offering interest payments on current accounts was not an instant one. Banks wanted to attract customers but on the other hand did not want the existing customers to turn their sight deposits into interest bearing accounts. They deliberately offered complicated terms and conditions in order to delay the process[91]. In 1988 all commercial banks were offering explicit interest payments on the balance of accounts (Ford and Mullineux 1995). After 1986, significant losses appeared in the banking sector

(see table [T-3.9], reporting profits from British banks), due to causes already mentioned and further elaborated at the end of the section. The competition among financial institutions during the following years encouraged to a geometrical increase in time and sight deposits in the UK (see table [B-3.6], on British banks expansion). In 1993 more than 95% of M4 was interest-bearing deposits (Arestis 1994). We have to take into account that in spite of these problems, British banks have one of the highest percentage in Europe, combined with a higher percentage than the US, of net income from non-financial products.[92]

On the other hand, according to Dow and Saville (1988), problems began to appear in the banking sector for two reasons. Firstly during the 1960s we had the emergence of a wholesale money market, mainly CDs. Banks had access to funds and used them during the 1970s - when regulation permitted - in order to increase their lending by relaxing their credit criteria. Secondly, during the 1970s fierce competition among banks for wholesale deposits (CDs) forced upwards the corresponding rates (Arestis 1994), exactly the opposite result, and for different reasons, than in the US. Furthermore *disintermidiation* enabled firms to find alternative sources of finance through the bank such as the Note Issuing Facility and the Multiple Option Facility, or independently like corporate and junk bonds. Banks were forced to relax further their credit criteria during the 1980s. Finally NBFI competitors appeared to have more favourable cost structures and attract many customers. By the end of the 1980s, building societies, already facing lower costs followed intense merger and acquisition (M&A) activity, presented initially decreasing and later constant economies of scale (Simper 1998).[93]

To summarise this section and referring to our model (2.1), we have discussed the concept of financial innovation caused by *liquidity enhancement*, *regulation* and taxation in the UK. The *strategic objectives* and the *competitive structure* shaped the proliferation of

financial innovation, with the oligopolistic banking system facing increasing challenges from the NBFIs. The emergence of *off* and *on* balance sheet, *responsive*, and *enhancing the liquidity* financial instruments was successful in that they *filled the spectrum* or addressed *regulatory imperfections.* The lower degree of regulative restrictions in the UK, in comparison with the US, is the main reason for the reduced level of innovative activity. On the other hand the lack of regulatory pressure was compensated with the emergence of competitive and disintermediation-related causes.

3.3 Conclusion

In the US the regulation developed in the Depression was a barrier for some financial institutions to compete with securities markets and money markets. NOW accounts acted as a Trojan Horse and an experimentation. Galloping inflation and the emergence of challenging competitors such as MMMF in the 1970s, brought some institutions into a very weak position. The arrival of MMDA and Super NOW accounts combined with new legislation offered all institutions a common level playing field.

On the other hand, the UK has not proved as innovative as the other side of the Atlantic. CDs were a prominent innovation that influenced in term of liabilities banking activities and definitions of monetary aggregates. The British banks also offered interest payment on demand deposits. But the more oligopolistic structure of the British banking sector which promoted and maintained the banking cartel was definitely a reason that prevented the emergence of a similar magnitude of new types of deposits account.

The obvious cause of these innovations is regulation. Regulations could shape a product, either by acting as a barrier so that financial institutions innovate in order to circumvent it, or to push its development further. But regulations as we said are obvious as a cause, but not totally adequate to provide a full justification, or account for the final

shape of the product. Other factors intervene in order to influence the development of the innovation. These other factors are disintermidiation (MMDA; in the UK, interest bearing accounts), competition (ATS), liquidity enhancement (ATS; in the UK, CDs) and institutional preferences (NOW, MMDA). Hence more than one cause contributed to the emergence of a particular innovation (NOW and MMDA).

Apart from initial causes, financial innovation is also shaped by available existing routines (Super NOW, MMDA) technology (ATS, NOW) research spillovers (Super NOW), appropriability (NOW), and strategic objectives of the financial institutions such as market share (NOW) or the market structure (Super NOW). The financial innovation could be radical (NOW) or incremental (Super NOW, MMDA) process (ATS) or instrument (almost all the others), responsive, off (ATS) and on balance sheet usually enhancing liquidity. The successful innovations usually fill the intermediation spectrum (NOW, MMMDA), exploit regulative imperfections (NOW, MMMF), temporary monopolies (NOW) or better risk management (CDs) and cost reduction (ATS) of the financial institution. *Mutations* that do not include one of these features (POW) do not *survive.* The dynamic nature of our model is initiating by a regulatory action (DIDMCA), where the proliferation of existing innovations (NOW and MMMF) providing scope for further innovations (MMDA). It is also worth highlighting that the causal focus, the shaping of products and their relative success were different for different products, but also for the same products in different financial environments (here the US and the UK).

The cluster of financial innovations of bank special liabilities, provided us with supportive evidence for our analytical framework and model of financial innovation, in that these liabilities could all be analysed satisfactory using the framework. In the next chapter, we shall investigate another cluster of innovations, related to the emergence of derivative financial products.

Endnotes of special liabilities of banks

[1] In Graddy 1985, page 35 we could find a detailed analysis of Fed regulation until 1978 relevant to commercial banking.
[2] During the period 1930-1933, 10000 banks failed nationwide (History of US banking, Federal Reserve System internet address).
[3] In 1987 JPMorgan found a loophole in section 20 of the Act. Banks could not affiliate with a business 'principally engaged' in securities. The percentage of activities of no 'principal engagement' was defined then by the Fed at 5%, later 10% and in the mid 1990s 25% *(Euromoney*, 1996b).
[4] It was amended in 1970 in order to supervise any company owning at least one bank.
[5] Ceilings were increased in 1970, 1973 and 1979.
[6] The ratios were, 6% to 14% for transaction deposit and between 0 and 9% for nonpersonal time deposits (Hadjimichalakis 1995).
[7] Grady (1985) includes a very illustrative table on financial activities, provided by financial and non-financial institutions in 1960 and in 1984.
[8] This Act in brief introduced the following novelties: widening the sources of funds (liabilities) and expanding the product base (assets) of depository institutions.
[9] The demand function and velocity of circulation became extremely unstable due to NOW, RPs and Cash Management in 1970s and later MMMF, Super NOW and MMD accounts. It became also impossible to anticipate the multiplier for non-borrowed bank reserves. All ex-ante estimations of this multiplier and models were of doubtful accuracy until the incorporation in 1981 in the models of the information about the legalisation of NOW accounts. In 1987 Volker, the chairman of the Fed, admitted that institutional and market development made it difficult to make judgements about the relationship between monetary aggregates and economic variables (Rasche 1987).
[10] The peculiar situation when during a period that interest rates were rising, and borrowers were not willing to borrow money. We have also to add the impact of last recession, problems caused to banks due to the fall of junk bonds prices and problematic estate loans.
[11] Through higher monitoring and, mainly, reserve requirements costs (Hadjimichalakis 1995).
[12] From 1985 until 1991 the yearly amount of failed banks fluctuated between 100 and 200 cases and the corresponding figure for 'in-market' mergers fluctuated between 300 and 600 cases (Koch 1992).
[13] A megabank is a full service nationwide bank, a superregional is a full service limited expanded bank, and a community bank is a locally owned and managed bank. Plus two other independent categories: the investment and specialised sector finance banks (Koch 1992).
[14] Federal Reserves using the regulation Q forced banks to pay on their time deposits 3% for 1955-7, 3.5% for 1957-62, 4% for 1962-70, 4.5% for 1970-3, 5% for 1973-9 and 5.5% for 1979-85 (Hadjimichalakis 1995).
[15] Regulation D was introduced in 1913 and forced banks to maintain reserves in non interest bearing form as reserve balances in Federal Reserves or cash in their vault (Graddy 1985).
[16] Bankers paid 3 percent on deposits, charged 6 percent on loans and hit the golf course at 3 pm (Koch 1992).
[17] Reserve requirements could be between zero and three percent. But in 1990 the Fed reduced the reserves requirements to zero percent (Hadjimichalkis 1995).
[18] The reason behind this regulation was the desire of the Fed to reduce the cost that banks were facing during and after the depression years. The payment of interest on demand deposits was considered by the Fed as 'excessive' or even destructive competition. They preferred to create an artificial cartel in order to avoid banks being tempted to invest in high yield but also high risk assets in order to boost their returns (Mingo 1979). In 1971 the Commission on Financial Structure and Regulation (the Hunt Commission) proposed the easing of regulation that prevented competition among financial institutions. Its recommendations were not *immediately* implemented (Gibson 1975).
[19] In relation to the corporate clients, banks were offering additional services below the usual cost in order to compensate for having their demand deposit without interest payments (Hadjimichalakis 1995).
[20] See Sealey (1979). Many other researchers such as Kane (1970), Pyle (1974) or Spellman (1980) argued against the regulation 'Q' as promoting the inefficiency (Morgan 1982).
[21] We have to add that depositors turned to investors under these circumstances and were facing an enhanced liquidity and probably credit risk.

[22] In Gibson's (1975), there is a detailed analysis of some isolated cases around the US, where thrift institutions were allowed to offer checking accounts.
[23] The name of the institution was the Consumer Savings Bank of Worcester. A detail worthmentioning is that 167 over 179 mutual Savings and Loans in Massachusetts were not Federally regulated i.e. covered by FDIC and subject to interest rate ceiling practices (Gibson 1975).
[24] This action is described by the regulative authorities as 'offering third party payments services' (Basch 1976).
[25] All New England States adopted the NOW accounts except Rhode Island, where the vast majority of thrift institutions were owned by commercial banks, and Vermont, where thrift institutions represented the smallest proportion in the US (ibid).
[26] Commercial banks compensated through additional services attached to their savings accounts or better branching (Kimball 1977).
[27] Since they offered more services than the smaller ones and the latter probably preferred to see the effect on the issuing institution, mainly in processing issues, of this novelty and then act (Basch 1976). In Massachusetts only 34% of Savings banks offered NOW in 1972, 14% in 1973, 34% in 1974, 12% 1975 and 3% in 1976 (Basch 1982). Undoubtedly a NOW account has a higher cost than a savings account and a different duration profile. The former point was later used by S&Ls in order to explain higher lending rates, especially in areas where banks did not charge draft fees. It was also argued that NOW accounts, due to their duration profile were reducing the amount of mortgages offered. None of the above was conclusively proved (Hartzog 1979).
[28] A similar observation was that early adopters had high non-interest costs i.e. administration and extended branching as well as a mobile clientele i.e. a high ratio of closing/opening accounts. Banks with extended branch networks favoured the free draft accounts (Basch 1976).
[29]The Herfindahl index could calculate the degree of oligopoly or less conducive competition. Markets with a high ratio were characterised by early introduction. Additionally banks that had their headquarters in urban areas tended to be early adopters (Basch 1976).
[30] These two States acted as an experiment for a partial application of the Hunt recommendations (see Gibson 1975). The regulation allowed 5% interest and only 150 drafts per year-in 1974 the last condition was abolished (Gibson 1975).
[31] We have to take into account that the cost of NOW accounts is significantly higher than for demand deposits. It was estimated that in 1974 only 11% of demand deposits of commercial banks, and 34% in 1975, were transferred to NOW accounts.
[32] In 1975, 65 of 145 of commercial banks in Massachusetts did not offer NOW accounts (Basch 1983).
[33] This price discrimination was already observed during the 1960s in checking accounts where the 'minimum balance, no-service charged' policy was not actively promoted by banks and it was offered only in cases that customers were requesting it (Basch 1983).
[34] A detailed analysis is available from Paulus in Federal Reserve Bulletin in 1976. It was estimated also that at the end of 1975 commercial banks had lost only 3% of their total deposits.
[35] They believed that conversion or launch of new ones was too expensive or even that there was a lack of computer facilities. Kimball (1977) showed that the impact on pre-tax earnings related to the loss of deposits is higher than the cost of introduction NOW accounts.
[36] The minimum balance requirements could be a crucial factor for the profitability of NOW accounts in relation to the minimum average balance maintained (Siminson 1980).
[37] During the same year Western Savings Fund Society in Philadelphia offered a similar account called WOW. This account permitted unlimited drafts but they had to be countersigned by the bank (Gibson 1975).
[38] The States were Texas, Illinois, California and Massachusetts and their results were tested on a fifth State, Pennsylvania (Morgan 1982).
[39] The generalisation called 'prices' refers to the above four areas of competition (ibid).
[40] Repos and MMDA are not part of M1, but of M2 (Hadjimichalakis 1995). A rise in the deposit rate could entrain a further increase in Money Supply since it induced consumers to reallocate funds from other financial assets (Hadjimichalakis 1981).
[41] In 1980s the reserve requiremnet ratio was 10 between 12 percent (Tatom 1983) .
[42] In 1987 some money market funds had a minimum amount of only $500 (Lown 1987)
[43] Commercial paper, CDs and Treasury Bills are the most important short term marketable securities.
[44] In 1975 MMMFs were less than $3 billion, in 1979 were $12 billion and in 1982 reached the $196 billion and during 1988 surpassed the $300 billion.

[45] In 1990 General Motors offered MMA of only $250 minimum deposit and with a very competitive rate since they economise significant costs due to reduced personnel and reduced advertising or branching costs (*Forbes* 1990).
[46] Since they were perceived as competitors with time and Savings deposits, they were included in the same monetary aggregate (M2) with them (Tatom 1983).
[47] Both of them were offering rates comparable with Treasury bills.
[48] This innovation required extensive and efficient communication networks. The Fedwire (discussed in the credit cards chapter) facilitated and enabled the Cash Concentration Systems.
[49] The MMMF and the cash concentration system considerably reduced the expected demand for money and created the monetary phenomenon of 'the case of missing money' (Golfeld 1976) during the 1970s. In the 1980s, the monetary authorities incorporated MMMF in their M2 aggregate (Dow 1982).
[50] The minimum amount was $100000 and the duration of the Repos was usually overnight, if their maturity was longer they were called term RPs.
[51] Plus three pre-authorised or automatic transfers (Tatom 1983). This loophole discriminated against small banks with reduced networks of ATMs and branches (*Forbes* 1983).
[52] Remind ourselves that M1 consists of currency, travellers checks , demand deposits and other checkable deposits. M2 is the sum of M1 plus overnight RPs and Eurodollar, plus MMMF, plus Savings deposits (including MMDA) and small time deposits. M3 is M2 plus large denomination time deposits, plus term repurchase agreements and Eurodollar plus MMMF (institutions only) (Lown 1987).
[53] Terminology used from Tatom in his paper. He explain three potential shifts: types of deposits belonging in the same category, types from different categories and other financial assets not belonging to monetary aggregates like bonds. All these possibilities create different scenarios in relation to the M1, M2 aggregates and the velocity of circulation (ibid).
[54] Non personal MMDA are subject to the same reserve requirements as non personal time and savings balances in 1980s equal to 3% (Tatom 1983) and (Ragowski 1984).
[55] As we have already mentioned, a rise of M2 and a fall in its velocity, but no significant change in M1 growth and velocity (Tatom 1983).
[56] We could also observe a type of potential 'cannibalisation' of CDs or small time deposits. Later we will discuss this concept more and we will see that this cannibalisation took place only for CDs.
[57] They reduced their minimum amount and linked their products with brokerage services and other mutual funds. Also they offered tax-exempt and multiple risk-return profile securities (Keeley 1985).
[58] At least three percent since the lowest returns were around 11% and some even offered 24% (*Forbes* 1983b/c).
[59] Flannery (1982) advanced the argument that retail deposits were quasi-fixed factors of production. The establishment of deposits is costly and could reflect a longer term bond for banks. Hence they try to share their establishment cost with the customer in order to increase the switching cost. Under this reasoning institutions could pay more than the market rates in order to attract customers (Rogowski 1984).
[60] Initially slightly more than 8% and then around 7.5% and almost for the whole period less than the T-bills rate by 150 to 250 basis points (ibid).
[61] This term is used in order to describe the case where a new product is obtaining the market share of a recently launched product with some common features. Sales of this new product could emanate from new consumers, consumers of competitive brand and consumer that switch from the old product. Cannibalisation becomes a problem when it provides no incremental financial benefit (Kerin et al 1978).
[62] Cashing checks and dealing with payrolls, operating costs could be close to one third of banks total costs (*Forbes* 1983b).
[63] Due to this development thrift institutions entered areas that they had previously ignored and were authorised to issue credit cards and invest up to 20% of their assets in consumer loans. Mutual Savings were authorised to make loans up to 5% of their assets. During the period 1980-1989, 1000 institutions failed and from the remaining 2900, 1000 were considered as not healthy. (White 1995). The Federal Savings and Loans Insurance Corporation had to inject $150 billion for the period 1986-1991. The deposit insurance was increased from $40,000 to 100,000 (Hadjimichalakis 1995).
[64] Despite the fact that banks offered new products such as mortgages, Trust services, discount brokerage, data processing, insurance and other financial products (Koch 1992).
[65] The demand for large CDs was further reduced since the MMMFs were their main purchasers and their market was initially reduced (Mahoney 1987).
[66] The Scottish and Irish banks do not create money since they are obliged to keep a Bank of England pound in their reserves for every pound they print.

[67] Restrictive periods for credit creation were 1955, 1957-8, 1964, 1966 and 1969. The results affected many financial institutions but mostly banks (Artis 1981).
[68] The research was undertaken by Fisher (1968), Goodhart and Crockett (1970). On the other hand the effort to calculate the money multiplier connecting GDP and monetary aggregates was not so successful (ibid).
[69] The cash reserve ratio was reduced to 1.5% from 8% and a commitment to competitive forces was made (ibid).
[70] The new M3 was equal to the old M3 minus the foreign currency deposits of UK residents. Because the British balance of payment had improved.
[71] Unofficially already exercised under the form of 'old boys club' and abolished in 1997 when a new institution took over the supervisory role for the whole financial sector the Financial Supervisory Authority.
[72] During the 1970s their difference reached almost 6% in 1976. After 1979 the possibility of arbitrage brought them into tandem movement (Artis 1991).
[73] It stands for Public Sector Liquidity (PSL). PSL1 was private sector holdings of M3 plus money market instruments plus Certificates of Tax Deposits. PSL2 is PLS1 plus building societies and other savings deposits. They were first published in 1976 and first used in 1979 (Artis 1981).
[74] As we will discuss in the next paragraph, M3 was distorted between 1974 and 1980 by commercial banks circumventing IBEL regulation (Pepper 1993).
[75] Especially in the non-interest bearing parts of the money supply i.e. sight accounts before 1980s and currency (Trundle 1982, Heardy 1985, Dow 1988).
[76] As part of their Medium Term Financial Strategy. The purpose is to combine them with adequate rhetoric and provide a stable financial framework for economic agents (Arestis et al 1993).
[77] Since neither of M1 or M3 could include all transaction balances because the former is too narrow and the latter too broad.
[78] The M3 was achieved a only target twice nd both times after revisions (Salmon 1994).
[79] Due to its components, M3 is a good indicator of bank liabilities. Abandoning it could mean that due to disintermidiation banks are not the only credit creator hence M3 does not illustrate the magnitude of credit in the economy.
[80] The monetary base control would have offered to bank a set of choices in order to comply with the desirable percentage, which differs significantly from the interest rate approach where banks have not any real choice (Artis 1981). During 1970s the Bank did not even publish figures these monetary aggregates only the IMF published them (Niehans 1982).
[81]It was perceived to have a 'close relationship with money GDP over a period of 40 years' in accordance with Financial Statement and Budget Report 1990/1991 and selected as an aggregate expressing the money supply (Godgon 1991).
[82] M4 is analysed by the authorities alongside other variables in order to detect inflationary trends (Salmon 1994).
[83] The minimum value is £50,000 and are CDs issued in increasing multiples of £10,000 (Pawley 1991).
[84] This actually took place in the 1970s each time the 'corset' was introduced. In 1974 - 1975 commercial bills increased from £350 to £500 million, in 1977 bills increased from £320 to £430 millons and in 1978-1980, bills rose from £710 to £2700 million (Pepper 1993).
[85] For mainly two reasons: in previous years large profits were reported and they were afraid that an increase on overdrafts rate could lead to loss of market share (Gowland 1982).
[86] The 1965 Budget provided this opportunity to individuals but the 1973 budget denied this possibility. During the period 1971-1973 M3 was thus further distorted (Cowland 1982).
[87] The concept survived and was incorporated even in the Financial Service Act in 1986 during the Big Bang.
[88] The Special Deposit scheme was applicable only to commercial banks and extended networks were very costly.
[89] The concept of implicit interest payments is related with the free administration of sight deposits during the past i.e free bank statements, cash-in of cheques or withdrawls (Ford and Mullineux 1995).
[90] Mortgage financial instruments are not considered as routine innovation from the banks' perspective, but we are not going to discuss this issue at this stage. Mortgages are going to be discussed in the securitization chapters.
[91] The breakthrough came in the middle of 1980s when the Royal Bank of Scotland offered the first simple interest rate bearing check account (Pepper 1993).
[92] During 1980s fluctuated between 3% and 4% over assets. From 1.48% in 1980, to 1,79% in 1986 (Canals 1993).
[93] In the same paper, it was suggested that the prolonged period (1991-1996) of intense M&A could not be very beneficial since probably the lowest possible cost structure had already been reached.

Chapter four

'...plus ultra...'
Francis Bacon on the potential of science

4 Derivatives

Introduction

During this chapter we are going to discuss the emergence and proliferation of our second cluster of financial innovations: derivative financial instruments. We are also going to explain the situation where financial innovation or a cluster of financial innovations could lead to the emergence of further innovative activity in order to remedy the consequences of the former one. These financial innovations have many features which can be explained using our analytical framework of financial innovative activity.

This chapter discusses the causes of derivative products and the particular role of regulation as a potential constraint on the emergence of these instruments. We discuss also the two sources of derivative products, the over the counter and the Exchange-traded instruments. Then we refer in detail to forward and future contracts, swaps and financial options, otherwise called the first generation derivatives. We are going to explain their particular causes of emergence, their particular characteristics and classification. During this analysis, we also refer to their income generating ability and their corresponding risk exposure. Finally, we are going to explain their particular reason for success.

Then we are going to discuss the second generation, following the same approach. These second generation derivatives consist of swaptions and credit derivatives, and will provide us with the first instruments that could be classified as exploratory. In the last section we shall present the problems that derivatives could cause to financial institutions and we will conclude with the emergence of a further innovative process, the VaR model, that was created in order to measure and ultimately control the risk exposure due to the derivative financial instruments. This financial process is illustrative of the dynamic nature of the financial innovation process.

4.1 The emergence of Derivatives products

During this section, we shall refer to the main causes of the emergence and proliferation of derivative products. It will be clear that the initial cause was reinforced by later developments. Then we shall discuss the particular role of regulation as both a boost, and potential barrier, to financial innovative activity. Finally, we shall refer to the particular role and function of the over the counter and Exchange-traded derivatives.

4.1.1 Causes of the emergence of derivatives

The purpose of this study is not to provide an exhaustive list of derivative products currently available or a detailed description of the historical evolution of derivatives. We are going to discuss the main types of derivatives and their risk exposure, limitations, prudent use and further innovations in response to their characteristics.

Derivatives are also referred to as contingent claims because their performance depends primarily on the performance of another - underlying - financial asset. Derivative instruments have involved customized bundles of financial attributes that replicate specific returns fitting clients' objectives.[1] Their main characteristic is their immense leverage effect, i.e. derivatives usually require a small amount to be paid now offering the possibility of future profits or losses of a multiple level.

As we have already mentioned above, major political and economic events have considerably altered the economic environment from 1970 onwards. The OPEC oil crisis, combined with the high inflation in the US from Vietnam war expenditures and the collapse of Bretton Woods created long term and sustained high inflation and Exchange rate volatility in all major developed countries. It is possible to say that derivatives were primarily designed as hedging instruments, hence a suitable solution in order to avoid the undesirable consequences of the Exchange and interest rate volatility and the galloping

inflation of the 1970's.[2] These conditions created an increased demand for hedging instruments, in other words, financial instrument able to provide protection and insurance against this market volatility.

Later, derivatives were initially very convenient to reduce the financial burden from specific regulation[3] and they considerably enhance the balance sheet of the bank by removing items off-balance sheet. This was the case at the initial stages of their development, when regulation has directed at balance sheet. The situation later changed (Basle 1988, Capital Adequacy Directive, applicable from 1993) and currently the regulative burden could vary from bank to bank.[4] An additional element is that derivatives were and still are usually fee based and enable banks to diversify further their income generation activities.[5] This diversification was most welcomed by the banks and satisfied their *own preferences*, because it reduced their exposure due to their position in relation to market volatility.

But the geometrical expansion (see table [T-4.1] on Exchange and over the counter total derivatives figures from 1986 until 1994) is due mainly to developments in the *information technology* sector. Derivatives would not have been developed without the emergence of the current huge information-processing capabilities and technology. Information technology permitted the design, execution and management of these extremely complex products. These developments were primarily the widespread use of PCs, the exponential increase in the capacity for storing and processing information and the development of extremely specialized and sophisticated software programs. These developments in the information technology area offered financial and corporate institutions[6] a multiplicity of risk positions. Furthermore low cost replication trading strategies due to *low transaction costs* and significant low cost leveraged opportunities were available to users. At the same time a completely *new kind of expert* was required to

design these products. These experts have a mathematics or physics background since the pricing models require significant mathematical skills. We are going to discuss later in more depth this new requirements and accompanying academic work.

During this sub section we have highlighted the different causes that contributed to the emergence and proliferation of derivative products. In terms of our models (2.1), it is clear that the initial cause of *market volatility* was later combined with additional causes such as *government intervention*, *regulation* and *financial institution's preferences*. The proliferation required also advanced technology and *new academic work* and resulted in lower costs and an enhanced *spectrum* of financial instruments. The next subsection is going to focus on the particular role of regulation in the proliferation of derivative products.

4.1.2 Role of regulation

The only significant constraint on the exponential increase in derivatives products came from the regulatory authorities. During this sub section we shall discuss briefly the main regulatory efforts to control the derivative activities of banks. We shall avoid referring in detail to each effort and we shall limit ourselves only to their relevant contribution.

Primarily it was the monetary and supervisory authorities in the most developed financial centers of the 1970s and the 1980s, i.e. the Federal Reserve in the United States and the Bank of England in the United Kingdom, that tried to control the use of these instruments via guidelines and directives. But the first organized effort to deal at a global level was the 1988 Basle Committee on Banking Regulations and Supervisory Practices report for capital adequacy requirements.[7] These capital requirements became enforceable from 1993. It also proposed guidelines for the off-balance sheet items and their treatment.[8]

Since then the regulatory authorities have acted in response to financial distresses rising from derivatives, like the Metallgeshelshaft oil company' in Germany (1992)[9], Orange County in the US (1994) [10], and the Barings Bank collapse in the UK (1995).[11] In 1992 a BIS study discussed the considerable growth of OTC derivatives.[12] Later a Bank of England report in 1993 highlighted qualitative requirements of participants. Then the Group of Thirty (G30) report in 1993 promoted mainly the bankers' point of view.[13] In the same year a more general report, similar to the Bank of England report, was published from the Commodities and Futures Exchange Commission in the US. Then in 1994, the BIS issued the 'Risk Management Guidelines For Derivatives'. These regulatory efforts presented a common set of recommendations in order to reduce the potential negative consequences of derivative products.[14] Later a special report on the Barings case of the Bank of England (1995), discussed the importance of internal controls for derivative users and the Basle Committee of Banking Supervision and the International Organization of Securities Commissions (IOSCO) discussed the actual disclosure of banks and their limitations.[15] Finally in 1996 the Financial Accounting Standards Board in the US issued an exposure draft on derivatives and hedging activities.[16] Concluding, we could say that, there is not any uniform capital adequacy rate applicable to all derivatives products. The regulatory capital adequacy charge depends on the type and duration of the instrument.

The post-active or responsive regulation concentrated its efforts on bringing the off-balance-sheet derivatives items under supervisory control and on promoting the enhancement of *internal controls* in the financial institutions. As we will discuss in the last sub-section, these efforts on the other hand did not manage to reduce the proliferation of financial derivative products and their use by banks. In the next sub-section we shall discuss the over the counter financial institutions function and the particular role of clearing houses for the proliferation of derivatives.

4.1.3 Functions of OTC and clearing houses

Before commencing the discussion of the main derivatives products it is essential to explain the two main sources or providers of derivatives products: the Over the Counter (OTC) and Exchange traded derivatives (see table [T-4.1] on the proliferation of these two sources of derivative instruments).

Financial institutions like banks are the suppliers of OTC products. An OTC derivative instrument could be a **customized** swap, option or forward contract without the interposition of clearing houses, tailored to the specific financial needs or requirements of the buyer. Their pricing formulas enable banks to replicate any conceivable return pattern and provide endless individual customized products. Often, they are even less expensive than the off-the rack products. Then this pricing is not uniform and objective. It is possible for different financial institutions to offer different prices for the same product or a financial institution to be able to price a product that another institution is not. This distinction was critical in order to create *tangible* and *intangible* comparative advantages (Tuffano 1990). We have to mention that the initial purpose of the OTC services was to reconfigure market risk and not to provide liquidity. This enabled a *better management* of the risk that financial agents face.

The Exchange traded derivatives (see table [T-4.1]) are standardized products like equity options, Forward Rate Agreements (FRA) or Futures traded on the floor of Exchanges. They require the existence of a clearing house as an intermediary between sellers and buyers. The Clearing house provides **enhanced liquidity**, reduces transactions costs and reduces credit risk. It requires a margin to be deposited at the beginning of the agreement and any losses or profits are treated as an adjustment of this margin. When a position is closed out then open interest contrasts are reduced. An extreme case of reduced

transaction costs is the Exchange traded equity index (Remolona 1993). The Exchange traded derivatives did not manage to match the proliferation of the OTC traded instruments (see table [T-4.1]). But any financial instrument related with Exchange networks presents *network positive externalities*, in other words the higher the number and notional amount of the derivative traded contracts, the more profitable for its user.

At this point, it is possible to discuss the S-shaped life cycle of products. We had discussed this concept in the first chapter on innovation (1.1.2.4). The current position (amount of sales) of a financial instrument could be explained as a point on an S-shaped curve[17] or sigmoid diffusion approach. We can integrate the Product Life Cycle theory with Merton's (1992) contribution on financial innovation and its standardization, that begins from OTC and then moves to Exchange-traded and then moves further to synthetic products which are customer-tailored and based on Exchange-traded instruments. Typical examples are forward and future contracts that we shall discuss in the following section.

During this sub-section, we have discussed the two different sources of derivative products. In terms of our model, the OTC products provided tailoring of the particular needs of customers, hence a *filling-the-spectrum* function and *better risk management* abilities. The particular models they used, or the degree of *skills* their researchers possessed, could distinguish considerably their pricing and *product strategies*. Additionally the existence of *intangible benefits* could boost the innovative effort. The emergence of Exchange-traded instruments enabled further *reduction of costs*, *enhanced liquidity* through *network positive externalities* and provided inputs for *further* innovative effort. In the following sections, we shall discuss in detail the different types of derivative products; we begin with forwards. It is possible to divide them into first generation (forwards, futures, swaps and options) and second generation (swaptions and credit derivatives).

4.2 Forwards

During this section, we shall discuss Forward derivative instruments. We are going to explain the characteristics of a forward contract which classify them as the raw material of most derivative products, their pricing and the risk involved for the banks.

4.2.1 Characteristics of Forwards

A Forward is a contract between two parties where one party accepts to buy and the other to sell at a specific date (delivery, expire or maturity date) and price (forward price) a predetermined financial asset (usually currencies) or commodity.[18] The buyer has a 'long' position and the seller has a 'short' position. During this chapter we are going to discuss only currency and interest rate forwards since they and only they are banking products. However, very often users of commodity forwards involve bank credit lines and letters of guarantee during their transactions.

A particular type of forward contract is the Forward Rate Agreement (FRA) where two parties decide that at a particular date the first is going to lend the other a specific amount of money, for a predetermined period (usually three to six months) and is going to receive a specific interest rate. This rate is called a forward/forward rate. FRAs very soon became an extremely popular financial instrument (see table [T-4.1] where FRA's are a component of the interest rate figure). From 1986 till 1994 their expansion was exponential. FRAs include a double aspect of *risk transferring* and equity generating.

Often users do not wait till the maturity date but prefer to 'close down' their position or unwind by re-arranging the contract with the bank or by simply contracting the opposite forward contract. In the FRAs case it is possible to compensate for the difference between the interest rates on the particular date and the agreed forward/forward rates.

The plethora of choices on dates, denominations and amounts make forwards impossible to be standardized, hence they are able to fulfill the specific individual requirements of the user. This particularity places forward contracts under the category of over the counter (OTC) banking products where the other party is always a dealer or a financial institution i.e. the bank. The bank on the other hand could make another offsetting forward contract in order to hedge its own position.

Forwards could be used for hedging and speculative purposes. Their main advantage as hedging instruments is that users do not have to commit any cash till the maturity date and they are also certain of the exact price they have to pay. The speculative use is related to the differences between the expectations of the user and the market.

The price of the forward contract could **not** be significantly different from the current price plus the carrying cost, i.e. buying at spot the particular amount of the foreign currency and depositing it in an interest-bearing account or buying foreign government securities till the maturity date, due to the interest parity theorem (King 1998). If its price was significantly different i.e. the difference larger than the transactions costs involved, it would be possible to make a risk-free or arbitrage profit.

In the case of FRA's, they are priced in comparison with the more liquid futures markets that we are going to discuss later in the section (4.3). It could be supported that forward contracts are the most important of all derivatives products since many of them could be explained as complex or 'enhanced' Forwards. Consequently, it is possible to perceive forward contracts in terms of our model (2.1) as a *radical, responsive financial instrument*, initially *off*, and later *on*-balance sheet, that *transfers the risk* or generates credit (the case of FRA's). We are now going to discuss in more depth the income and risk exposure emanating from forwards contracts.

4.2.2 Income and exposure from forwards

Income is the difference or the spread between bid and offer price. Every time the bank buys or sells any amount in foreign currency or any FRA offers the customer two different prices, this enables the bank to make a profit. Apart from this spread that banks receive, the main determinant of gain or loss is the difference between the current (at the maturity date) spot price from the arranged price. Usually clients use lines of credit in order to finance their transactions. But a real-world complication is that only large corporations, agencies and big institutions have lines of credit and the cost of obtaining them could be significantly high and outweigh the potential benefits from the agreement.

Banks face two types of risk from forward contracts: credit and settlement risk. Credit risk arises from the deviation between forward and spot prices i.e. the bank could have been wrong in their past expectations about the current price. The settlement risk is concentrated on the fact that the user has to make, if he is able, only one payment at the end. An additional risk for banks is that FRAs are used as a substitute for mismatch of maturities between their assets and liabilities. In general terms, forwards contracts enabled *enhance management* of banks' risk exposure. Concluding, FRA and forward Exchange contracts are considered as a good source of income at medium risk (see appendix [A-4.1] illustrating the risk spectrum of financial instruments).

Forwards are the simplest derivative contract. Their main cause of emergence was the *volatility* of financial markets. Banks do not require elaborate techniques in order to price them and they are considered as the basis of most derivative products. They also enable both users and providers to enhance their *risk management.* In the next section we are going to discuss 'standardised' forwards contracts or better known as Futures.

4.3 Futures

During this section, we shall discuss Futures contracts. They are very similar to forwards but they differ in two aspects: their degree of risk for the financial institution and their connection with positive externalities.

4.3.1 Characteristics of Futures

Futures are similar to Forwards except that there is a limited choice of dates and magnitudes of financial assets or quantities of commodities.[19] One party accepts to deliver a specific good for an agreed futures price or value at a specific or prompt or last trading day.[20] The most common contracts are currency, commodity, interest rate[21] and stock[22] index futures[23]. Financial futures in foreign currency were introduced in 1972 to the Chicago Mercantile Exchange, and in interest rates in 1975.

This reduced choice of dates and type, enable them to be standardized and tradable on the 'floor'. The exchange place is not anymore a bank but a clearing house between the seller and the buyer, and usually brokers organize and trade. The existence of the clearing house as we have already mentioned smoothes and enhances the liquidity of these financial instruments. Any organized financial network (Economides 1993) presents elements of positive externality in terms of price and type of asset traded for the user. In other words, the larger the amount, and available types, of futures contract traded, the lower the price and the wider and more diverse the types of contract traded.

Futures in contrast to forwards also require a continuous process of partial payment during the period prior to the delivery date, which is called marking-to market. This procedure spreads the payments during this period by paying every day the difference between the initially agreed futures price and the day's settlement price for an identical

futures contract. They also require an initial deposit (called a performance bond) of a percentage of the contract, called margin or collateral as a guarantee.

This narrow selection makes it significantly easier to 'close out' any position and encourages speculators[24] and arbitrageurs as well as hedgers to use Futures to a great extent. Usually securities houses and banks are the main users of futures in order to obtain liquid funds. In recent years their volume has increased considerably and the most popular type of Futures are interest rate and equity index contracts, and to a lesser degree currency contracts (BIS 1998).

Futures are used also as Forwards as components of more elaborate and complicated derivative products such as options on Futures based on existing *routines.* During the next sub section, we shall discuss mainly the income from Futures for the financial institution.

4.3.2 Income and exposure from Futures

Since Futures are not OTC financial products, financial institutions are not the counterparty of these contracts. But banks buy and sell contracts on behalf of their clients, earning a fee for these activities. On the other hand they do not face any credit or settlement risk. Generally the marking to market process reduces the potential exposure and the performance period is reduced to one trading day; by adding the part played by the clearing house, credit risk is almost non-existent on Futures contracts.

The pricing of a future contract in interest rates is determined by three factors: supply, demand and the interest rate yield curve.[25] This curve is not generally flat due to market's bullish or bearish expectations and due to liquidity preference.[26] The Futures price should not be materially different from the spot price plus the carrying cost; if it was, the arbitrage opportunities would be obvious.[27] The profit or loss is determined again as in

Forwards as the difference between spot price and price paid at the purchase of the contract. Concluding, Futures' financial instruments are a source of fee based income and are almost risk free, for the bank (see appendix [A-4.1] on financial instruments' risk spectrum).

Futures are similar to Forwards and their only difference is that in terms of our model (2.1), their nature is that they are *incremental* and based on *existing routines* nature; and their cost could be lower due to standardization. The main cause of their emergence was inflation and exchange rate *volatility*. They present strong *positive network externalities* due to the existence of an Exchange network and they provide risk-free, fee based income for the bank. Due to their relation with Forwards, they also represent a perfect example of the cumulative nature of financial innovation. During the next section we shall discuss a different derivative product, the swap agreements.

4.4 Swaps

During this section, we shall discuss swap agreements. There was a significant proliferation and diversity from the original types of swap in relation to the income source and risk involved. It was also *more* than *one* factor that caused their emergence and diffusion.

4.4.1 Characteristics of Swaps

The increased *volatility* of interest rates and exchange rates at the end of the 1970s and early 1980s boosted the demand for hedging instruments.[28] Generally a swap is an exchange of income streams or repayments of the principal between two parties. These parties could be corporations, financial institutions or government agencies.[29] Any swap

agreement has a predetermined period and price. It could be short, less than three years, or longer.

Regulation was an additional important factor for the emergence and proliferation of swap agreements. The initial and very successful types of currency swaps were the Parallel or Back-to back loans where two parties lend to each other for the same period in different currencies[30] and banks could play a significant role as specialists, and agents which assume the credit risk. The problem with parallel loans was the risk that one party defaults while the other continue the payments.[31] This type of currency swap was used at the end of the 1970s by British institutions in order to **avoid exchange** controls and *minimize* their *tax burden* (McClintock 1996). Later developments such as straight currency swaps required an annual fee to be paid by the provider of the stronger currency to the other party in order to compensate for exchange rate losses.

There are mainly five types of swap agreement: interest rate, currency, equity swaps, debt/equity and assets swaps.[32] The first interest rate swap took place in 1981 between the World Bank and IBM. The first type of swap is the most popular: it includes interest rate cups, floors and collars[33]. Users do not exchange the principal, hence the risk faced by the bank is a small proportion of this amount. Swap agreements are the largest component of OTC interest rate derivative (see table [T-4.1] on the composition of interest rate derivatives). Participants usually do not deal directly but through an intermediary dealer, but sometimes it is possible to find a brokered swap, i.e. two parties matched directly. Before 1991, it was always a financial institution, but in January 1991 the Chicago Board Of Trade (CBOT) introduced Exchange-traded three and five year interest rate swaps. Hence it is possible to observe some early signs of *network positive externalities.*

Interest rate swaps are priced by calculating the NPV of the two legs.[34] The floating rate leg could be estimated by observing the interest rate yield curve which should be

reflected in the market's forward interest rates. Swaps could be used for speculation and hedging purposes. They facilitate the restructuring of balance sheets and profit and loss accounts[35] by converting fixed rate financial instruments to floating. They permit users to exploit their comparative advantage in the credit market and obtain cheaper credit. They also enable institutions to utilize sterile cash balances and bypass exchange controls. Arbitrageurs could also use swaps in order to exploit a comparative advantage or discrepancies in the cost of funding. In the medium term, it is fair to say that swap agreements enabled the reduction of *market imperfections* through the reduction of asymmetry of information. In recent years, due to the economic growth of the 1980s, a geometrical proliferation and expansion was observed in interest rate swaps and in a lesser but still remarkable degree of currency swaps (BIS 1998). This proliferation was also based on the already enhanced information technology capacities of financial institutions.

Swap agreements in terms of our model (2.1) could be perceived as *responsive*, and in a sense a *radical,* financial *instrument* or *process* that was initially *off* balance sheet and offered a *credit transferring* function. We can classify them as radical, because other innovations emerged later from the original swaps such as complicated swaps, swaptions and default swaps (see latter section 4.6.1). In the following sub-section, we shall elaborate more on the pricing and risk exposure of swap agreements.

4.4.2 Income and exposures of swaps

Initially banks only had to bring together the two parties in a swap. Later banks began to act as intermediaries and guarantee the payment, hence they had to face considerable credit risk.

Swap agreements also required credit lines but, as we have already explained, these are expensive. But due to competition among banks, the terms of swaps have become more

accessible now to corporations. It is worth saying that the main bulk of swaps used to be long term until 1988 but later short term swaps by far outnumbered them (FRBNY 1992-1993). This fact could also imply a more short term and speculative approach, overshadowing the hedging function of swaps.

For **interest rate** contracts the swap spread is based on the T-bill rate plus some basis points and it is determined by the current supply and demand conditions for the underlying assets and the particular type of contract. Since both parties do not exchange the principal, the only risk that banks face is the future market risk, since there is not any additional credit risk except the net payment. Generally interest rate swaps risk declines as time goes by, but there is a considerable difference in risk exposure between amortizing (lower) and accreting (higher) interest rates swaps (see appendix [A-4.1] on the risk spectrum).

The introduction in 1991 of Exchange traded three and five year interest rate swaps considerably reduced credit risk. But inflexibility could constrain demand and dealers continue to prefer the higher fees involved in the OTC market. In 1993, 92 percent of the US financial institutions interviewed were using interest rate swaps to manage their lending portfolios (Simons 1995).

Currency swap pricing is based on the interest rate yield curve of the denominations involved i.e. it is treated as a deposit and a loan. It is priced as a long dated forward contract exchange[36] for a period of five years where the bank assumes the credit risk and its pricing is affected by interest and exchange rates. Currency swaps involve more credit risk due to: lack of net settlement, swap of principal, much less liquid market. The marking to market value increases as maturity approaches.

The interest rate and currency swaps were the most important items of *off* balance activities of banks and orchestrated efforts took place in order to force banks to report them

(Matten 1996). As we have already mentioned their increase during the period 1992- 1997 was remarkable: interest rate swaps increased sixfold and currency swaps doubled (BIS report 1998). A careful observation of the risk spectrum appendix [A-4.1] could support the argument that swap agreements could include a lot of risk for the financial institution depending on the type of the agreement. The diversity of swap types as we have already discussed above does not allow us to form a uniform opinion about their degree of risk. It was something already noticed by the BIS report in 1988 on financial innovation, where we encountered three types of swap both off and on balance sheet (BIS report 1998).

Debt /Equity swaps exchange debt for investments and involve a bank, a company and a government. Timing is extremely important for these deals and provides the bank with the possibility to remove a low-rated even written-off debt and receive a fee.[37] The concept was to provide liquidity to banks engaged into international lending to less developed countries (LDC). The bank sells the loan to an agency at a discount then the agency sells it at a discount to an investor who can redeem it at a discount to the central bank of the LDC and acquire equity in a local firm. The benefits for the bank are: the removal of idle assets from the balance sheet, the receipt of income and the safeguard from future further loan granting operations to the LDC.[38] **Asset** swaps or synthetics are conversions from fixed to floating rate bonds and involve a swap spread considerably higher than interest rate swaps.

Concluding in terms of our model (2.1), there are three causes for the emergence of swap agreements, *financial market volatility, regulation* and *economic growth.* The existence of new technology made them feasible and supervisory intervention also shaped the development of these financial innovations. Interest rate swaps are less risky than currency swaps but the plethora of particular terms and choices available on these agreements makes it impossible to have a general rule about their credit exposure. It is even

possible to observe some *positive network externalities*. Swaps enabled *better management* and addressed market *imperfections* (asymmetry information). In the following section, we shall turn to an even more important and radical derivative instrument, the option.

4.5 Options

During this section we shall discuss one of the most important derivative products, the option. Its conception enabled financial institutions to design further innovative products and its successful providers could have significant advantages.

4.5.1 Characteristics of Options

A financial option is a contract that confers to its holder the right to trade - sell or buy - a specific financial asset, for a given price at or until a particular date. In contrast with derivatives discussed so far, it is **not** an obligation. The price is called an exercise or strike price, the date is referred to as the maturity or expiration date and the price of the option is called a premium.

There are two types of option: calls that enable the holder to buy an asset and puts that enable the holder to sell the underlying asset. The person who has this right is called the holder of an option, the person who is selling this right is called the writer. If the holder is able to exercise his right at any moment during the period the option is called an American Option. If he has the choice only at the maturity date then it is a European Option. And if few exercising dates are available it is called a Bermudan Option. Options could have as underlying (real) asset or financial asset: interest rate, commodity, equity (in lots of 100 shares), stock index, Futures and currency.

Over the counter (OTC) options existed even during the great depression period[39], but it was only after 1973 that options re-emerged, after Congressional and Securities and

Exchange Commission approval, and began their geometrical expansion.[40] The majority of traded and OTC options have straightforward rules and they are called vanilla options. It is also possible to have a particular customized structure and call them exotic options.[41]

If the difference between the spot and the exercise price is favorable to the holder's position then the option has an intrinsic value; if it is unfavorable then it is called the future value.[42] Buyers of options are attracted due to the low cost they have to pay for 'insurance' against undesirable movements in the price of the underlying asset. Options also offer a very low cost leverage ability and could also provide enhanced liquidity due to easy access to opposite (closing) contracts. This low cost feature is also further enhanced, if we take into account the cost involved in the alternative, old fashioned protection i.e. acquiring or disposing of the asset in question.

As we have already mentioned, it is possible to incorporate an option on a particular asset or even on a derivative product such as Futures and Swaps. The concept of option, i.e. the choice to exercise or not, and similarly the situation where a financial position is hedged, maintaining at the same time the right to take advantage of any positive development, was not entirely new.[43] But it has shaped irrevocably the financial sector. In terms of our model (2.1), options could be considered as *radical* financial instruments, *off* balance sheet, not entirely *responsive* despite the obvious causes of *markets volatility*, and *risk transferring*. We are going to discuss in depth the pricing and risk exposure of financial options.

4.5.2 Income and Exposure from Options

Options pricing or the premium, is calculated using the Binomial model or the Black-Scholes pricing method.[44] The premium is calculated taking into account the time-period

spot price, exercise price, volatility of the underlying asset, interest rates and storage cost of the asset.

Brokering can yield risk free income for the bank as part of its intermediation without involving any additional credit risk except the transaction costs. Selling (OTC) options is not much more risky at least from the credit risk view. But writing an option could create significant exposure if the holder decides to exercise his right and the bank for any reason (such as negligence, fraud or deliberate exposure) does not possess the asset and is obliged to buy from the market at the current price. This case has unlimited market risk exposure and the position of the bank is called a naked position. Buying options could involve a settlement risk since the bank pays the premium without knowing if the client is going to deliver the underlying financial asset.

As we are going to discuss in the last sub section, the pricing of an option is not objective and uniform, it can vary with the parameters, underlying assumptions and set of information and data that the bank uses. In the case that a bank offers a lower price (premium) for the same OTC option due to a superior pricing model, it is possible to acquire a *competitive advantage* through either lower prices or more advanced instruments with lower costs. This could offer them the ability to appropriate the benefit of the innovation and confer them *tangible* (abnormal profit) or *intangible* advantages (reputation, know-how). A significant novelty of financial options was the emergence of *new organizational structures* in financial institutions, specialized in the pricing and control of exposure of financial options.

High premiums often discouraged users. In order to make their products more attractive, banks offered OTC and consequently customer tailored options: currency options of lower premium called Hybrid Currency Options which enable a more flexible protection based on certain criteria.[45] Most of the time they are European style hence the

premium is further decreased (Briys and Crouhy 1988). It is certain that the emergence and proliferation of options and option based instruments contributed to the *filling* of the *intermediation spectrum* of the market. The creativity involved in the design of these products is going to be discussed in a later section (4.6.2).

Concluding, options brokering is very safe where buying or selling could include a lot of risk exposure if they are not properly hedged.[46] In terms of our model (2.1), options were originated due to the *volatility* of the markets and transactions costs involved in hedging. They were also helped by the significant advancement of relevant *academic work* as a basis for pricing. They could also provide significant *tangible* and *intangible* advantages to the issuer through *appropriability* of the benefit and contribute significantly to the *filling* of the *intermediation spectrum* of the financial markets. They also create *new organizational structures*. An additional aspect of financial options is that the concept of option combined with the pricing method, could be perceived as *new financial materials*. In the next section we shall discuss second generation or advanced derivative products such as swaptions and credit derivatives.

4.6 Second generation or advanced derivative products

During this section, we shall discuss more elaborated, second generation, financial instruments. We are going to focus on swaptions and credit derivatives. Other instruments in the same category are the Asian options[47] or average price[48] and quantos[49] (or quantity adjusted) options. These instruments are often called exotic options due to their less straightforward pricing methods than the standard derivatives or vanilla options (King 1998). All of these could be classified as incremental financial innovations.

4.6.1 Swaptions

It is possible to combine both characteristics of option and swap agreements. A swap which includes also the right to change the type of income stream it receives at any time convenient to the holder is called a swaption. When a floating rate swap could be converted to a fixed income stream, it is defined as a call or a payer swaption; the opposite case is a put swaption. It is possible to be European or American.

It is also possible to include the right to end the agreement: a synthetic swap. If the holder receives a fixed income it is called a *callable* swap and if he receives a floating stream, it is a *putable* swap. If the holder could stop the agreement without any penalty or extra cost it is called an *exit* option. Swaptions could be perceived as long term options on a portfolio of FRA's (Malhotra and McLeod 1995).

Swaptions do not appear to have appealed until now to large number of users (see table [T-4.1] on the emergence of the swaption from 1988). This could be the result of their complicated nature or because users are able to replicate the desirable payoffs by using other financial instruments or just because their price is not yet appealing to users. But still they represent a very attractive financial instrument due to their asymmetric hedging aspect.

The particular characteristics of swaptions make them impossible to be standardized and to be available on the Exchange. Hence the vast majority of these financial instruments are OTC.[50] Selling swaptions is considered to be much more risky than isolated options or swaps (see appendix [A-4.1] on risk spectrum). These financial hybrids involve both market and credit risk and require extremely elaborate pricing techniques. Banks' risk profile is particularly affected by the potential replacement cost in the case that the user decides to terminate or alter the status of the original agreement.

Swaptions could be classified as *incremental financial instruments*, predominantly *off* balance sheet, that enable the *transfer of risk*. It is possible to perceive them as a hybrid type of *exploratory innovation* since even if at least one of their component (swaps) is a *responsive* innovation. Its is clear that their main cause was to provide more attractive financial instruments for potential users and filling the intermediation's spectrum.

4.6.2 Credit derivatives

A credit derivative instrument is a financial contract whose payoff is contingent on changes in the credit quality of the underlying assets.[51] They appeared in 1993 mainly for banks' protection or to allow them to free their credit lines.[52] The investor receives a premium and, in the case of a **predetermined** event, he pays a predetermined amount to the holder of the contract. Very often cash settlements are the most common form of contingent payment since physical delivery is not possible (*International Treasurer* 1997). As is obvious from their name, their main purpose is to address or reduce the credit risk of a financial asset. Initially it was suppliers, particularly investment banks, that originated this financial innovation in response to their *own requirements*.

The emergence of this innovation was facilitated by the fact that banks had accumulated a significant portfolio of loans and bonds, corporations had large exposure to single customers or equity investors faced considerable sovereign risk (*Euromoney* 1996a); in other words situations that are characteristic of concentration and correlation of risk.

The main credit derivative is the credit option that acts as a put option. It is possible to discern two types of instrument, one hedging against the deterioration of the asset and one guaranteeing the spread or return on the asset (Pierides 1997). A particular type of credit option is the default swap[53] or credit swap. It is like a put option on a portfolio of

bonds or loans which enables the holder to receive a payoff in the case of a particular event (*Euromoney* 1996a), in other words it guarantees the principal.

Related credit derivative products are *loan portfolio swaps*[54] and *total return swaps.*[55] Another type is *credit linked notes* where the issuer is able to reduce payments in the case where a financial variable (credit cards receivables) deteriorates (Neal 1996). Later credit derivative instruments became tailored to cover project risk, or hedging against other eventualities, including hedging even against even business disruptions (*International Treasurer* 1997) such as the consequences for employees' remuneration in the case of bankruptcy, (*Euromoney* 1996a). A credit derivative contract, also enables the holder to tailor better the time dimension of an investment.[56] Credit derivatives are only limited by the *creativity* of the designer of the instrument - taking into account that the option element always involves very elaborate techniques - and the competence of the specialized staff to price the product. Consequently, credit derivatives require the emergence of *new structural organization*, as with financial options, in order to create and price their products.

In 1995 the total amount of credit derivative contracts reached the amount of $20 billion (Neal 1996) in the US and a similar amount in 1996 for the UK.[57] In early 1998 the global figure was $165 billion and the forecast for 2000 was to reach the notional amount of $2,000 billion.[58] Unquestionably in the future due to the diversity of potential applications, it is going to be a heavily contestable field of expertise for the establishment and exploitation of tangible and intangible advantages.

Credit derivative products face significant uncertainty in relation to their regulatory status despite the fact that in the future, it is not inconceivable to receive a boost due to regulation.[59] Furthermore, the tax treatment could be very ambiguous, depending on the use of financial instruments such as option, guarantee or swap (*International Treasurer* 1997). Furthermore, credit derivatives could open completely *new markets* for banks,

mostly in the wider area of insurance.[60] Finally, insurance companies, and particularly property and casualty specialists, also entered this domain by using the option structure in 1997 in order to provide credit option products.[61]

Despite the fact that credit derivatives emerged in order to satisfy the preferences of financial institutions, their dynamic evolution could confer them the characteristic of an *exploratory* innovation. On the other hand credit derivatives are *incremental* innovations since it is clear that they are an option based product even if they acquired a relatively radical nature. It is possible to describe credit derivative instruments as a *hybrid exploratory* and *incremental financial instrument*, currently *off* balance sheet, that *transfers risk* (credit and price) and considerably *fills the intermediation spectrum.* They could be based on *existing routines* (financial options), be technology driven, require considerably-specialized staff and *creativity.* They could create *new markets*, and *organizational structures.*

4.7 Risk management and banks

During the previous sections we discussed the benefits that derivative products confer on banks, and thus much of the reason for their development. But in time, derivatives also imposed costs in the form of new and higher risk exposure. During this section we are going to discuss some limitations on pricing techniques, and how banks could deal with these new situations and challenges inter alia by further dynamic innovation.

4.7.1 Problematic pricing

When we analyzed the main derivative instruments we referred to the pricing of these products. One fundamental advantage of derivative products is that the holder is not forced to pay the whole amount in order to hedge his position. Additionally the lack of need to

find a matching counter-party further reduces the transaction costs and thus pricing. Pricing should reflect mainly the risk to which the particular product exposes the bank. The pricing could be the result of the interaction between supply and demand forces, like the Exchange traded Futures or options where only a fee is applicable and the burden of the exposure is on the clearing house. This fee would normally reflect the exposure that the bank suffers.

On the other hand the pricing of OTC derivatives, especially financial options, swaptions and credit derivatives, usually is based on pricing models. But pricing models and theories rely on certain **assumptions.**[62] Unfortunately these assumptions are not always applicable to the real world. Information is not either free or universal and economic agents are not always profit maximizers or independent. Transactions costs exist and sometimes are material, hence they could influence the decision to take a position on a particular asset. During the same process, liquidity is not always given or perfect and could contribute further to the agent's decision. Additionally, all customers do not possess the same credit facilities and lines. Finally historic data are not a certain indication of future movements or indicative of future price volatility.

Even Black and Scholes, the most important pricing formula for call options, used fundamental assumptions which are seriously challenged by empirical evidence, especially the validity of past data, as an indicator of the future potential movements of prices and the relationship between the underlying stock and the introduction of the option to the stock market. It is also possible to observe that different users take into account different time periods in order to calculate volatility or that the risk free rate (used in the formula) could be either constant or change during the duration of the financial instrument.[63]

A further important aspect of the pricing models is the replication of the pay off of derivatives implying redundant assets and complete markets. None of the above corresponds to financial markets (Gibson and Zimmerman 1994). We can also add the

complication which emerges from the introduction of new products in incomplete markets. It was suggested by Hart (1975) that opening new markets in incomplete markets could make things worse matter than better, and consequently the prices charged not the lowest possible or the optimal ones.[64]

The regulatory authorities both in the US and UK are also preoccupied by these limitations.[65] It is obvious that the *pricing* of derivatives instruments could be *problematic.* But additional measures could be taken and we are going to discuss them in the following sub sections.

4.7.2 Proliferation of derivatives and reduction of risk

We have established that a bank could face many different and auto-correlated risks. We are also aware of the limitations of derivatives pricing models. Consequently banks using derivative instruments could reshape their risk exposure approach in order to reduce it. Before discussing this potential reduction, we will briefly discuss the expansion of these financial instruments.

It is also worth mentioning the exponential increase - more than 25 times- of the notional amount of derivative contacts of the US banks between 1985 and 1993 (Simons 1995).[66] The concentration of derivatives in the largest banks amounted to 86% of notional capital of the top nine US commercial banks in 1991 to 94% in 1995.[67] During the same year these top nine banks accounted for more than $16 trillion of outstanding notional capital (Edwards and Ellen 1996). During the same period the top eight British banks had a similar high exposure of more than $ 7 billion (IOSCO 1996). It is possible that large banks could exploit their economies of scale, enhancing expertise and consequently *intangible advantages.*[68] In 1995 the global figure for outstanding OTC derivative products was $45.5 trillion. In 1997 the Securities and Exchange Commission forced banks and thrift

institutions in the US to disclose more information and risk exposure on their derivative activities.[69]

In the light of this massive growth and the corresponding exposure of banks to new risk, we are going to discuss some actions that banks have to undertake in order to reduce their exposure. These actions are related to deep knowledge of the instruments, the existence of guarantees or insurance and monitoring of the customer's performance. They are also possible to be perceived as *future incremental innovations*, some of them addressing shortcomings of the existing financial instruments.

Banks must be able to identify what specific instrument is appropriate for the financial situation of their client and advise him appropriately. Referring to the spectrum of derivatives products (available in appendix [A-4.1]), banks should move from high risk to low risk products in order to reduce their risk exposure.

Banks could demand more frequent *settlement* especially for swap agreements and insist on imposition of *collateral* and consequently shape the pricing of the products depending on the number of settlements or the type of collateral.[70] In accordance with the G-30 report, only half of derivative providers require collateral in case the buyer exceeds his credit limit.[71] They could begin default insurance specifically addressing credit risk.[72]

From the same perspective, the emergence of credit derivative products could reduce considerably the credit risk that a particular institution faces.[73] But the supervisory authorities ignored any similar development in their capital adequacy requirements (Neal 1996). This fact tended to change, as we are going to discuss in the following section.

Banks should apply in their derivatives products portfolio the *marking to market* evaluation. An illustrative example is interest rate swaps where banks calculate the potential unrealized losses if current interest rates persist.[74] This mark to market valuation should take into account, if it is applicable, the replacement or substitution cost of the deal.

This evaluation could be problematic due to adverse market conditions hence they should use statistics - with a certain confidence level - to evaluate the potential cost.

In the case of swap agreements, excessive exposure could be reduced if banks follow the netting approach that the International Swap Dealers Association (ISDA) proposed i.e. master agreements for all off-balance sheet items so that players could net their obligations. It is still a problem that banks do not publish any detailed list of their swap, futures and options activity.[75]

Financial institutions should recognize the credit status of their counter party and consequently apply not only quantitative but qualitative controls too.[76] Pricing should also take into account the credit status of the counter-party. Price *tiering* could avoid high quality firms being overcharged and low to being undercharged. It could be combined with active substitution policies.

We did not address systemic risk from the increased amount of derivative instruments for two reasons. The first is that it is not in the scope of our research. The second one is that there is not a consensus about their impact on market volatility and the risk taking capacity of the system.[77] It is fair to mention that some researchers believe that the extensive use of derivatives does not increase the volatility of stock returns and the existence of supervisory forced (regulation T[78]) margin requirements do not control the volatility of the underlying stock's return.[79] A related argument was that the more elaborate and developed the stock market, the lower the volatility.[80] Derivative products could also be perceived as tools that apart from risk sharing, enable information gathering under imperfect market conditions[81] for different aspects such as transaction costs.[82] They enable also the implementation or replication of complex risk strategies with a lower cost than the cash market. However, we perceive increased systematic risk from the quantity of derivative instruments used (Michie and Grievie Smith 1995).

All these measures could be undertaken in order to reduce the risk involved in derivative financial instruments, can be integrated and *further enhanced* by the introduction of a *new process financial innovation*, the Value at Risk evaluation model.

4.7.3 The emergence of Value at Risk (VaR) model and future trend

The massive proliferation of derivative products and potential limitation on their pricing strategies, created a need for an integrated process innovation that could measure the risk and exposure undertaken. This new financial process is called VaR.

The Value at Risk (VaR) model, measures the worst expected loss over a given time interval under normal market conditions at a given confidence level. It is important to define the time dimension of this model and depending on the liquidity of assets, the time horizon varies. It is perfectly conceivable that a financial institution has to base its model on a different time horizon than another.[83] Another important factor that VaR models take into consideration is the confidence level of their estimation.[84] Additionally, the period that data cover and furthermore the weighting on these data[85] could differ from financial institution to financial institution.

There are three main methodologies in estimating the VaR value. The first uses a normal distribution for yields change or the Delta normal method. The second approach uses an actual distribution for yield changes or the Historical-Simulation method.[86] The third approach comprise a volatility correlation.[87] A recent analysis by researchers in the Bank of England, suggested that simulation based models capture some aspects of the financial markets better most of the time.[88]

In October 1994, J.P.Morgan launched the RiskMetrics system[89], the Delta-Normal using a 95 % confidence level and a daily or monthly horizon. A few months later Bankers Trust created an incremental innovation, the RAROC 2020 using the Monte Carlo[90]

method, with a 99% level of confidence and an annual time horizon. Depending on the above parameters the change could be material (Matten 1996). Later other financial institutions followed the launch of their own models.[91] The potential advantages could be divided into two main categories: enhanced risk management for the innovator and considerable income from its sales to other financial institutions.

A potential limitation of VaR is that it does not take into account crises and unknown risks, of fundamental uncertainty that stress analysis is able to simulate. Other complications, similar to option pricing problems, are the limitations of historic data, and on the ability of the financial institution to liquidate its portfolio (*Institutional Investor* 1995). We have also to mention that financial instruments most of the time present returns which are skewed rather than normally distributed.[92] In addition the relationship price/payoff is not always linear as the standard model assumes[93] and a time horizon longer than 20 trading days reduces the estimation's reliability.[94] Finally VaR models need to allow for change in the quality of collateral assets.[95] A more general and recapitulating comment is that the VaR model is constructed on some theoretical premises (assumptions); if these premises do not hold, its estimations are not reliable and further innovations are required. Improvements or incremental innovations based on the initial VaR models began to emerge, taking into account other credit related risks.[96]

The already mentioned G-30 proposal in 1993 and the BIS report in 1994 were the first to mention the importance of internal models of risk exposure.[97] In December 1995 the Securities and Exchange Commission issued a proposal in order to enhance the estimation of market risk by a choice of three methods. In 1997 the Fed suggested the connection between the capital charge and the internal risk measurement of the financial institution[98]; the Bank of England too investigated aspects of VaR applications.[99] Finally at

the end of 1997, a Basle Committee amendment of the 1988 Capital Accord, was adopted by the Bank of England and the Fed.[100]

The VaR model could be perceived as a *radical* and *responsive financial process* innovation, is *off* balance sheet, that considerably improves *risk management* and could provide significant *advantages* for its creator. This innovation is a clear example of the dynamic approach that we have to adopt during the investigation of the financial innovation phenomenon. A cluster of derivative-based innovations created an unprecedented complex and a large risk exposure, combined with a regulatory burden (in the 1990s). This exposure was able to be better controlled by the emergence of another financial innovation. They try to analyze each of these risk attributes, isolate and sell any of those not compatible with their client profile or desired risk exposure. The plethora of derivative products, limited only by our imagination, could reshape and minimize the risk that banks face.

4.8 Conclusion

During this chapter we have discussed a cluster of financial innovations that emerged after the 1970s, mainly due to inflation and exchange rate volatility and shaped by government and regulative intervention (swaps); institutional requirements (credit derivatives and VaR) and transaction costs (swaps, options) contributed also to this innovative activity.

Many derivative products were routine based (Futures, swaptions, credit derivatives) and of a cumulative nature. Derivatives required enhanced technological capacity (swaps) as well as new academic contributions (options, credit derivatives). Without these parallel development, their emergence was not feasible. They also presented features such as increased appropriability of the potential benefit (options) and considerable creativity (credit derivatives). Some of them were enhanced by the existence

of positive network externalities (Futures and swaps) and large institutions benefited by them due probably to economies of scale.

They could rarely be classified as radical (forwards and options) and mostly were incremental. They were all of them responsive with the exception of those financial options which could be classified as exploratory. Most of them were off balance sheet but, became on balance sheet as the capital adequacy regulations changed, and they were mainly risk and price transferring (FRAs, credit options). They are also based on new financial material (Options and credit derivatives), created new organizational structures (options and credit derivatives) and are able to open new financial markets (credit derivatives).

Their main reason of success was their ability to fill the spectrum of intermediation, enhancing risk management (Forwards, Futures, swaps and VaR) and providing many tangible and intangible assets (options, credit derivatives and VaR) to their innovators and adopters.

During our discussion we encountered and explained a financial process innovation, the VaR, that illustrated the dynamic nature of the financial innovation process. The magnitude of the already mentioned cluster of first and second generation derivative products combined with their pricing limitations and shortcomings created a risk exposure that a further innovation was required to deal with.

In this chapter, we discussed the emergence and proliferation of financial derivative products under the analytical framework of our model of financial innovation. The framework was shown to be capable of encompassing, and throwing light on, a second cluster of innovations; the causal process, including the inducement to further innovations in order to solve problems caused by the initial innovation, was shown to be quite different from the first cluster. In the next chapter, we shall discuss a third cluster of financial innovations, securitization.

Endnotes of derivatives

[1] The first derivative contract could be traced back to Ancient Greece around 400 BC. Olive producers were selling their crop in advance (*Management Today* 1995). Derivative products and particularly options were unofficially traded during the Dutch Tulip Bulbble in 1647 and in the NYSE in 1817

[2] Especially after the collapse of the international fixed Exchange rate system of Bretton Woods in 1973, combined with the OPEC crisis, resulted in high inflation in the developed countries.

[3]At the end of the 70's and beginning of the 80's monetary and supervisory authorities in all developed countries demonstrated a new attempt to control and regulate the financial environment, particularly the capital adequacy requirement regulation especially after the Mexico 1982 crisis and crystalized in 1988 Basle agreement that we will discuss later.

[4] As we shall discuss in the last section, after 1996, internal risk control model that banks use could influence the amount of capital that they had to use in order to back their activities (*Derivatives Strategy* 1996,BIS 1997, World Bank Colloquium 1998).

[5] The non income activities are significant for the diversification of income sources of banks. In 1994 non interest activities represented between 34% and 40% of all US commercial banks (*Management Accounting* 1995).

[6]In 1995, an analysis undertaken in 12 European countries and the US suggested several reasons why financial institutions do not use derivatives. The main six reasons were institution's restrictive regulations, poor understanding by management, perceived unlimited liability, limited liquidity in derivatives markets, regulatory restrictions and negative press coverage ('INTERSEC/EMFA Survey').

[7] A detailed classification of 'components of capital' and 'assets capital weight' is included in Matten (1996).

[8]The Basle proposals also harmonized the capital requirements among countries that historically had significant differences such as the US, the UK and France and Japan. Exposure risk could be measured either based on the current exposure i.e. the replacement cost plus a factor (much contested later) provided by the BIS, or by calculating the original amount's exposure.

[9]It used futures expecting the oil price to rise and lost $ 500 million (McClintock 1996).

[10] Its investment fund used inverse floaters, betting on the reduction of interest rates, and they lost $2 billion (ibid).

[11]They used Nikkei 225 stock index futures and expected an increase in the stock index: they lost $1 billion (Ibid). During the same year unauthorized derivatives trading cost the Daiwa bank $ 1.1 billion and the next year the Sumitomo corporation $1.8 billion (www.kpmg.ca).

[12] It also highlighted the legal, systemic, credit and settlement risks (Recent Reports on the Financial Derivatives, Geneva Papers, 1995).

[13]Legal risk was the only risk really discussed by this report (ibid).

[14] The two most cited recommendations were the establishment of consistent mark to market valuation over derivatives and the performance of frequent simulations of different scenarios. Other recommendations were:

-Establishment of independent and knowledgeable risk management.
-Set of standards for independent internal and external audit.
-Assessment of credit risks using consisting methodology.
-Introduction of clearing facilities for OTC derivatives.
-Enforcement of regulatory supervision of credit risks.
-Improvement of information access for regulators.
-Removal of legal uncertainties.
-Acceleration of work on hedge accounting and disclosure standards (idid).

[15] This report discussed 67 large financial institutions from the G-10 and Hong Kong (Basle Committee on Banking Supervision and IOSCO 1996).

[16] It recommended that all derivatives should be in the balance sheet at fair value and distinguish hedging and no hedging use (www.kpmg.ca).

[17] In the x-axis we plot the time values and on the y-axis the amount of derivative instruments used. A very good example is US futures on T bills (Remolona 1992-3).

[18] The first Forward contract arose in the twelth century in medieval trade fairs used by Flemish traders (*The Economist* 1996a).

[19] Contracts like Futures appeared in Amsterdam in the 17th century and in the stock Exchange of Chicago and New York in the 19th century (*The Economist* 1996a).

[20]The same terminology with Forwards apply about having a short or long position.

[21] Short term futures are T-bills, CDs and Eurodollars, long term are GNMA certificates, Treasury bonds of the US, France, Japan Germany and the UK long Gilts and notes where a fixed amount is paid periodically on the security itself and not to the holder of the future contract.
[22] Types of index futures are S&P 500 and NYSE Composite .
[23]Legal risk was the only risk really discussed by this report (ibid).
[24] Scalpers, day and position traders are traders with a time horizon of minutes, day or a few weeks.
[25] During next chapter (5.1.4), we shall discuss in more depth the yield curves.
[26]In order to represent it, we use coupon payments of government securities as the best indication of market expectations.
[27]Arbitrage could be defined as risk free profit by taking simultaneously a short and a long position in a particular asset.
[28] In the beginning currency hedgers used rolling forward contacts in order to cover long periods but when in 1979 the Fed changed their policy and interest rates became more volatile, users demanded more elaborate instruments (Malhotra and McLeod 1995).
[29] In 1989, corporations accounted for 24% and financial institutions for 62% of interest rates swap agreements. In 1991, corporations increased to 31% and financial institutions reduced to 31%. During the same period, government moved from 7% to 11%.(FRBNY 1992-1993).
[30] These swaps could include a topping-up clause in order to compensate for significant Exchange rate changes.
[31]Another problem was the inflated consolidated balance sheet of the parent company.
[32]We omit the commodity swaps since they are not related with banks.
[33]Interest rates cups protect for undesirable increases, floors for decreases and collars define an acceptable area in which interest rates could fluctuate. Additionally every time we discuss interest rates swaps, we refer to the notional capital, which is the capital that we use in order to calculate the income stream from the interest payments
[34]The income streams that parties have to provide and receive are called legs.
[35]Since a swap due to netting requires much lower periodic cashflows than a straightforward loan.
[36] In contrast with the forward contracts they do not require funds transfer at day one or a fixed exchange rate for the whole period since it is possible to negotiate different rates during the period.
[37] These deals are not in fashion anymore due to inflation complications to the country and lack of secondary market for the investor and tailored products and regulative constraints.
[38] During the first five years after the Mexico crisis (1982), less than 3% of outstanding loans were swapped for equity. The major banks did not participate because they were afraid that their participation could trigger a more general downgrading of their loan portfolios (*Finance and Development*, 1988).
[39] The Securities and Exchange Act 1934 addressed the issue of their mis-use.
[40] A second regulatory effort to investigate the potential problems with options took place in 1977 called the Options Study. Based on this report, high financial risk is justified by the lower commitment of cost and capital and should be accompanied by as much awareness as possible. Famous options Exchanges are Chicago Board of Trade (CBOT), Chicago Mercantile Exchange (CME), New York Stock Exchange (NYSE), The London International Financial Futures and Options Exchange (LIFFE), Marche a Terme d' Instrument Financiers (MATIF) in Paris .
[41]Two examples of exotic options are Asian (based on average and not spot price) and Barrier options (if during the exercising period the spot price reaches a predetermined level, the holder loses his exercising right).
[42] The notion of favorable means that by exercising immediately he will make a profit (in the market).
[43] Except from the particular isolated cases in the past, the concept is very similar to the insurance policy principle.
[44]The Binomial Model enables the pricing of an option relative to the underlying asset by assuming two possible outcomes and two time periods The Black and Scholes formulas (1973) could be perceived as a type of Binomial model dividing the time into small fragments where interest rates and volatility are constant (King 1998).
[45] One of the first examples is the 'cylinder option' of Citibank later called 'collar option'. It enables the user to buy a call and simultaneously sell a put. A particular type of collar option is the zero cost collar (Gardener and Molyneux 1995).

[46]There are some indicators that help us to hedge our position. They are related to the premium's sensitivity to certain factors and we use four Greek letters in order to measure them:

-Delta: the change in premium if price moves one point.

-Gamma: the change in delta with respect to price.

-Theta: the change in premium with respect to time.

-Kappa: the change in premium with respect to volatility.

[47] Asian options are also Exchange traded; the London Market Exchange offered these types of options for commodities, called TAPOs in 1997(King 1998).

[48] An Asian option enables the user to hedge against the average spot price. The premium of an Asian option could be lower than in a straightforward option due to the diversification effect (Gardener, Molyneux 1995).

[49] A quanto option is a cross-currency option in which the pay-offs is denominated in a different currency to the underlying assets. (Cooper and Weston 1995).

[50] Deals could be arranged between two traders but they are subject to extremely long and time consuming negotiations.

[51] These assets could be single assets or baskets, indices, requiring cash settlement or physical delivery (*International Treasurer* 1997).

[52] The first deal was made by Bankers Trust and Credit Suisse Financial Products who sold notes that their redemption values depended on default events (*Euromoney* 1996a).

[53] They are designed for investors willing to accept small losses but, want to hedge themselves against large ones (Neal 1996).

[54] Two financial institutions with different loan portfolios agree to swap their returns (www.srz.com).

[55] In this case one party guarantees payment of interest on a bond and any difference in the price of the underlying asset and the other party pays a Libor plus some basis points and any adverse change in the price of the underlying asset (www.srz.com).

[56] A very good example is the creation of an investment profile of shorter than the existing maturity due to the purchase of a credit derivative contract for the remaining period (*Euromoney* 1996a).

[57]According to the Financial Times, the London market was estimated to reach in 2000 the amount of $100 billion (17/2/98).

[58] Most activity was concentrated in default swaps, and options on credit spreads were expected to grow considerably. It is also estimated that Europe is going to be more active than US due to EMU (ibid).

[59] The regulatory framework is not very elaborate because they are not clearly defined financial instruments, like securities, swaps or insurance products, and most of the time are off balance sheet (Neal 1996). As we shall discuss in the following section, the purchase of credit derivatives contracts from the financial institutions could lead to lower capital requirements.

[60] We use this concept in order to cover any aspect of hedging for risk undertaken i.e. credit, default, settlement risk.

[61] Since insurance companies are in the risk-management activity they have to address other types of risk such as the interest rate risk (*Forbes* 1997).

[62] Conrad (1989) challenged the assumption that the share price is not affected by the introduction of the corresponding option, and observed a permanent increase and reduction of volatility. Where Rao and Ma (1987) had found negative results. Detemple (1990) challenged the redundant element of available prices and by observing the incompleteness of the market caused by the discontinuity of the connection between new information and pricing adjustment, and making it impossible to replicate with dynamic strategy all possible pay-offs. Kabir (1997) in contrast did not find any relationship between option listing and volatility of underlying asset prices but he found a negative relationship between option introduction and the price of the underlying asset.

[63] The fair value and the current value could differ because of these different approaches (King 1998).

[64] The concept of incomplete markets implies that the usual Pareto equilibrium is not attained An economy with these characteristics is the typical second best situation (Hart 1975).

[65] The Bank of England in 1995 issued a paper discussing the pricing models that financial institutions use (Cooper and Weston 1995) and particularly for credit derivative in 1996 (International Banking and Financial Market Developments, BIS 1997). The Federal Reserve raised in the capital adequacy guidelines for 1997, the issue of pricing (World Bank Colloquium 1998).

[66] In the same article, a comparison between 1985 and 1993 showed that the amount of users did improve but not by significant percentages:

	1985	1985	1993	1993
Total bank assets	Percent of banks using derivatives	Notional amount of derivatives	Percent of banks using derivatives	Notional amount of derivatives
100-300	3.71	.58	5.88	4.51
300-500	6.78	.17	19.28	8.48
500-1000	14.01	1.63	30.86	8.91
1000-5000	40.59	13.20	58.17	98.17
5000-10000	93.62	20.87	95.52	196.61
over 10000	100.00	247.17	100.00	6,885.40
All banks	10.91	283.62	17.22	7,202.08

[67] According to the Office of the Comptroller of the Currency, December 1995 (www.occ.treas.gov).

[68] The profitability of the named financial institutions in the vast majority was boosted by these derivative related activities (Edwards and Eller, 1996).

[69] Institutions with stock market value more than $ 2.5 billions were forced to provide risk information in accordance to three different valuation methods: Tabular presentation of fair value of future cash flows, sensitivity analysis of potential loss in future earnings or cash flows and VaR predictions for adverse movement of the market (Journal of Accountancy 1997).

[70] In the US this began with savings and loans institutions where posting collateral was common practice.

[71] In defense of this fact we could mention that in 1992 only 0.01% of the notional principal of derivatives contracts defaulted (*The Economist* 1995a).

[72] The World Bank pioneered this risk exposure reduction by buying in 1991 from Deutsche Bank a default insurance for its swap deals with corporations.

[73] The consequences in aggregate level of systemic risk are not straightforward to evaluate. It really, depends on institutional behavior in relation to their risk taking and the regulatory authorities approach.

[74] This practice was introduced by Manufacturers Hanover Trust in 1988.

[75] In the U.S the gross volume of each bank is reported to the Federal Reserves by the Schedule L (bank) and H (holding).

[76] The credit should be allocated in relation to the particular characteristics of the customer and not based on absolute and universal benchmarks.

[77] For a detailed analysis of the negative impact of derivative products in the markets in see Mc Clintock (1996) and especially Carter (1989).

[78] It is the regulation that governs credit extension by derivative product providers. It is also supplemented by regulation G/U/X (Federal Reserve Regulations).

[79] See the study undertaken by Kupiec (1997) aiming at demonstrating that there is no relationship between derivatives and volatility or that the existence of margin requirements could reduce the underlined instrument's volatility as it was previously believed. Margin could only influence the volume of securities credit lending and the open interest particularly in futures contracts (Kupec 1987).

[80] In accordance with a survey undertaken in 1995, the annual volatility of the five most advanced stock markets index was the following:

Country	US	UK	Germany	France	Japan
Percentage	8.8	12.4	15.9	16.7	20.6

Source, 'Derivatives are good', www.fortitude.com

[81] The factors of trading cost and market lack of liquidity (Gibson and Zimmerman 1994).

[82] Through the observed prices of put, call, exercise price (ibid).

[83] The time horizon could vary from one day to a year. If we have a given VaR figure for a day it is easy to calculate for a longer period. We multiply the daily value by the square root of the number of days (Jorion P, www.gsm.uni.edu).

[84] This confidentence intervals depends on the percentage of probability that they assign to the estimation. It depends on the standard deviation values leftward and rightward form the average (mean) value of the estimation. Usually the confidence level is 67%, 95%, 97.5% or 99% or one, 1,65, 2 or 3 standard deviations (*Institutional Investor* 1995).

[85] It is possible to use the last 75 or 100 days or even the last three years and apply or not extra weight to the recent ones (ibid).
[86] Both are explained by Jorion (www.gsm.uni.edu).
[87] Initially it determines the factors influencing the current position and incorporates these factors in a multi variance equation estimating price sensitivity *(Balance Sheet* 1996).
[88] In the case of volatility, the parametric approach has a small advantage which is further reduced in well diversified portfolios (Jackson et al 1998).
[89] In early 1997, they launched an enhanced version called Creditmetrics which tried to quantify credit risk instead of the market. In a case of a swap or bond, it estimates the risk of loss of the principal and interest fluctuation. It also allows for stress or event tests to run through the model (*Risk* 1997).
[90] This method runs random simulations and their results could provide statistical likelihood of events (*The Economist* 1995c).
[91] For example in March 1996, CS First Boston launched their own PrimeRisk (*DFM*, 9/1996).
[92] From the moment that a derivative product includes the element of option, its user is able to exercise and consequently to reduce his exposure. Hence he does not face a set of potential outcomes normally distributed due to his option. This problem is also called 'lepto-kurtosis' (*DFM*, 1996a).
[93] We encounter this problem especially in options and it is called the 'curvature' problem. In simple terms this problem consists of the observation that derivatives and underlying assets do not change by the same proportion (Matten 1996).A further problem is the particular structure of option based financial claims that do not follow normal distribution due to their hedging abilities (put option) (*DFM* 1996b).
[94] Mainly because the market factor correlations are not sustainable (*Balance Sheet* 1996).
[95] In order to provide more accurate information on the credit risk exposure of a financial institution, any model should take into account changes in the quality of its collateral (Matten 1996).
[96] The already mentioned Creditmetrics (*Risk* 1997).
[97] They also proposed the VaR as suitable for a set of different institutions *(Institutional Investor* 1995).
[98] From January 1998, the capital requirement of a financial institution will be based on the internal measurement of risk, incorporating for the first time in their approach the qualitative aspect of the institution's risk exposure (Hendricks and Hirtle 1997).
[99]Including the publication of a paper undertaken by researchers of the Bank (Jackson et al 1998).
[100] This amendment enabled banks to calculate their capital adequacy charges using their own internal models (International Banking and Financial Market Developments, BIS 1997).

Chapter five

'There is nothing new under the sun'
(Old proverb)

5 Securitization

Introduction

During this chapter, we are going to discuss the phenomenon of securitization and a corresponding third cluster of innovations. During the discussion of securitization, we will consider the applicability of the concepts and features of our analytical framework and model of financial innovation process.

We shall define securitization, since there is not a uniform definition, and then refer to the main historical causes and events that contributed to its emergence. We shall also discuss two further innovations that were pre-requisite for the emergence of Asset Backed Securities, Special Purpose Vehicles (SVP) and credit enhancement.

The following section will be devoted to the US history of securitization. We shall refer in detail to the first mortgage-backed asset, the pass-through, GNMA security in 1970. It was a radical, new financial instrument that acted as the prototype for many similar routine innovations such as CPs and MCMs or more altered versions such as pay-through securities like CMOs. All of them were government backed and mostly emerged due to liquidity-enhancement reasons. Then, we shall expand the discussion to other types of asset backed securities: non-government-backed ones, such as CARs, CARDS and CCDN. During the 1980s and 1990s economic growth boosted further the ABS-related innovations. All of them fill the market spectrum and enhance the risk management of financial institutions.

The next section will discuss the emergence of securitization in the UK. The British story is less elaborate and its spectrum narrower than the US one. The lack of government

backing, different legal system and the more favorable condition of its financial institutions, acted as constraints on the proliferation of ABS. Still many types of ABS emerged such as MINI and HOMES; and, much later, other securities appeared, based on lease and auto receivables. The main causes of their emergence were more competition-related reasons and institutions' preferences than the liquidity enhancement and government-originated reasons in the US. They also contributed to better risk management and filling the spectrum of financial instruments available in the markets.

Finally, we shall discuss the risk issues involved, and the emergence of additional benefits and problems from the proliferation of securitization. These benefits cover areas, not addressed initially, such as cost structures, strategic objectives and intangible assets. The problems are related to characteristics of the ABS, expertise, risk management and regulatory imperfections. These could be addressed with further routine innovations. Securitization, after all, was a cluster of innovations with beneficial features for financial institutions.

5.1 Historical perspective and description of the process

During this section, we shall define securitization, discuss the history of securitization without referring to particular country details, explain two further reasons that enhanced securitization globally and finally discuss the structure of the securitization process and the emergence of two additional process and organizational innovations, essential for the emergence of Asset Backed Securities.

5.1.1 Definition of securitization

It is possible to attribute to securitization a dual meaning: a general and a more narrow one. This term could be used in order to describe the general phenomenon of raising a

considerable fraction of finance through the agency of securities. Or it could be used in order to describe the process by which loans and other receivables are packaged, underwritten and sold in the form of securities. We are interested in the second definition as a firm specific innovation.

In other words securitization is a process that separates the originator from the ultimate investor since the finance emanating from a security enables the originator to be another economic agent than the investor. Its impact is also to turn income producing assets into marketable securities and not only use them as backing - collateral - for borrowing.

In the following sub section we shall discuss the history of securitazation from a more general standpoint, not directly related with the US and the UK.

5.1.2 The story of securitization

Mortgage-loans are closely related to the initial stages of this phenomenon. The beginning of this phenomenon is situated at the end of the 1960s in both the US and the UK. A significant proportion of the balance sheet was allocated to mortgages. The purpose was to use residential mortgages in order to back the issue of new securities[1] and acquire more funds for new mortgages (Hull 1989). Traditional lending activity requires two main functions: the initial review of the application for the loan[2] and the monitoring function during the duration of the loan. These two functions are also applicable to the case of securitization.

It is possible to perceive securitization as a *cluster* of *innovations responsive* to the negative effects or shortcomings, emanating from the proliferation of a *previous* innovation: mortgage loans, and part of the *dynamic* aspect of the financial innovation process. The proliferation of these innovations created some problems for banks since the financial institution was also forced to back these loans by equity capital. The capital

adequacy ratio measures the degree of backing that an institution has at any time. The cost of this capital was estimated to be much higher for the institution than short term debt funds (Rosenthal and Ocampo 1988). In other words the cost of providing loans is significantly higher than the cost of providing short term finance. But one of the oldest and most profitable activities of banks is to provide loans.

Regulation was a financial burden (Silber, 1975 and Kane, 1981) but the situation was historically addressed by the existence of govermental backed institutions such as the Federal Depositors Insurance Corporation (FDIC), the Federal Reserve and the Bank of England. These institutions, enabled banks and regulated financial institutions to have less equity capital backing for their lending activities than finance companies.[3] This fact in the middle of the 1980s, after the Mexico crisis, was resented and perceived as a sign of future dangers by the regulators and many other institutions.[4]

Even with the existence of government backed institutions, the burden of these loans for banks is significant. The equity capital is expensive and banks were facing a dilemma: either to stop granting loans and reduce the amount of equity capital they have to maintain but lose a considerable source of income, or to continue their granting activity and back it with capital. Securitization offered a much easier and more convenient solution. It is possible to make loans and then unload them from the balance sheet and thus reduce the capital requirements.

Hence any *capital requirement* could be costly for the financial institution, act as a barrier and restriction for asset allocation and provide the incentive for securitization. This incentive could be identified as the *regulation* in our model (2.1). We are going to discuss two other factors that influenced the securitization process.

5.1.3 Further reasons that facilitated the expansion of securitization

Before the discussion of the particular reasons that enabled the emergence of this financial innovation, we are going to refer to two significant events that shaped the monetary and banking history of the United States and the United Kingdom. These events were the syndicate lending crisis and the proliferation of off balance sheet finance.

5.1.3.1 The syndicate story

Before the emergence of Syndicated lending world financial markets experienced the proliferation of Eurodollars where national regulation restrictions were not applicable and their credit creation process is based on the banks' own criteria and judgment.[5]

Citibank became a leading international player. Other major banks followed her example and built up large exposures in foreign debt arguing that a country could not go bankrupt.[6] This become the famous 'sovereign - risk hypothesis'.[7] When a large bank was leading a syndicate and earning substantial fees, many smaller institutions wanted to be involved even if they did not have the amount required and they had to borrow it. The hypothesis of no sovereign risk was proved completely wrong in 1982, during the Mexico crisis,[8] which crisis began by the significant shortening of maturities that appeared in the beginning of the 1980s. The problem was more acute because of cross-default clauses that created a chain reaction and the credibility of these institutions was severely damaged. US banks had lent the equivalent of 1.3 times their capital.[9]

None of the international monetary authorities was willing to back the default countries. Not even the International Monetary Fund (IMF) whose president, Mr. Witteveen on several occasions had praised and endorsed the lending activity of banks in Euro-currencies. And he was not the only one.[10]

Hence significant constraints were applicable to the allocation of banks' assets and a further reduction of loan portfolio was desired. But another factor that also influenced the emergence of securitization was the exponential increase of the off balance sheet banking activities.

5.1.3.2 The similar path of Off Balance Sheet finance and securitization

Banks faced regulatory requirements applicable to their assets. Off balance sheet (OBS) activities were estimated in 1987 to be 200% of on balance sheet assets for many leading US banks (Gardener 1988). These developments could justify the title, the 'invisible bank' and created significant problems for the evaluation of bank's risk exposure. These activities usually take two forms: either trading of instruments or fee generation, Lewis (1988), classifies banks activities in term of on and off balance sheet in figure 5.1.

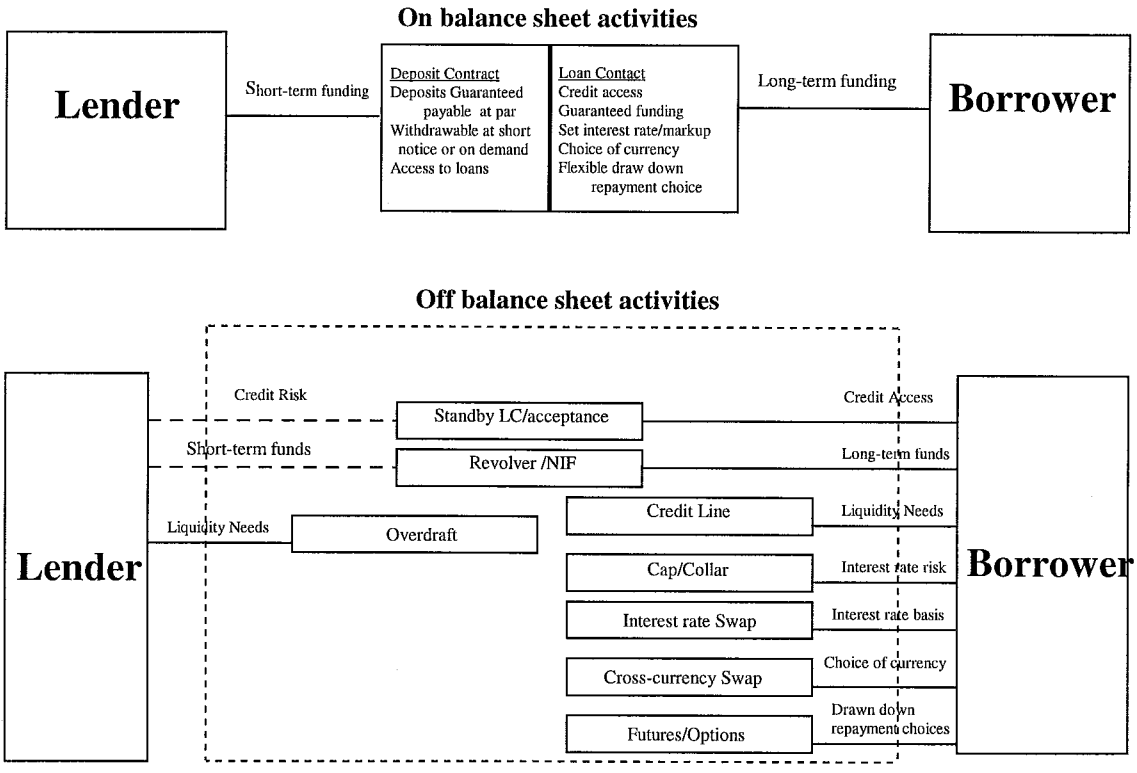


Figure 5.1, On and off Balance sheet activities

Source: Artis and Lewis (1991, page 251)

The main hypotheses about the proliferation of OBS finance are the regulatory tax, moral hazard and bank failure hypotheses. The first approach highlights the regulatory burden. The second one advocates the role of regulatory agents as guarantor of consumers' wealth. The final one underlines the confidence of customers in the bank acceptance letter instead of direct claims (Artis and Lewis 1991).

From the 1980s a considerable expansion of other OBS activities took place, related to derivative products such as futures, options and interest rate swaps. Securitization is at the core of off balance sheet activity. It is possible to relate the already mentioned expansion with asset backed securities.[11]

Additionally, disintermediation was accelerated by the fact that actual capital adequacy ratios were reduced after the 1982 crisis and banks tried to relax this pressure by either altering their balance sheets via securitization (either entering the underwriting process or debt placing business) and other non-capital based activities (very often off balance sheet). They adopted a clear cut orientation towards investment banking, making it extremely difficult to discern where a traditional bank ended and a new financial conglomerate began. Hence securitization is related with OBS activities that were increased considerably especially in the 1980s, due, not only to the pressure to *minimize capital requirements*, but also because of the emergence and consequences of syndicated lending. We turn now to discuss the structure of the securitization process.

5.1.4 Structure of Securitization

We are now going to describe the process of securitization and discuss the type of financial assets that a financial institution could securitize. In a few words the process normally consists of removing the assets from the balance sheet of the financial institution (called the originator), transferring them into a new legal entity and creating and issuing

securities such that their yield depends exclusively on the return of these initial assets, in other words securities that are backed by the underlying assets.

During that process financial institutions face two types of cost: the one-off fixed cost associated with the establishment of the appropriate systems that identify, group and monitor the assets, and expenses related to any individual issue such as legal, rating, underwriting and credit enhancement fees.

Structured financing is a complex process taking into account the legal accounting and tax limitations of both parties, and also additional features such as separating the originator from the new securities, enhancement of credit risk control and reduction of cost.[12]

The assets securitized must have predetermined cash flows, a low default ratio, well diversified risk, total amortization of principal in maturity and highly valued and liquid collateral. We can distinguish four main types of ABS. The first is Asset Backed Certificates like pass-through, the second is Asset Backed Obligations like Collateralized Mortgage Obligations, the third is Asset Backed Stock such as trade and consumer receivables and finally Asset Backed Commercial paper from financial assets (see latter Norton and Spellman 1991).

In the next sub section we shall discuss an additional process or organizational innovation that was essential for the securitization process.

5.1.4.1 Special Purpose Vehicle (SPV)

Financial institutions were forced to further innovate in order to facilitate the emergence of securitized assets. The purpose of the Special Purpose Vehicle (SPV) is to protect investors from any possible bankruptcy of the originators. The establishment of a SPV- a legal entity completely independent from the originator - could be under the form of a corporation, trust

or partnership (Rosenthal and Ocampo, 1988). It is bound not to undertake ***any*** other activity that could undermine its solvency.[13] The administrative structure and systems of both the SPV and the servicer, as well as the allocation of its assets, are also subject to restrictions in order to avoid excessive exposure.[14] The legal form of the SPV is very important due to taxation reasons in relation to the type of securities that it is going to be able to issue.[15]

The originator sells[16] the assets to the SPV and the latter is responsible for the issuing of Asset Backed Securities (ABS) in the form of public underwritten offerings or private placements. As we have already highlighted, the separation between the originator and the SPV is crucial in the case of the bankruptcy of the former.[17]

The SPV is also subject to rating. This rating is closely related to the type and allocation of assets that the institution acquires. The rating agency takes into account a worst-case scenario based on historical data and the credit strength of the source of receivables in question.[18] It is essential for these assets to be well diversified in order to reduce default risk and for the nature of their payment and cash-flows to be predictable. The rating agency is engaged in monitoring during the whole life of the security and it is possible to downgrade it. [19] It pays particular attention to the experience of the issuer and the expected life of the security because it has been observed that during the first period of the security losses are higher and very significant for the investors' returns.[20]

The structure of the SPV could be altered due to taxation reasons. A remarkable tax-and-reporting-induced regulatory dialectic has taken place in 1984 in the US, when the initial structure of ABS had to be transformed, in order to avoid reporting complications.[21]

The Special Purpose Vehicle (SPV) could be perceived as either an *organizational* or *process-responsive* innovation of no radical nature. Its purpose was to facilitate and *support* the emergence of securitized assets and its cause mostly based on the regulation

governing bankruptcy. A further *process innovation* was required by the development of ABS credit enhancement, which we consider next.

5.1.4.2 Credit Enhancement

During and after the transfer of the underlying assets, these assets have to receive a credit enhancement. The purpose of this enhancement is to provide some form of guarantee, and thus increased confidence, to the potential buyers of the ABS. There are many different types of credit enhancement.

- A high graded financial institution - usually an investment bank - could provide a Letter of Credit[22]. It is an irrevocable credit line that guarantees a loan in case the receivables are not enough to meet the obligations to the investors.
- A Spread account is created in case the yields of the assets are higher than the return of the securities, and a surplus is accumulated. This covers any future problem of increased default on the securitized assets or any unanticipated significant repayment.
- The creation of Reserve funds could be the result of any beneficial mismatch of yields for the SPV, explained already above, or any repayment taking place in the first periods of the ABS' expected life. This fund or spread account could initially receive a loan from the originator until the time that the difference between returns received and paid reaches a predetermined level.
- Over-collateralization is another type and it could take two forms, either the division of the security into two classes[23], or the pooling of a significantly larger amount of financial assets than the amount of issued securities.
- Another way is by creating a Cash Collateral account in the form of an initial injection of cash from the originator institution to the SPV. The purpose of this account is the same as for the reserve and spread account.

- An additional type of credit enhancement is by structuring a senior/subordinated form. This structure divides the security into two parts, as in over-collateralisation, or two classes. It is possible to sell these different tranches to different investors with different risk profiles. Sometimes the issuer could hold the riskier ones and subordinate his own tranche in case interest or principal payments cannot be forwarded to the holders of the securities.
- An insurance contract that could underwrite either the principal or the interest payments or both. The credit rating of the guarantor institution is crucial for the final rating of the securities.
- Finally a third party guarantee, coming from a semi-governmental institution such as the FHLMC or GNMA in the US could provide adequate security to potential investors and enable the security to receive a high rating.

In other words, financial institutions have found different ways, or to be more accurate processes, depending on their particular characteristics in order to facilitate and *support* the innovative process. These *variations* could be classified as *routine* or *incremental innovations* that were shaped by *creativity* and *strategic considerations* of the institutions. Both SPV and credit enhancement were created due to a ***mixture*** of *legal* considerations and the *preferences/requirements* of financial institutions in order to *transfer the risk.* It is possible to classify them as incremental, responsive *new organizational structures* or processes that facilitate the emergence of asset backed securities. In the following section, we shall discuss the emergence of this phenomenon in the US.

5.2 Asset Backed Products

In this section we discuss in more detail four types of assets backed products in the US. The first category is the Asset Backed Certificate, which is like a pass-through; the second is Asset Backed Obligations like Collateralized Mortgage Obligations (CMOs); the third category consists of Asset Backed Stock such as trade and consumer receivables; and finally Asset Backed Commercial paper from financial assets. These four types could be allocated into two main groups: pass-through and pay-through securities. We are going to discuss first the development of pass-through ABS in the US.

5.2.1 The history of Pass-Through

In order to understand the emergence of the first ABS, we have to refer to aspects of US banking history. During the 1970s, there was a significant growth in mortgages [24] with the active involvement of Savings and Loans institutions (S&L's).[25] Hence financial institutions had to find new ways to finance this significant increase taking into account the considerably high interest rates of the period.

These institutions experienced a significant mismatch of maturities since they received fixed income (mortgages-loan payments) when interest rates were galloping on US during the period. Profits were squeezed and the interest rate spread was at times negative during the 1970s. Hence using the backing of a government agency, they launched a new financial product called pass-through security.

A pass-through security is a certificate that represents ownership in a pool of mortgages which are homogeneous in term of interest rate, quality and terms. The monthly interest payments, amortization and prepayments of principal are passed 'through' to the owners of the certificates by the firms servicing the mortgage payments. The latter withholds a portion of the interest received as fees for his service and the guarantee that he

is providing for these payments. During that time the investor owns the mortgages. The most common pass-through certificates are those issued by Government National Mortgage Association or GNMA (Ginnie Maes) in 1970. A Pass-Through Bond is a mortgage-backed debt obligation that yields an income to the holder through periodical payments based on the interest, amortization and prepayments on the principal.

Two *variations* or *routine innovations* of pass-through securities were the 'senior/subordinated' and 'strips'. The first divides a security into two parts: a certificate that confers undivided interest to the holder and a second part - subordinated - withheld by the seller acting as credit support in a way similar to over-collateralization. The seller divides the security into many classes depending on the investors' profile, where some classes were receiving the principal, others the interest plus principal, and the rest the remainder of the interest (Hull 1989).

A significant problem arising from pass-through securities is the prepayment rate which cannot be known in advance. Depending on the market interest rate for mortgages, initial borrowers could decide to prepay a part of their outstanding mortgage. This complication could distort significantly the maturity of the pass-through security as well as its value.[26]

It is not possible to discuss the history of pass-through securities without discussing even briefly the importance of the secondary market for their emergence and proliferation. The mismatch of maturities could be overcome by reducing the holding period of these assets, hence reducing the potential risk of change in interest rates. Profits could be generated from the substantial economies of scale and the substantial fees for servicing a large portfolio. Initially the first move was to sell the whole loans or participations to the Federal National Mortgage Association (FNMA)[27] or to private investors. Alternatively

they could originate mortgage pass-through securities or bonds, both of them guaranteed by the GNMA.

The emergence of pass-through securities was conditioned and facilitated by *government-backed* institutions. Ginnie Maes were created due to a ***combination*** of *regulatory, institutional preferences* and *liquidity-enhancement* reasons. They were *responsive, radical,* new financial instruments that *enhanced risk management* and contributed to *the filling of the risk-return spectrum.* In the following section we shall discuss publicly-issued ABS and the role of FHLMC.

5.2.2 The role of the Federal Home Loan Mortgage Corporation and other pass-through securities

The role of the Federal Home Loan Mortgage Corporation (FHLMC)[28] was catalytic in the emergence and proliferation of the securitization phenomenon in the US. The FHLMC buys mortgages in quantities, puts them together in more or less homogeneous packages and sells them to investors.[29] Hence it is the first non-private originator of securities.

From its creation, the FHLMC helped the more efficient functioning of the secondary market by using standardized mortgage documents. They purchased mortgages or participating interests. They developed two mortgage securities in 1971, the Mortgage Participation Certificate (PCs) and Guaranteed Mortgage Certificates (GMCs). The PCs provide monthly interest at a certificate rate together with the pro-rata share of principal received by the FHLMC.[30]

A comparison between PCs and Ginnie Maes enables us to state that PCs present interests in more homogeneous mortgages, less frequent sale, higher minimum and group denomination and non-timely payment of principal compared to Ginnie Maes. But they offer significant safety, marketability and reasonable flexibility for their potential buyers. It

is possible to perceive them as routine innovations that enabled the diversification of potential customers in accordance with the strategic objectives of the institutions. The potential buyers for these products initially were predominantly thrift institutions (accounting for over 95% until 1977), later bank trusts and insurance companies became the major buyers.[31]

The PCs and CMCs were *incremental, on-balance-sheet responsive* new *financial instruments* that *transferred risk.* Their causes related to *institutional requirements* and *preferences* related to *liquidity enhancement* and *backing by government.* The attributes of these instruments were further to *fill the risk spectrum.* Their particular characteristic was that the issuer was not a private institution but a public one (FHLMC), even if banks were heavily involved in the process. During the next sub section we shall discuss the second category of ABS, the pay-through.

5.2.3 Pay-through securities

The next step in the securitization process was the creation of pay-through securities. The first pay-through security was developed in 1983 by FHLMC and marketed by First Boston Corporation. The main reason for this innovation was, as already mentioned, the cyclical nature of payment of pass-through securities, particularly the fact that when interest rates were falling, such as in 1986, many borrowers decided to refinance their mortgages.[32]

Collateralized Mortgage Obligations (CMO) are typical pay-through securities where the issuer borrows money against the security of the mortgage and pays a cash flow to the investor. They are backed either by a government agent (Ginnie Mae), or by a government-sponsored agent (Fannie Mae[33]). In distinction from pass-through securities, the owner of the asset is not the owner of the mortgages and the issuer can change the timing of payments; hence the repayment problem is not completely eliminated.[34] The

timing of payments could further enhance the liquidity of the financial institution. Due to this diversification we could think of them like corporate bonds.

Using the available technology, a typical structure of CMOs is to divide them into different tranches depending on the investor's profile. The first tranche is described as the 'fast pay' where investors receive all principal repayments from the pool of mortgages, the second tranche receives its repayment slower and the last one is like a zero-coupon bond where no payment takes place until all other holders are paid. The later tranches received two main boosts: initially in the mid 1980s, for a couple of years, in the US due to loophole of corporations tax regime, and later, at the end of 1980s, from Japanese investors for whom the CMO last tranche return was not considered as capital gain for tax purposes.[35] As is obvious, in both cases, the innovation was *shaped* by *taxation reasons* or *regulatory (tax) imperfections.*

The CMOs are available in units of $,1000, significantly lower than the GNMA units of $25,000. A CMO is usually rated as triple 'A' due to the credit status of the collateral involved. They are usually over-collateralised and backed by FNMA, GNMA or FHLMC. A subsidiary or special purpose vehicle (SPV) undertakes the issue process and its collateral is held by another financial institution. As we have mentioned above there is still considerable risk regarding the pace of repayments and their effect on the maturity of the tranches (Forbes 1984). In case an investor wants to overcome this problem and have a guaranteed maturity, it is possible to buy new incremental instruments called Planned Amortization Class of bonds (PAC) with a priority prepayment schedule.

The CMOs increased tenfold in the US from just $5 billion in 1983 to almost $50 billion in the beginning of 1987, and reached the half trillion dollar level in 1992. An additional point is that from 1981 until 1987 the percentage of securitized new mortgages began from 26.8% and picked up to 92.5% in 1986.[36] Apart from the cases already

mentioned above, CMOs[37] experienced significant popularity after 1984 when tax regulation made them subject to specific beneficial taxation treatment for a particular type of issuer of ABS[38]. Needless to say, technological development in the mortgage markets in the 1990s, which made them more accessible, supported the innovative process behind ABS.[39]

Another financial innovation based on the CMO structure was the CMO equity first issued in 1986 by the Californian Public Employees Retirement System. The equity component consisted of the extra cash from the servicing - coupon payments - of the underlying CMO which was the result of over-collateralisation. Its main advantage is the counter-cyclical nature of payments; as interest rates are rising, the spread between coupon and yield is widening, less repayments are taking place and the lengthier the duration of the CMO, consequently the higher the value of the equity. In September 1986, the Floating Rate Collateralised Mortgage Obligations (FRCMO) first appeared.[40] These created significant problems for the floating rate note market because the floating tranche was offering more attractive coupons and investors switched from perpetual floating rate notes. The particularity of this product was the interest rate cap[41] that was included in the security.

Regulation and particularly *taxation* could influence the attractiveness of ABS. It is also certain that *available public* and *in-house technology* enabled the emergence of these complicated securitized assets. Pay-through securities have some disadvantages compared with pass-through. The main problem is the target clientele, i.e. tax and regulatory issues distinguish them. The former ones are classified as real estate investment and consequently are *attractive* to REIT (Real Estate Investment Trust) and thrift institutions. The latter is treated as a debt and it has a reduced market depending on the investor's profile. Therefore the more uniform and predictable is the income stream, and if it is backed by high quality collateral the more easy it is to securitize a pool of assets.

In terms of our model (2.1), *liquidity enhancement* and the existence of *government backing* caused the emergence of CMOs. It is worth observing that they are also an example of ***dual causality*** innovation. They were *incremental, on balance sheet, responsive* to the *limitations* of pass-through securities that *transferred risk. Technology* enabled their emergence. They *filled* the *spectrum* of financial assets in the markets and enhanced further the *risk management* of financial institutions. *Taxation* also considerably shaped these securities since they took advantage of *regulatory (tax) imperfections.* In the following sub section we shall discuss further incremental innovations that were not backed by government.

5.2.4 Other types of asset backed securities

The main characteristic of these underlying assets is that they are not guaranteed by the Federal authorities i.e. the government-related credit-enhancement programs such as the GNMA, the FNMA or the FHLMC. Hence alternative arrangements have to be made in order to compensate. The issues either have to create a new SPV or a trust.[42]

In 1985 the first lease-backed notes were issued to a value of $192 million[43], the backing assets were computer leases and the pace of their expansion was not very impressive- reaching the next four years the amount of $36 billion (Hull 1989). In the same year automobile loans called CARS (for Certificates of Automobile Receivables) or FASTBACs (for First Automotive Short Term Bonds)[44] and were issued to a value of $900 million and in a year's time the amount grew tenfold to $10 billion.[45] Automobile loans have a maturity of two to six years and stable prepayment patterns. Part of the interest payment is withheld by the servicer and the remainder plus the entire principal prepayment are passed through to the investor.[46] The majority of lease receivables have stable payment

cash flows and several years of maturity, easily identifiable and assessed collaterals and lessees that are often highly graded.[47]

In 1985 commercial mortgages appeared on the ABS scene. One of the first cases was the Olympia & York Maiden Lane Company for $200. Initially they were either privately placed - suitable for short term securities, or targeted the Euromarkets. Other non-conforming mortgages or jumbo mortgages appeared also in 1985 and mainly in 1986 through pass-through certificates[48] paying a monthly payment of principal and interest. In 1987 the first publicly-offered commercial mortgages began to be regrouped, offering asset backed securities. A major further development was the credit rate granting of commercial property; hence it was possible for a commercial property to be viewed as a rated security by itself.

Then in 1986 CARDS™ (Certificates for Amortizing Revolving Debts) were privately[49] and publicly[50] placed. Credit cards or trade receivables present a particular problem: short maturities and low and unpredictable balances. In order to overcome this problem the SPV - where banks was not directly liable - should create a revolving structure which enables it to prolong the maturity of the security.[51]

In 1987 Credit Card Backed Notes (CCBN) were issued in public either as a true sale or as a restructuring of an institution's finances,[52] hence keeping them in their balance sheet for regulatory purposes. The creation of this new structure without the existence of a SPV could maintain its rating due to overcollateralization[53], the existence of a spread account or reserve fund or other guarantees. Briefly, the process that creates stable rates is related to the allocation of a portion of the receivables to the investors, commitment to add new accounts in the case of rapid repayments, and a third-party guarantee against any adverse event. Unquestionably, these innovations were *required and facilitated* by the available information technology.

In order to make them more attractive for the Euromarkets, issuers added further features by restructuring the payments flow to semi-annual or annual and provided lump-sum principal payment at maturity. And in order to reduce the risk of prepayment or default, issuers of Credit cards and auto-loans receivables-backed securities created a master trust.[54] This master trust included a large number of assets and enabled them to create many different securities based on the cash flow of these assets, hence the above mentioned risks were reduced due to the large number of assets and securities issued. Both of them could be perceived as *routine innovations* that made the innovation more attractive to potential customers.

At the end of the 1980s the main providers of ABS were mainly commercial banks (33.8%), then dealers or investment companies (21.1%); thrift institutions only accounted for 10.7%. Apart from financial institutions, manufacturers' subsidiaries issued 30% of all ABS. Asset backed securities from 1986 until 1991 increased fivefold.[55] In tables [T-5.1] and [T-5.2] we can observe the geometrical increase of ABS in the US. We have to pay particular attention to the increase of consumer credit, tripling in five years (1989-1995) and particularly revolving credit which sky-rocketed in the 1990s. Another type of asset whose securitization significantly increased was automobile loans, which increased fourfold during the 1990s. But unquestionably the main share of the ABS market still, during the 1990s, was mortgage-based securities. As we have already discussed, more than 80% of outstanding mortgages are securitzed; and in accordance with table [T-5.3], in 1994 residential mortgages were more than $3 trillion and, adding commercial mortgages, exceeded $4 trillion.[56] These developments were also the direct result of considerably *increased economic wealth* and an exponential rise in the underlying assets, observable in the data in tables [T-5.1] and [T-5.2] on ABS, and [T-5.3] on mortgages.

Unquestionably the standardization of underlying assets or predictability of cash flows was extremely important for the process. In the 1990s, they begun to cover completely new areas such as recreational vehicle loans, boat loans, lease receivables and college student loans (*The World of Banking* 1992). It is essential to remind ourselves that without the *available information processing technology* these special cases, in relation to their characteristics, could not have been used as underlying securities for ABS (Hall 1989).

But we must bear in mind that, as we have already mentioned non-financial corporations also entered the ABS market and issued long term bonds which by 1988 amounted to $38 billion. Commercial paper issues reached $21 billion in 1988 backed by assets that were producing stable and predictable cash flows. The particularity of these securities is that they could include also a variety of assets such as credit card, auto lease, trade, equipment and airlines receivables, i.e. limited only by the imagination and *creativity* of the designer of the product. Hence institutions were able to re-deploy their equity capital at their own discretion.[57]

All these pass-through securities in the US, could be explained by our model (2.1) as *incremental, responsive, financial instruments, on balance sheet* innovations *that transfer risk.* They emerged due to the need of financial institutions to *enhance their liquidity* in accordance with their *preferences* and with *economic growth.* They were based on *existing routines*, highly sophisticated Information *Technology* systems and sometimes *strategic considerations,* such as customer targeting, encouraged *routine innovations.* They offered an *enhanced risk management* and *filled further the spectrum* of *financial instruments.* In the next section, we shall discuss the securitization in the United Kingdom, in order to consider whether it showed the same pattern as the US.

5.3 The UK experience

The history of British-originated ABS was different from the US. Despite the fact that in the United Kingdom interest rates also fluctuated during the 1970s and 1980s we did not observe the same innovative activity. Despite that, the UK is the second largest issuer of Asset Backed Securities in the world. The vast majority of issues initially were originated by the Centralized Mortgage Lenders (CML).[58] But later after 1992 banks came to be involved very actively in the issue of ABS.[59] We are going to discuss the main reasons why the British innovative effort was much inferior to the US one.

One of the first examples in the UK is the £50 million Mortgage Intermediary Note Issue (MINI) issued in January 1985 by Bank of America. Later the National Home Loan Corporation issued floating rate notes (FRN) called HOMES to the Euromarket. The main difference between these two issues is that the second one was rated as AAA, because the pool of both mortgage and interest rates was guaranteed. Then the Property Investment Certificate (PInC) was used as a security backed by commercial buildings and entitling its owner to receive an income from the rent or sale of the underlying building.[60] In 1990 Commerzbank issued securities to the value of 50 million pounds for show-homes.[61] In 1991 the mortgage-backed securities market in the UK reached the amount of $21 billion.

In 1991 the National Home Loans issued the first security backed by second mortgages.[62] But the pace of change and innovation in the UK was extremely slow.[63] The importance of mortgages for the British homeowner is very different from their US equivalents.[64] The National Home Loans Corporation tried to standardize mortgage documents but there was still a significant difference from the US, notably the *lack of governmental backing* through an official economic agent like FHLMC or GNMA. Hence they were forced to find alternative - market oriented - methods to back their issues, usually

through enhanced structures[65] and adequate rating - in most cases triple A - from established specialized firms like Standard & Poor or Moody.

During the 1980s mortgages increased geometrically (see table [T-5.4] on residential mortgages) and net lending increased during the same period fivefold. But ABS peaked in 1988 at significantly lower levels than their US equivalents. In 1988, less than 10% of new issued mortgages were securitized.[66] The issuance of asset backed securities experienced a significant slowdown during the recession in the early 1990s, particularly during the years 1992 and 1993. Their total amount had fluctuated considerably in 1988, 1991 and 1994 reaching approximately the same amount (see table [T-5.5], on British MBS and ABS issues). Residential mortgages during that period accounted for 100% of ABS until 1990, falling to 76% in 1994 (OECD, 1995). The most interesting aspect is the originators of these ABS. As illustrated in table [T-5.6], the initial issuers were the Centralized Mortgage Lenders and later leasing companies, but banks after 1992 took over as the most important issuers (75% of all issues). This reflected growth in mortgage lending by banks, from zero in 1986.

An additional reason that reduced the innovative effort of British financial institutions was that, until the end of the 1980s, British banks or building societies did *not encounter* the same *acute problems* as the US banks and S&L institutions. It was also argued that UK financial institutions were also better capitalized.[67] Both banks and building societies were well capitalized and they had access to low cost funding[68]. Before the 1986 Building Societies Act, building societies faced severe restrictions on their activities and on the allocation of their asset portfolio. But since 1986 their restrictions were significantly reduced and they were permitted to diversify their portfolio, including transferable mortgages, and undertake transactions involving ABS. But, as we could observe from table [T-5.6] on originators of ABS in the UK, individual building societies

did not participate in the securitization process due to the *lack* of appropriate information *technology* facilities.

We also have to take into account the fact that the UK *legal framework*, especially for non-mortgage assets, is extremely tight and creates additional problems for the emergence and proliferation of banks' ABS. The British Accounting Standards Board was extremely preoccupied with any type of connection - direct or indirect - or subsidiarity between the SPV and the originator.[69] In the US, the generally accepted accounting standards (GAAP) are much more clear, especially in terms of what is and what is not a sale.[70] In October 1991, the British accounting body pronounced that, originators should include them in their balance sheet.[71]

Additionally at the end of 1980s, due to the recession, home-owners were falling behind in their payments. *Property values* were *falling* and interest rates were moving upwards. On the other hand credit rating agencies withdrew their triple 'A' rating from several issues. Given the desirability for potential buyers of high rating this created some negative impressions in the ABS market. The reason for this externality could be located in the downward rating of financial institutions involved in the insurance of mortgaged-baked securities. It is worth mentioning the story behind the downward rating of one these insurance companies. A highly leveraged bid for BAT industries in 1988/1989 created some negative impressions about the credit status of its insurance subsidiary Eagle Star and, since the latter was involved in the insurance process of ABS, they faced a downward rating.

It is clear that the whole process is extremely sensitive to any factor that could potentially cause any, even remote, problem to the holder of the ABS. The rating companies were extremely cautious about the UK building societies during the period 1970-1987, when they experienced an average loss on their loans of less than 0.01% of

their outstanding mortgages. Credit rating companies like Standard and Poor issued in their evaluation a default rate of 20-25 percent (Norton and Spellman, 1991).

Finally, it was observed that the *yield margin* between ASB and T-bills in the United Kingdom was significantly lower than the margin in the US (Hull 1989). This reduced premium could be a considerable barrier for potential customers. As a monetary phenomenon it is not always possible to identify the causal direction. In other words it is not feasible to discern whether the slow pace of securitization caused these reduced yield margins, or these reduced yield margins were the result of lack of competition or 'depth' in the securitization process.

The innovation activity in the UK was thus less impressive than in the US for many and diverse reasons such as different *legal* approaches, lack of particular balance sheet problems and lack of *government-backing* institutions. In terms of our model (2.1) was caused due *to institutional preferences*, *competition* and *disintermediation* reasons apart from the already-cited reason of *liquidity enhancement.* The British-originated securitized assets could be perceived as *incremental financial instruments*, *responsive* and *on balance* sheet that *transfer risk.* They *filled the spectrum* and enabled *better risk management.* This discussion illustrates that the **same innovations** may arise from **different causes** within different financial systems as we saw also in chapter on derivatives.

In the following section, we shall recapitulate the discussion of the risk involved and elaborate more on the benefits and potential problems of securitization.

5.4 Securitization and banks

During this section, we shall present briefly the types of risk that could be addressed by securitization. Then we shall refer in more detail to the benefits and advantages - some of them unanticipated - of the proliferation of securitzation for the innovating institution and

associate them with the particular stages of our analytical framework and model of financial innovation. In the following section, we shall elaborate more on the potential problems, and consider them in terms of scope for further innovative effort. Finally, we shall conclude by presenting a more holistic view of the phenomenon.

5.4.1 Types of risk that banks face

At this stage we have to recapitulate and present a more detailed view of the types of risk that a contemporary bank faces in relation with the underlying assets. Since there is a plethora of assets to be securitized, we are going to discuss them within a more general approach, and establish how they are related to the securitization process and how securitization could help a bank to reduce them and enable a better risk management. We are going to discuss the credit, interest rate, and repayment risks, and the principal-agent problem.

Credit risk is the most important risk and it is inherent to most financial products. It is associated with default risk. It could be related to the amount of exposure to the particular client, industrial sector or even country. It could be systematic or specific. Securitization could not eliminate the credit risk and is affected by this type of risk, since any default of an underlying asset like a mortgage entails both a loss of principal and interest payments. In order to reduce this problem financial institutions have created special structures of SPV that are insured by insurance policies or two tier (senior/junior) issues.[72] An additional point is that securitization could allow a *reduction* of overall credit risk through diversification. Consequently a bank could expand its activities to other areas, through this diversification reduce its overall exposure and finally reduce the credit risk.

Interest rate risk embraces a wide range of possible combinations. We can divide them into two main groups: mismatch of received and owned payments or missed

opportunities of favorable market conditions. In the first case we receive lower rates and we pay higher. It could be the result of combinations of different types of interest rate, i.e. floating and fixed. Securitization could alter the type of income that the bank receives or balance the risk due to an excessive exposure to a particular type of return. Needless to say, if we use the securitization process in order to reinforce the type of interest payment that an institution receives or pays, the potential exposure to the market's adverse movement is significantly *improved.* In relation to missed opportunities, the securitization could enable us to exploit market conditions by altering, through securitization, the allocation of our portfolio and issue securities in a different interest rate structure than the existing one.

Prepayment risk is able to reduce considerably the duration of an ABS. Whether it concerns credit card receivables or mortgages, the repayment or refinance could entail significant alteration of the expected life and yields of the security. Securitization could aggravate this problem if the overall exposure of the portfolio of the bank does not include assets and liabilities that could compensate any significant change in the prevailing market conditions. In order to reduce this problem banks should create revolving structures or build up reserve funds and spread accounts. The prepayment risk is also related with the reinvestment[73] risk that a bank faces. The *Discretionary* use of funds could be perceived as a positive point for banks and a negative one for its note, bond and share holders. A bank could reduce this gap between its own management perception of best use of their funds and the perception of the other above mentioned groups. It is related to the *principal-agent* problem, or mismatch of expectations. By securitizing and diversifying the portfolio a bank could reduce this discrepancy. We have to add at this point that by securitizing and expanding the same type of activities this problem is accentuated.

It is obvious that, except for the *filling-the-spectrum* attribute of asset backed securities, the *risk management* feature related mostly to credit and interest rate risk is

enhanced; but still other types of risk may persist. Since it is not crystal clear whether securitization is able to reduce or increase the risk exposure of a bank and even create new types of risk exposure, it will be useful if we categorize the potential benefits and problems emanating from securitization. In the following sub section, we are going to discuss further the benefits emanating from securitzation in order to associate them with the different stage of our model and provide further examples of the *dynamic* nature of the financial innovation model.

5.4.2 Benefits of securitization.

It is possible to distinguish many advantages[74] related to the use of the securitization process for the financial institution involved. These advantages are created during the proliferation of the ABS and could also be reasons for further *unanticipated* improvements. It is not by any means a strict classification since the distinctions between some causes and successful features are not always clear or objective, but the classification is not as important as the emergence of these unanticipated benefits (see model of financial innovation in 2.5.1).

The following benefits are associated with the initial causes of innovation such as ***liquidity enhancement***, ***cost structure*** and ***competitive pressure***.

- The transfer of these assets also provides more *liquidity* to the involved bank. Except for the already-mentioned reduction of capital required to back its assets it enables lending without additional deposits to back them.
- A further benefit of securitization is a considerable *cost reduction* for the financial institution hence the capital required is significantly lower than for traditional lending activities. Taking the example of Sperry Corporation, the cost of these ABS was 14.26% where the corresponding cost in the case of debt issue was estimated at 17.33%

(Rosenthal and Ocampo 1988). These significant reductions could be beneficial for the potential buyer since the corresponding price is going to be lower too. The 1988 Basle Committee on Bank Regulations and Supervisory Practices 'offered' an additional incentive to banks to securitize by setting the capital requirements on different types of assets.[75]

- A further point is the possibility of *reduced fixed costs* for the institutions that are going to participate in this process to a significant degree. As we have already explained, the one-off costs of creating a system able to facilitate and monitor securitization could be used more than once. The impact on the cost of future issues could be material and, if you add the above mentioned acquired and enhanced know-how, the consequences are not negligible at all. In other words, it is possible to have economies of scale and scope.
- It enables the financial institution also *to manage and match* its assets and liabilities much better and deal with any kind of mismatch of exposure (maturity or interest rate), especially in order to reduce the exposure of the institution to any particular sector or type of financial claim. It also provides considerable opportunities for restructuring the institution's finance. A typical case already mentioned its RepublicBank Delaware, where they managed to substitute their CDs by these ABS and reduce their financing cost by 56 basis points (Rosenthal and Ocampo, 1988). Financial institutions are also in a position to control their interest rate exposure better if they sell their loans after their origination.
- Before and especially after the implementation of the Basle capital requirements in 1993, the capital requirements for securitized assets were significantly *lower than* the ratios applied on traditional lending activities (commercial, car and credit loans). Especially in the case of trade receivables the difference could be substantial. The consequence was to 'free' capital for further banking activities.

- It is possible for an institution to exploit its *comparative advantages* better. Traditional lending activity was a vertically integrated process. Securitization enabled more institutions to participate in this process. Each step of this process requires a particular expertise and skills since securitization is not a risk-free process.[76]
- It is possible to enjoy significant premium yields as it is considered a new instrument in comparison with the conventional borrowing instruments. A typical manifestation of this phenomenon is the US market for ABS where a permanent differential was observed in yields of between 50 and 100 basis points from traditional T-bills (Hull 1989). The difference, especially for credit card receivables, went significantly above these figures.[77] This fact could enable financial institutions issuing ABS to be *more competitive* than institutions that do not offer ABS.
- It also allows a broader access to capital markets and a considerable fee to the investment banks that provide the credit enhancement, the structure of the ABS and the placement of the securities. A typical example was the First Boston initiative to issue the first AAA, ABS backed by non-mortgages, which generated a considerable fee of almost a million dollars and a significant *competitive advantage* among its competitors, or Salomon Brothers in creating the revolving structure of credit card receivables (CARDS).

The following benefits are associated with particular elements of the financial institution such as ***strategy objectives***.

- A successful originator of loans, as we have already mentioned above, is now free to *expand* its activities significantly more since it is not bound by capital requirements and consequently cost limitations. The originator is now in a better position to increase market share and boost its growth. Especially during recovery and boom periods where the demand for loans and generally for financial claims is increased, financial

institutions could use securitization to unload their balance sheet and respond to the increased new demand. At this point regulators are worried that this could generate an imprudent credit policy on the part of the originators but the originator's risk cover is a considerable dissuasion from this.

- Issuers of asset-backed securities can create *different securities*, based on the same pool of loans, *depending on the risk profile* of the investor. These products could be distinguished into 'slow' and 'fast' paying tranches. It is essential to add that in most cases the initial owner of the assets keeps the servicing and monitoring of these loans. The servicing generates substantial fees and sometimes the spread account's balance. This institution also keeps a significant portion of the risk exposure of these assets.[78]

Finally, we could encounter many features that enable ABS to be successful innovations. These features are related to the ***filling of spectrum***, ***regulative imperfections***, ***intangible assets*** and even ***initiate further*** innovative activity in accordance with the ***dynamic*** nature of our model of financial innovation.

- Based on the filling of spectrum approach these *new financial* instruments enable different types of investors to find instruments that correspond to their investment profile.
- The originator very often also has a reasonable degree of *flexibility* in the case of any change in the market for the underlying asset. It is possible to have a call option in case they want to handle any default case differently from the pool insurers. It is also possible to have an asset-substitution right under certain predetermined conditions.[79] We have to pay particular attention to the possibility that the SPV has recourse to the originator on actual or moral grounds.[80] It is also possible under predefined conditions to refinance the remaining pool of assets in case of prepayments (Twinn 1994). All these cases could reduce significantly the cost faced by the financial institution.

- The pooling of financial assets into homogeneous packages enables the investor and the financial institution to *assess better* the type of *risk* that he faces without having to take into account the overall exposure of the bank's portfolio. It also permits a better actuarial calculation of the exposure from the rating agency or credit enhancers.
- It is possible for an institution to determine its target market and *decide whether* to adopt a debt or equity structure. A secured debt structure is considered as a debt instrument - impossible to remove from the balance sheet - whether the delayed pass-through security is considered as an equity. Sometimes it is better for it to be a debt instrument mainly for taxation reasons (see further Norton and Spellman 1991).
- The Special Purpose Vehicle (SPV) which is set up by the bank is much *safer* and cannot be restructured by management. This parameter enables the bank to receive a high rating, enhances the confidence of investors in the ABS and the bank receives the benefits of offering higher than its own grade-rated securities.
- Another important complication for banks is the *significant improvement* in their financial ratios.[81] Two ratios especially could be considerably improved: the Return on Capital Employed (ROE) and the Return on Assets. These two ratios could be improved by increasing their returns due to servicing fee income and even more by reducing the denominator of the second ratio, i.e. assets.[82] These points are extremely important if we take into account that investors' perceptions of US banks at the end of the 1980s were very unfavourable (Hull 1989).
- An efficient servicer should maintain adequate record-keeping and reporting procedures, and especially be able to enforce the terms of the obligations. At the same time it is a significant *intangible asset* that enables the building up of expertise and simultaneously has the maintenance of a close relationship with many borrowers and potential customers on products and services.

The ***dynamic*** approach is also highlighted by the initially-contradictory point that, as rating companies become more familiar with the risk involved, privately placed securities are backed by a wider range of assets. It is possible to observe the typical Product Life Cycle phenomenon whereby the initial innovative product exhibits specific characteristics, then it becomes standardized, and at the end it is tailored to the particular needs of the buyer. In other words the proliferation of securitization is enabling banks to be innovative, and credit enhancers and credit rating firms to assess better the risks involved.

It is possible that benefits from the proliferation of securitization could encompass areas that initially were not targeted, and confer advantages in areas such as *cost structure*, *competitive advantage* and *strategic choice* available to the institution. But at the same time additional disadvantages could occur and we shall discuss them in the following sub-section.

5.4.3 Problems emerging from securitization

The process of securitization could create some additional problems for a bank, or even aggravate existing ones. These problems could occur at all stages of the model of the financial innovation, and could act as reasons for further innovation, initiating a financial innovative process. We are going to regroup some of these ***shortcomings*** and present them in a more coherent form; again as in the previous sub-section the classification - in accordance with the type of shortcoming - is not a definite or absolute one.

During the proliferation of the securitization, it is possible to encounter some problems that could be attributed to particular features of the innovations such as duration, type and quality of underlying assets, and expertise.

- A very common problem is the considerable difference between the actual and the stated *maturity* for the majority of ASB, including CMO.

- The *liquidity* of CMOs is seriously questioned since they represent a significantly different pool of mortgages or assets in general. The ABS never reached the liquidity of ordinary corporate bonds because of the extremely diverse prepayments patterns.[83] If the market is thin, as in the UK, it is possible even to face a liquidity risk.
- This tendency could cause significant *'adverse selection'* problems since banks are going to securitize their best-performing loans and leave the most low-rated or poorly-performing loans on their balance sheets.
- The underwriting process is not a traditional ground for banks since they are not *familiar* with this type of activity. Furthermore, banks can be 'forced' to move further into the middle and low end of the corporate market in order to compete with other financial institutions or to compete with the corporations or to provide financial services to corporations.

Other shortcomings could be related to ***technology***, ***strategic objectives*** such as reputation and timing and 'package' of the instruments.

- The *technology* available is a significant problem. In the UK building societies had traditionally less sophisticated IT than banks. It is essential to provide detailed information on payment flows, rates of default and the geographical spread of accounts. The rating agencies required a lot of information about the breakdown of delinquencies, write-offs and payment streams.
- An additional less tangible problem of early amortization is the negative impact on the *reputation* of the institutions involved since investors are going to suffer a prepayment exposure due to early amortization and, possibly, loss of income.
- ABS rating is extremely *sensitive* to any change in their structure or to the participants of their structuring. Any change in the rating of the enhancer, i.e. the institution

providing the Letter of Credit or any other type of insurance, could reduce the initial rating of the security.[84]

- *Timing* is extremely important. Periods with high spreads over Treasury Notes should be avoided because of high impending costs. As was observed in the US, during the fourth quarter spreads tend to widen because many issues take place due to the window-dressing that many banks are doing for the approaching year-end.
- Another problem is a possible *divergence* between appearances and actuality. Credit card receivables could be structured to appear as Eurobonds with guaranteed repayment of principal and specified date. But in the beginning of the 1990s this illusion was shattered; they were not bullet bonds, they are amortizing events that could trigger their repayment.[85]

Finally many complications could emerge in relation with the successful features of securitization, such as the enhancement of the ***risk management*** and ***regulatory imperfections.***

- Related to timing, banks should avoid relying extensively on the securitization process as a 'pipeline' for the expansion of the institution's portfolio: if a bank undertakes a spiral of expanding activities based on the *systematic use* of initial capital commitments in order to back financial claims; then securitizes them and uses the proceeds for further expansion; if the market ceases to find the asset backed securities to be *attractive,* then a serious problem could emerge for the bank.[86]
- The *prepayment risk* became an important issue, initially for mortgage-backed assets, but later much more acutely for the credit card receivables. The latter were extremely sensitive to the default and prepayment rate of the underlying asset. A reduction of the yield below a predetermined level as well as a particular percentage of default[87] could automatically trigger the amortization or the credit enhancer to step in. When this early

prepayment takes place the asset comes back to the balance sheet of the bank due to the nature of the credit card backed securities, like a call option on a bond. Credit rating companies initially perceived the narrow spread as a sign of lower credit enhancement requirements or as lower default risk for the security and granted a better rating. Credit rating companies are very powerful when issuers do not desire a private placement or to keep them in their balance sheet because they are immune from bankruptcy complications as in the case of banks.[88] They also publish rates for issues that have not required their rating.[89]

- It is common that banking systems are significantly interdependent through interbank lending activities. Securitization could create strong *links* among banks, and an increase in *systemic risk* in the case of a massive collapse of the ABS markets could create significant problems on both sides of the balance sheet of banks as asset-holders of securities and a liability-source of funds.
- Any *change in legislation* could initiate significant changes in the attractiveness of the ABS for investors. The Securities and Exchange Commission (SEC) initially had to grant permission to any credit card and general purpose loans in order for it to be possible to sell them in public; later this restriction was relaxed. Regulators forced banks not to remove commercial property mortgages from their balance sheet. Regulatory pressure on insurance companies' exposure on commercial property in the beginning of the 1990s made them perfect candidates for commercial property backed securities. Another typical example was in 1992 when the US Congress announced its intention to cap interest rates on credit card debt. The pace of new issues was dramatically reduced but it is a fact that no ABS has defaulted yet.[90] Another case is US tax regulations which consider most of pass-through as 'grantor trusts' where a true sale and not a refinancing is taking place. Hence they do not apply the tax burden on the

trust; otherwise they would be taxable as a corporation and payments to investors would be treated as dividends subject to income tax (Norton and Spellman 1991).

In other words, the proliferation of securitization could create additional problems in areas of strategic objectives, reputation, technology ***shortcomings,*** risk management and advantageous regulative imperfections. In most cases, these problems could act as causes for a ***dynamic*** response of the financial institutions in the form of further innovative processes. Unfortunately, it is not analogous to the institution's shortcomings in derivatives where a single financial process innovation (VaR) could address some of them. In this case, almost each requires to be addressed separately. In the following sub-section, we shall conclude by briefly explaining why securitization is on balance beneficial for banks profitability.

5.4.4 Why banks should undertake securitization

The 'market school' believes that securitization will reduce the role of banks since the increasing sophistication of the economic agents reduces considerably the possible exploitation of imperfections. The 'banker school' perceives securitization as one more stage in the historical banking process. Since banking history is full of innovations, this view is reassuring in terms of the survival of banks. Probably the latter view is closer to the actual situation (Cowen and Kroszner, 1994).

ABS is a relatively low-cost source of funds and credit rating agencies were willing to offer a triple A rating for issues backed by collateral and particular guarantees to institutions where even their own unsecured debt did not enjoy this rating. The expansion of ABS belongs in the 20% band of risk-weighted capital and many financial institutions could participate in their issues, could deepen the market and considerably improve their

liquidity and consequently their marketability. These could further lead to standardized ABS traded on exchanges where even positive network externalities could occur.

At the end of the 1980s, according to Norton (1991), banks owned almost 50% of all consumer assets. Given the plethora of assets ranging from insurance premiums and gas reserves, passing through recreational vehicle loans and encompassing assets of uneven cash flow like commercial loans and high yield bonds, the potential for securitization is enormous and limited only by the temporary limits to business innovative capacity.

Hence financial institutions in terms of our model (2.1) created these initial *government backed* securities in order to *enhance their liquidity* and remove the *regulatory burden* (capital adequacy requirements) and *reduce their cost*. Securitization was caused *by more than one reason*. The *technological capacity* and *strategic objectives* of the institutions shaped these innovations and *filled the spectrum* of financial assets and *enhanced risk management*. But their proliferation offered further positive aspects, sometimes not anticipated, at the different stages of the development of these innovations. Apart from the positive aspects some disadvantages and problems occurred, many of them in areas of further innovative development. Securitization overall was a successful innovation with much further scope for evolution and development.

5.5 Conclusion

During this chapter, we have discussed the phenomenon of securitization and the cluster of financial innovations that followed the first securitized asset in 1970. The phenomenon of securitization also took a further boost due to two other events: the expansion of syndicate lending and the proliferation of off balance sheet banking activities.

The main causes of emergence were liquidity enhancement, institutional preferences and later economic growth (CAR, CARDS, CCBN) and competition-

disintermidiation (MINI). In order to emerge, securitized assets required two additional innovations: an organizational one (SPV) and a process one (Credit enhancement). The financial system (government backing and regulation) and the state of the financial institutions could affect positively (US) or negatively (UK) the emergence of these innovations. Securitization is thus another cluster of innovations that had more than one cause to emerge.

Their emergence could be influenced by information technology advancements (CMO, CARS, CARDS, MINI) by existing routines (GMC, CCBN, CAR) and strategic objectives such as the target market (CCBN). Some innovations were also characterized by a cumulative aspect (CMO and other ABS). Asset backed securities are radical (GNMA) or incremental (PC, CMO, CARS) most of the time on balance sheet, responsive new financial instruments that transfer the risk and enhance the liquidity.

Their main attribute was the filling the spectrum of financial assets available (GNMA, CMO, CARD) and mainly the enhancement of risk management and potentially cost reduction. They could also target regulatory imperfections (CMO).

Their proliferation could bring additional benefits related to cost structure and enhance the strategic objectives of the institution and emergence of intangible assets. But they could generate some problems on particular aspects of the financial instrument and the risk management of the institution. These shortcomings could act as further incentives for further routine innovations, addressing them since we should not forget that initially securitization (MBA) is itself a response to existing innovations (mortgages).

In this chapter, we have reviewed the emergence and proliferation of securitized assets and presented further evidence about the applicability of our financial model. In the next chapter, we shall discuss the last cluster of financial innovations of our research, plastic cards.

Endnotes of securitization

[1] At the end of the 1980s, two-thirds of residential mortgages were securitized and the outstanding amount of securitized mortgages were estimated at more than $500 billion (Mishkin,1989).
[2] A loan could be defined as a contractual relationship between two parties: the originator and the borrower. The originator provides a certain amount to the borrower and the latter is obliged to pay it back at a prearranged period and paying a predetermined interest rate. A particular type of loan is called a *secured* loan where the financial institution is given a prior claim to a collateral in the event of bankruptcy.
[3] In 1988 banks were required to have around 7 percent in order to back their lending activities, where finance companies were estimated to require around 9 percent (Rosenthal and Ocampo, 1988). In 1997 the figures were around 5 and 7 percent of equity for backing their respective lending activities.
[4] The high leverage that banks created, was a sign of exposure and increased risk. For that reason many potential buyers of banks' long term debt obligations required a *higher* yield premium at the end of the 1980s due to their default risk (Rosenthal and Ocampo, 1988).
[5] Euro-dollars initially appeared in 1950's when Communist countries wanted to invest their dollar surplus outside the US and increased significantly in 1960s when the Federal Reserve imposed restrictions on the lending of US banks, but took off after the OPEC crisis in 1973. A well illustrative example is that in 1965 they were estimated to be $55 billion, $650 billion in 1973 and $2100 billion at 1984 (Lever and Huhne 1985).
[6] In 1981, Walter Winston, head of Citibank, said that bankruptcy is a procedure that was developed in western law to forgive the obligations of a company that owes more than it has. Any country will own more than it owes even if it experiences some cash flow problems in the short term (Lever and Huhne 1985).
[7] The problems experienced by Turkey and Zaire in the late 1970s were considered as insignificant and temporary one and the spread was constantly decreasing, reaching one percent in 1979 for Argentina, Mexico and Poland.
[8]The main function of bankruptcy is to seize the assets of the default party, but there was not any procedure covering this eventuality for default countries. The main reason that makes almost impossible the default risk is in the case that loans are denominated in the same currency as the borrower country, the typical example is the US borrowing US dollars.
[9]The purpose of a cross default clause is to assure simultaneous payment to the different borrowers. If one bank demands repayment then it initiates the immediate repayment of the others. Two thirds of the $87 bullion of debt were originated by 9 large banks, with exposure twice their capital (Congdon 1993).
[10] In 1976 and 1977, Witteveen praised the useful role of banking system of recycling the surpluses of the OPEC countries in a manner that has helped to sustain world trade and economic trade. British Labour (1977) and Conservative (1979) Chancellors on several occasions, as well as the US. Secretary of Treasury (1979) and the Chairman of Federal Reserve (1980) argued in favor of the lending activities of banks to Less Developed Countries (LDC). Non oil producing countries had borrowed $294.7 billion until 1979 when their exposure in 1975 was only $169 billion in 1975 constant prices. A very detailed analysis is included in Lever and Huhne (1985).
[11] In the US, it was estimated that in 1988, 41.3% of home mortgages, 2.4% of consumer installment credit and 2.5% of business credit (commercial loans and leases) were off balance sheet. These figures after only four years, in 1992, were 51%, 15% and 7.5% respectively, a very significant trend and overall percentage (FRBNY 1993). A similar analysis highlighting the expansion of off-balance sheet activities during 1980s is including in Artis and Lewis (1991).
[12] A simplified example about the impact of capital adequacy regulation on the cost of funds is the following : if the ratio is 10% and the expected return an assets is 15% then the spread over the borrowing funds should be 1.5% omitting any further complication arising from bad debts or administration cost.
[13] In the US they often call it a 'bullet-proof' or 'bankruptcy-proof' institution (Norton & Spellman 1991).
[14] Rating institutions are preoccupied about the experience of the servicer as well as the existence of adequate systems and the back-up existence of a suitable organization to take over in case of inability of the servicer to fulfill its task. The most common structure for mortgage backed issues is a mortgage pool and liquid assets such as cash deposits or short term (three months) highly liquid and marketable investments (Norton and Spellman, 1991).

[15]Depending on the type of legal entity, the nature of income streams could be taxable or not. For example at the end of 1980s the Limited Purpose Finance Corporation enjoyed significant tax advantage on the treatment of its profits when it was issuing pass-through securities.

[16]It must be a valid sale hence the assets are going to disappear from the originator's balance sheet. The originator has to notify this in an official letter (opinion letter) and is also responsible for covering a part of any losses - based on historical data. It must clear that it is a sale and not a secured loan or any kind of repurchasing agreement (see Swchartz, in Norton & Spellman, 1991).

[17] There are two types of bankruptcy: voluntary and involuntary. Special legal provisions have been created both in the SPV charters of incorporation and the legal framework covering bankruptcy procedures in order to safeguard as much as possible the holders of securities issued by SPV (see Swchartz Norton & Spellman). If it is not structured by a 'bankruptcy remote' style, at least one independent director is required to be appointed in the SPV (Schwartz, 1994).

[18] When these historical data are not available then it has a negative impact on the rating and costs involved, and may as a result become unattractive (Bank of England 1994).

[19] If the SPV is created only for a particular transaction (sale) it is also called 'one - off'. In order to reduce the transactions cost involved, an originator could use an existing Special Purpose Vehicle and adopt a multiseller securitization conduit. Other costs could occur in order to receive the appropriate rating by the agencies (Schwartz, 1994).

[20] A high default rate from the beginning could undermine payments for the rest of the duration of the security significantly more than in a later stage when reserves could be accumulated or part of the principal payments made.

[21] The ABS was considered as debt and they should remain in the balance sheet. In order to avoid keeping the transferred loans in their balance sheets, the solution was to transfer any excess yield emanating between income from the underlying assets and payment to the servicer and security holder to a particular fund designated to cover credit losses.

[22] As we mentioned above, the originator of the assets is still liable for a part of losses. But if larger losses are incurred, an insurance company or another financial institution provides a Letter of Credit covering a multiple (six to seven times) of the amount of the originator's contribution.

[23] Security is divided into two classes (A/B) and the B class is retained by the seller and used as guarantee for any loss. Another similar form is the purchase by a third party of a subordinated part (tranche) of the security.

[24] Based on Federal Reserve Bulletin 1979, from 298.1 billions Dollars outstanding mortgage debt in 1970, they reached 761.9 billions Dollars in 1978. The amount for Total Residential Mortgage Market Originations increased from $44.4 billion in 1970 to $192.2 billion in 1978 (Brinkerhoff, 1979).

[25] In 1970 the main providers of residential mortgages were S&Ls (37.7%), Mortgage Companies (23.3%) and Commercial Banks (18.3%) where in 1978 the allocation changed and S&Ls provided 50.1%, Commercial Banks 22.7% and Mortgage Companies 15.3% (Brinkerhoff, 1979).

[26] Many researchers tried to propose a model that could take into account the prepayment factor in order to assess the value of a pass-through security. An important question is whether the decision to refinance the mortgage depends on an autonomous probability or this probability depends on different factors such as mortgage age, the outstanding fraction or seasonality. But the discussion is between the default risk and the prepayment. The former affects the insurance and consequently the fees charged for that insurance and the later the maturity. These fees are influenced by current interest rates, prepayments and especially the value of the underlying mortgages. A much more detailed analysis is discussed by Schwartz and Torous (1992).

[27] It was established in 1957 as an institution to buy and sell participation interests in mortgage loans. Its real role is to enhance the liquidity of mortgage-granting institutions and especially the S&Ls.

[28] The Federal Home Loan Mortgage Corporation was chartered by the US Congress and its board of directors consists of members of the Federal Home Loan Bank (FHLB). It acts like a private institution.

[29] The process is the following: lenders call and make an offer to the FHLMC, if their offer is accepted, they have to deliver their loans for underwriting; once it is underwritten funds are passed to the lender. The latter continues to service the loan and submits monthly reports.

[30] They are offered for sale four times per year and have a long duration of 25 to 30 years. The transfer agent is the Federal Reserve Bank of New York and they are not classified as real estate assets

[31] In 1979 S&Ls accounted for 21.4%, Bank Trust 17.3%, Insurance Companies 15.2% and dealers 12.4% (Brinkerhoff, 1979).

[32] The result of any refinance is a substantial loss of income for the securities holders since the early repayment forces them to re-invest their money at a lower rate of return due to lower interest rates (Patterson 1987). The same took place also in 1993, when the massive refinance sky-rocketed the origination to $1 trillion. Mortgage providers accommodated this increase and expanded their business considerably. When

during 1994 the Fed increased their rates seven times, the next year half of the mortgage wholesalers had to exit the business (Dallas 1996).

[33]It stands for Federal National Mortgage Association and it was established in 1938 after the Depression. Its role was to buy and sell mortgages depending on the prevailing economic conditions i.e. when credit was constrained it was buying mortgages and vice versa.

[34]Only a handful of issuers, such as Citicorp and FHLMC, guarantee the timing of the prepayment. (Patterson 1987)

[35] This example is illustrative of tax-caused innovation and explained in detail by Miller (1986).

[36] Residential mortgage originations:

Year	1981	1982	1983	1984	1985	1986
Total $ billion	71	74	152	155	180	332
(%)Securitized	26.8	73	57.9	45.2	68.9	92.5

Source, Rosanthal & Ocampo (1988)

[37] The question of what constitutes a sale is regulated by the Financial Accounting Standards (FAS) No 77 and particularly the treatment of CMOs is defined by FASB Technical Bulletin No 85-2.

[38] The Internal Revenue Service (IRS) proposed the 'Sears Regulations' and revoke the tax exemptions applicable to grantor trust (SPV) which were restructuring cash flows.

[39] For example the automated underwriting by Freddie Mae, the proliferation of mortgage and credit systems or direct sale of mortgages based on the above, increased the amount of mortgage origination (Dallas 1996).

[40] The first FRCMOs issued were $150 million by Shearson Lehman and $120 million by Centex Acceptance Corporation and until the end of the year $6.5 billion were issued.

[41] FRCMO initially included an inverse floater tranche that offered returns negatively related with interest rates in the form of a rate minus Libor. But still, it was not fully protected from upwards movements of interest rates.

[42] The first non-conforming mortgage securities from Citibank where a trust was created with the participation of United States Trust Company of New York.

[43] First Boston underwrote a lease backed note for Sperry Lease Finance Company. Sperry Corporation was financing the purchase of its products and wanted to unload its balance sheet from this burden, eliminate interest rate risk and have access to new capital under better conditions, since its rating was just A/BBB+. The SLFC was rated AAA, due to back-up from the parent company and third party enhancer (UBS) (Rosenthal and Ocampo 1988).

[44] Salomon Brothers for Marine Midland and Valley National first issued CARS and later Drexel Burnham issued FASTBACs.

[45] During the period 1985-1989 auto loan backed securities mounted to $30 billion (Norton & Spellman, 1991).

[46] More or less the same more or less logic could be applied to truck, boat (seasonal pattern on payments) and recreational vehicle loans (longer maturity, five to fifteen years) where third party buy-outs were used (Norton and Spellman 1991).

[47] In Sperry ABS, the Federal government owned 37% and Pennsylvania State 12% of the leases.

[48] Citibank was one of the most prominent players that also bought from brokers significant packages of non conforming mortgages, and only in 1986 issued 22 ABS. A common way to structure these securities was to create a trust in the place of SPV.

[49] The first private issue was by Salomon Brothers on behalf of the Banc One Corporation in March 1986 for $50 million for the particular revolving credit example. It was not required to create a SPV because banks are not subject to the bankruptcy code hence there is not any reason for a SPV. They also created a spread account in order to remove them from the balance sheet. This spread account acted as a credit enhancement and since in the first months its level could not have been sufficient they injected, temporarily, one million dollars. They did not buy any additional enhancement and consequently Standard and Poor did not offer them a rating.

[50] The first to issue these ABS was Bank One in Ohio for $250 million and Salomon Brother trademarked (TM) this name. During the above period, Credit cards backed securities reached $20 billion and the main underwriters were First Boston, Goldman Sachs and Salomon Brothers.

[51] Fitch in 1990 down-grated a Sears receivable-backed deal because, in the case of bankruptcy of Sears, the over-collateralistion could initiate the incorporation of the assets back into the Sears balance sheet (*Euromoney* 1991). The SPV uses principal prepayment to purchase new trade receivables balances and it creates two tranches, one large and fixed, sold to the investor, and a smaller floating one kept by the seller. If they decide to adopt a senior/subordinated structure then it is possible that over-collateralization could create problems since it is not inconceivable for it to be interpreted as a 'pledge'.

[52] In 1986 RepublicBank Delaware was willing to restructure its financing and substitute its floating rate CDs (150 basis point above Treasury Notes) with lower cost securities.

[53] Again since it is a bank, and taking into account the history of insolvency of national banks, the creation of a SPV is not required by the rating agency since, in case of bankruptcy, note holders are not going to suffer any loss. In addition other sources of enhancement were exploited such as reserve account, and Letter of Credit of $10 million from UBS. In the Delaware case, the amount of pooled receivables was 20 percent more than its outstanding notes.

[54] Citibank, the largest issuer of credit card securities, was the first to create these structures (*The Economist* 1992a).

[55] From $10 billion in 1986 to more than $50 billion in 1991 (*The World of Banking*, 1992).

[56] During the same year the figure for all the other assets combined were $180 billion (table [T-5.1]).

[57] The most famous structuring program in the late 1980s was the Corporate Asset Funding (CAF) of Citicorp.

[58] In 1993, CML accounted for 76% of issues where banks accounted for 24% (Bank of England, *Quarterly Bulletin* 1994). The CML reduced its costs considerably by providing mortgages through brokers and direct advertising and not requiring an expensive branch network. The Specialized Mortgage Lenders (SML) were formed in 1986 (OECD, 1995).

[59] In 1992 and 1993, banks accounted for 71% of new issues and CMLs for only 17%.

[60] The most common form was a double document, the first creating a contract that confers to its holder an income from the building and a second a share in the management company that collects and redistributes to the holders of PINCs income emanating from that building. The main reason for this distinction was the tax treatment of property companies in the UK.

[61] Show-homes are the prototype of a particular design-type of houses that are created. Their particularity is that they are the first to be built and the last to be sold. The SPV buys the houses and leases them back to the builders; any change in their value does not affect the holder of the security, but rather the builders that trade them *(Euromoney* 1990).

[62] This is due to the particular popularity of mortgages during the 1980s in the United Kingdom where some homeowners obtained more than one mortgage.

[63] Until the end of 1991 only two British clearing banks and only one building society had issued ABS. The British mortgage-finance companies were the main suppliers of ABS (*The Economist* 1991c).

[64] It is worth mentioning that the Bank of England does not lose track of the mortgages when they are securitized; they just change the originator in their records from banks or building societies to Other Financial Institutions (OFI). During the 1980s residential houses were the most important single financial asset of British economic agents. A plethora of different commercial banks and building societies were providing finance for the acquisition of these assets. British homeowners were extremely reluctant to abandon their traditional financial relation with a familiar financial institution and replace it with an impersonal financial structure.

[65] Over-collateralisation, reserve funds, Letter of Credit, and insurance contracts

[66] We have just to compare tables [T-5.4] on net mortgage lending and [T-5.5] on the MBS issued for their overlapping years 1987-1992.

[67] This point was made for European banks generally in order to explain the reduced success of ABS in Europe, combined with a hostile legal framework (*The Economist* 1991c).

[68] According to the OECD (1995), British financial institutions and investors do not manifest any significant interest in ABS. The main originators were Specialized Mortgage Lenders (SML), formed in 1986, as part of the business in order to obtain funds to cover the increased demand for mortgages.

[69] It is interesting that when a SPV is established in the UK, it automatically has the right to sell its securities to investors without any special permission from the London Stock Exchange Commission, whereas in the US in many cases -we will discuss them later- they need ad hoc permission.

[70] This discrepancy in the definition of sales and subsidiaries, forced the Department of Trade and Industry (DTI) to initiate the formulation of Exposure Draft (ED) 42, in 1989 tried to define the nature of a subsidiary and therefore what could be a sale and the removal of the item under discussion from the balance sheet.

[71] Initially the Bank of England issued a Notice in 1989 mentioning explicitly the conditions for transfer of mortgages. In the Loan Sales notice it was clear that the servicer must 'ensure that its role is not seen as being more than acting as an agent'(para.14). Then the Exposure Draft (ED) 49 issued in 1990 highlighted the importance of joint presentation between two business entities interconnected either directly (unified management) or indirectly (exercising major influence), de jure based on the articles of constitution) or de facto (business practice).

[72]It is a division of notes into junior and senior where the former are deferred payment until the latter are paid. Nowadays it is possible to have more complicated junior notes act as backing for payment but they are not paid last as long as there is any outstanding principal deficiency (Norton and Spellman 1991).

[73] Reinvestment risk is the risk related to the possibility of receiving an unanticipated payment during a period where the market rates for re-investment are lower than the return that the bank was receiving before the repayment.

[74] We do not discuss the benefits for initial borrowers, although a survey of US. fixed rate mortgage borrowers indicated that, between the mid 1970s and mid 1980s, borrowers paid less interest by almost 100 basis points in comparison with treasury bills (Rosenthal and Ocampo, 1988).

[75] In this case, we refer to minimum CA requirements defined by the Basle committee. The US and UK banks adhered to these requirements, hence an additional 'burden' on their position was enforceable.

[76] A famous example of unsuccessful securitization is the Equity Program Investments Co (EPIC) in 1985. The main reason behind the failure of this real estate syndication company was that, although it applied credit enhancement, it had an inadequate credit review, an overexposure of the credit enhancer. For more detailed analysis, see Ronsenthal and Ocampo (1985).

[77] In the beginning of 1991 it reached the 130 to 140 basis points (*Euromoney* 1991).

[78] It keeps the first tranche which covers the expected rate of credit loss (already discussed representation on spread account). But it does not cover the entire exposure; another significant portion (seven to eight times the initial rate) is covered by the well-capitalized credit enhancer. The final portion, where there is very low possibility of credit loss, is covered by the holder of the ABS.

[79] Warranties cover every aspect of the relationship between the SPV and the originator. In the case of substitution, it must be extremely clearly defined what are the particular characteristics of every new substitute.

[80] We are referring to the possibility of return of non-performing assets as part of the enhancement process or in order to sustain a good reputation of the originator.

[81] We have to take into account that banks are also firms and as firms their value is closely related to their share price. Their share price could be significantly affected by the published figures and ratios.

[82] We have also to take into account a loss of income from the underlying assets which could more or less compensate for an equal reduction of income paid to debt holders. This could take place if we reduce the outstanding debt of the bank by the same amount of the securitized assets.

[83] Even when Citibank in 1991 structured many deals, distributed them globally, involving many market makers in order to assure 24-hours trading which failed to materialize. ABS are considered as a 'story' bond and are subject to 'street' liquidity i.e. the investment mood of the period (*Euromoney* 1991).

[84] In 1990 ABS issued by First USA Credit Card Trust and Colonial Card Trust in 1989 were down-graded because the Japanese bank that provided their letter of credit was down graded. Many Japanese banks in the beginning of the 1990s experienced the same problems as the US banks in the beginning of the 1980s. (*Euromoney* 1991)

[85] Prepayment in ABS was one of the most common problem of Japanese institutions in the late 1980s and beginning of the 1990s in the US (*Euromoney* 1990).

[86] This phenomenon took place in the late 1980,s in the UK when CMLs adopted this approach in order to cover their operational costs and they had to face a low demand for ABS (Bank of England, 1994).

[87] For example Sear's issues in 1991 had a 5% benchmark for triggering early amortization where at the time of issue only 2-2.5% was the actual default rate (*Euromoney* 1991).

[88] Credit rating companies publishes reports analysisis of different types of ABS. These reports could create strong impressions in the markets. A typical case is Moodys report at the end of 1990 highlighting the increased default rate and poor quality of credit card receivables which, combined with high spreads (130 to 140 basis points) over Treasury notes, reduced fivefold (from 66% of new issues to 12%) new issues in the beginning of 1991 (*Euromoney* 1991).

[89] In 1987 Moody's rating company announced that they were going to provide rating even for ABS already issued.

[90] Even if Citibank and Sears admitted to have already restructured some deals (*The Economist* 1992a).

Chapter six

'We make war so that we can live in peace'
Nicomachean Ethics,
Aristotle 340 BC

6 Plastic cards

Introduction

During this chapter we are going to discuss the introduction and development of plastic cards in the banking sector. The initial launch of credit cards followed by a cluster of further innovations which, in this chapter, we attempt to explain was in accordance with our analytical framework and model of financial innovation. The discussion of plastic cards could be divided in three main areas.

First we are going to discuss briefly their history and predecessors in the form of Travel and Entertainment (T/E) cards. Then we shall refer to the development of bank credit cards due to competitive pressure and desintermediation reasons, and their capacity to generate credit and fill the spectrum. We shall add the importance of banks' expertise for the emergence of affinity cards.

Secondly, we shall discuss the introduction of debit cards due to cost-structure-related reasons and the new smart cards which were associated with dealing with the shortcoming of existing cards and the completion of various more elaborate functions, monetary and non-monetary. Thirdly in order to understand the introduction and development of plastic cards we also have to explain other aspects of electronic banking such as the Electronic Fund Transfer (EFT), Point of Sale (POS) and the Automated Teller Machines (ATM). Then we will discuss developments particularly in bank credit cards since they are the most important for our analysis, and analyze the factors that shaped their development and led to further innovations.

During the discussion of bank credit cards we shall focus on some aspects and developments that justify the dynamic perspective of our model.

6.1 Historic development of credit cards

The concept of credit is very old; the first written proof of credit transactions is recorded in the Code of Hammurabi around 1750 BC (Mandell 1990). Further credit practices developed on an informal or semi-formal basis.

The first provider of a basic consumer revolving credit was Provident and Clothing Supply Company in Bradford in the United Kingdom in 1880[1] where customers used their vouchers in order to buy from an approved list of shops.[2] The first credit card was developed in the US in 1914 by the General Petroleum Corporation of California.[3]

We can divide credit cards into monthly charge cards such as American Express and Diners; option cards like Visa and Mastercard; and budget cards (usually store cards). We are going to discuss retailers cards briefly in the affinity's cards section. Combinations of the above are available, like retail cards using the Visa or Mastercard facilities through an intermediary bank or even a mixture of payment systems.[4] During the first sub section, we shall discuss the first credit cards: the travel and entertainment cards.

6.1.1 Travel and Entertainment cards

Travel and Entertainment cards are also called charge cards, the first one was Diner's Club in 1949 (Mandell 1990). The initial purpose of this card was to use it in order to settle bills in hotels and restaurants in New York and pay the total amount at the end of month without any limit on the amount of expenditure but also without the possibility of extended credit beyond the end of the month, applying penalties in case of non paying customers.

Later in 1958 American Express, the traveller's cheque innovator, was established and finally Carte Blanche, initially owned by Hilton Hotel Corporation and later wholly owned by Citibank, followed in 1959 (Frazer 1985). In 1966 American Express launched its up-market Gold scheme, an action not followed by the other two. It was offered in

association with financial institutions in order to provide an instant overdraft facility to the holder. Later in 1986, Amex launched the Optima, which bypassed the banks and the revolving credit emerged as a novelty feature (Mandell 1990). In 1990 it reached more than twelve times the number of cardholders of the other two combined (Hanson 1988).

In 1951 the Diner's Club was initially launched in the UK and in 1954 it expanded its operations.[5] American Express was launched in the UK in 1963 and Carte Blanche in 1966. The initial reason was mainly to accommodate visiting US card holders; they had both an enrollment and an annual fee.[6] Until the 1990s, credit was not granted beyond the end of the month when all balances were due to be paid. The primary source of income for T/E cards is the (4% to 5%) discount they receive from merchants (Hanson 1988) and the secondary source is the annual fee, and finally the enrollment fee.

The only successful non-American T/E cards were the Eurocard, a charge card scheme that was extended to 13 European countries and the JCB, standing for Japan Credit Bureau, which did not offer a revolving credit facility either.

These T/E cards offer significantly higher spending limits, but normally still a limit of some sort, they offer non-financial benefits such as prestige, participation in prize competitions, special discounts but also immediate replacement and travel insurance. Amex especially has pioneered different extras such as a diversity of clubs and extra warranty extensions (Steiner and Teixeira 1990). A specific disadvantage of the T/E cards is that they are only accepted by hotels, travel agencies and up-market retailers (Frazer 1985).

The Travel and Entertainment cards were the first financial product, not even originated by banks, that offered *instant* consumer credit to their clients. During the next sub-section we shall discuss the first bank-issued credit cards.

6.1.2 Bank credit cards

During this sub-section, we shall discuss the emergence and proliferation of bank credit cards in the US and the UK, and we shall elaborate more on the particular features of bank credit cards.

6.1.2.1 Bank credit cards in the United States

It is imperative to mention that the situation between the US and the UK in relation to consumer credit was quite different. Consumer credit especially in the form of installments and revolving credit was very common in the US at the end of the previous century, whereas it was completely unknown in the UK (Mandell 1990). The first hybrid credit cards, as have already mentioned, were developed in the US at the start of the century.

The first bank to launch a credit card to its customer was the Flatbush National Bank in New York, which introduced 'charge-it' cards in 1947. Then Franklin National Bank in 1952 was the first bank to offer credit cards to customers of other banks (Drury and Ferrier 1984). The scheme applicable to card holders that have an account in the issuing bank has to be called secured[7], and the opposite unsecured.

The first years of the expansion of credit cards were extremely slow due to high *installation* and maintenance cost and low acceptance from the merchants, making early issuers sell their operations, as Chase Manhattan did in 1962.[8] An exception was Bank of America which after launching its card program called BankAmericard in 1959, reached one million holders in 1961 and 2.7 million by 1967. The increased number of cards reduced the cost of issuance and maintenance per card and transaction. The **break-through** came in 1966, when the bank set up the BankAmericard Service Corporation whose purpose was to license its schemes to other banks for a fee. The novelty was that banks did not require to set up and maintain their own costly schemes, running simultaneously the

risk of low demand for credit cards or facing the possibility of excess capacity. Hence the cost per card was reduced to the prevailing fee.[9] Based on the above facts, it is fair to say that the real emergence and proliferation of bank credit cards took place in the second half of the 1960s.

In 1970 BankAmericard Service Corporation was sold and became the National BankAmericard Service Incorporated (NBI). Later in 1974 a separate entity was created called IBANCO in order to provide international credit card schemes. In 1977, the former became Visa and the later Visa International. Meanwhile in 1966, competitor banks[10] in the same state (California) set up the California Bank Card Association in order to issue and run their own credit card scheme. The name of the card, Master Charge was bought the name from First National Bank of Louisville. In 1983 the name changed to the current one, Mastercard.

By the end of the 1960s, both Visa and Mastercard launched a huge promotional campaign using unsolicited mailing of credit cards which led to a significant increase in the number of holders (Mandell 1990).[11]

Initially in the states in which branch banking was allowed, banks offered state-wide credit cards.[12] In states where it was not permitted such as Illinois and Indiana, banks formed associations in order to circumvent the *regulation* and be able to offer their credit card schemes (Drury and Ferrier 1984). Continental Bank of Chicago and later Citibank began to expand their credit card operations across the country as a means of building a national presence, in advance of the anticipated legislation.[13]

Until 1976 it was not possible for a bank to issue both cards but a federal court ruling on grounds of discriminatory practices enabled banks to offer both of them - the duality principle. But very soon - by the end of 1977 - banks had abused this liberty. Not only had they massively opted for this duality, they also tried to reduce their cost by

merging the application, billing marketing and administration process, making competition non-existent. The Justice Department forced banks to abandon this practice for some years, forcing some banks to abandon the dual practice.[14]

The creation of NIB and ICA promoted the launch of nationwide advertising campaigns in order to boost the demand for the above schemes. In order to cope with the large numbers of transactions, special systems were created that enabled the authorization[15] and recording of credit card transactions.[16] In the following sub-section, we shall discuss bank-issued credit cards in the UK to provide some comparison with the US.

6.1.2.2 Bank cards in the United Kingdom

In the United Kingdom, the BankAmerica Service Corporation licensed Barclays Bank in 1966 to use the colors of BankAmericard as well as providing adequate software to run the operation. The result was the issue of Barclaycard initially as a cheque guarantee card. But the credit card function prevailed and from 1.3 million cards in 1970, business grew to more than 12 million in 1986 (Hanson 1988). In 1977 it began to use the Visa logo. Barclaycard processed for other banks such as the Yorkshire Bank and the Bank of Scotland and, until 1983, the Trustcard of TSB which joined the Visa network in 1978 (ibid).

In 1970 National Westminster, Midland and Lloyds banks established a joint venture[17] in order to share research, marketing, data processing and accounting costs and launched in 1972 their own credit card called Access and mailed a considerable number of unsolicited credit cards.[18] In 1975 they had issued 3.2 million cards and reached ten million cards in 1986. In 1975 Access joined the Interbank Card Association.

In 1981 the first gold card in the UK was the product of cooperation between Lloyds bank and American Express[19], then the following year other banks like Barclays

(Visa) and Midland (Mastercard) issued their own. In the following sub section, we shall discuss the main features of bank credit cards, which are common to both the US and the UK.

6.1.2.3 The main features of credit cards

The main feature of credit cards from their beginning is that they offer credit to their holders. Usually they offer extended credit periods and only a minimum - 5% of the balance - monthly compulsory payment (Drury and Ferrier 1985). If the holder does not pay the full balance, the outstanding amount or in some cases the full initial credited amount is subject to interest charges. On the other hand banks receive a discount of between 1.5 and 5 percent from the merchants.[20] These discounts are lower than the discounts received by the T/E cards (Frazer 1985). The discount received by banks is subject to competitive downward pressure and a typical example could be Barclaycard's discount reduction from 2.8 percent in 1978 to 2.4 percent in 1984 (ibid). In the 1990s the discount war continued and intensified between the Visa, Mastercard networks and Amex (*The Economist* 1991a). This price war could be viewed as *routine* or *incremental* innovations in accordance with the *strategic objectives* of the financial institution.

In the UK historically banks did not charge fees where as in the US usually they did.[21] The main differences between bankcards and T/E cards were that the former had initially a local significance due to the banking legislation in the US, and their cards did not have an annual subscription. The local dimension disappeared at the end of the 1960s when BankAmericard licensed its scheme, and in 1967 the ICA (later Mastercard) was established. In other words, credit card networks acted as an avenue in order to deliver nationwide financial services and circumvent the Glass-Steagall regulation. Banks began to increase the spending limit on their credit cards and offer additional services in order to

compete with the American Express products such as travel insurance or insurance cover for purchases using their own credit card.[22] These financial and non-financial services could be perceived as *incremental* financial innovations.

Credit cards were not acting as cost-reduction instruments in comparison with the cheque or debit processing cost. It was estimated that their costs were significantly higher.[23] Building societies also offer credit cards under arrangement with the Visa or Mastercard network or other banks participating on these networks.[24] Some credit cards like Barclaycard or Trustcard could be used simultaneously as cheque guarantee cards. They could also be used in order to draw cash from any cash dispenser or counter of banks that belongs to the same network, subject to a daily, weekly or monthly maximum amount. Cash withdrawals are subject to a servicing fee or an immediate interest charge. These services and functions of credit cards could be perceived as *further incremental innovations*.

Additional revenues emanating from credit cards result from the cross-selling of credit cards or the policy to include them in packages with other financial products such as debit cards or chequing accounts. For a short period issuers used to sell their database to third parties, but later in 1973 this was banned.[25] Another development that enabled banks to better manage their credit card operations was the emergence of securitization. It enabled banks to issue securities backed by the receivables from their credit cards and reduce their cost of finance by attracting low cost funds and be able to reduce the interest charged to their cardholders. Most issues were AAA but they were considered as quite unregulated and a significant slow-down was observed after 1992 (*The Economist* 1992b).

A very important aspect of credit card operations is the prevention of fraudulent activities. Fraud increased considerably by the unsolicited mailing at the end of the 1960s and card losses in the US had significantly increased due to bad screening and theft.[26] Later

losses occurred due to the lowering of credit criteria in the 1970s and 1980s in order to expand the cardholder's base in accordance with their *strategic objectives.* Bad debts constantly increased from 2% in 1970 to 3% in 1980 and then peaked in 1991 and 1992 at approximately 5%. After 1992 the situation stabilized to around 3.5% of outstanding balances (*The Economist* 1996b).

In 1985, fraud was estimated for Barclaycard to be around 0.27% in the UK (see Hanson 1988); this is a considerable increase from the 1980 figure of 0.16% *(The Economist* 1985). Bad debts in 1995 were reduced to 0.10% or 0.19%, depending on the source (see table [T-6.1] on the card fraud during 1990s in the UK). Mainly authorization techniques reduced the amount of fraud and increased the level of security (Drury and Ferrier 1985). In the UK banks co-operated under the co-ordination of the Association for Payment Clearing Services (APACS) and it is believed that this is the main reason that losses are not proportionately as high as in the US.

All major card-issuing banks like Citibank and Barclays extensively use *expert systems* and *scoring models* in order to enhance their credit system (Steiner and Teixeira 1990). It was suggested that, with the introduction of smart cards, credit scoring and transactions-recording system could use neural networks in order to provide enhanced control.[27] These were *additional innovations,* either new financial *processes* or new financial *instruments* that emerged in order to facilitate the functioning of the initial innovation - highlighting the dynamic development emanating from initial shortcomings of the innovation i.e. the credit cards. We have to mention that credit cards are a typical example of *positive network externalities* (Economides 1995).

At this point, we can summarize and classify credit cards in terms of our model (2.1) as *competition-* or *disintermediation*-caused financial innovations. It is possible to classify them as both *instruments* and *processes* since they act as instant credit generated.

Additionally, they could also be described as *radical* innovations since a cluster of further related innovations followed their initial creation. Some doubts could exist since it was not initially a banking-originated innovation. Their design was shaped by *technological developments* - we are going to refer to them later in more detail - and *strategic objectives* of the financial institutions in terms of additional features. Hence they were *responsive, on-*balance-sheet financial innovations that *generated credit*; *filled the spectrum* of intermediation; and temporarily took advantage (in the US) of *regulative imperfections*. The dynamic perspective of these innovations could be illustrated by further innovations, either *process* (credit scoring) or *instrument* (smart cards), that emerged in order to deal with the initial shortcomings. In the following sub-section we shall discuss affinity cards and their implications for banks.

6.1.3 Proprietary and Affinity cards

Before discussing affinity cards we are going to discuss the private label card schemes that pre-existed. At the beginning of the century in the US, coins or tokens were developed in order to enable customers to buy goods from the issuing store, in the 1920s oil companies applied courtesy cards to affiliated petrol stations, and in 1936 American Airlines issued their own credit plan (UATP).[28]

A major innovation in the 1970s in both the US and the UK was budget accounts, where the customer was paying a monthly amount to the issuer and was able to spend a multiple. The proliferation of these financial products lost their momentum when in the 1970s financial institutions offered their own labeled cards, since there was not any other clear benefit emanating from these budget cards.[29] It was also suggested that budget cards had higher interest rates and no interest-free period.

Then loyalty schemes appeared related to discounts received by customers when they were purchasing from a particular retailer like Sears and Roebuck and Marks and Spencer, or a petrol company such as Mobil or Esso. The purpose of these cards was not to generate a direct profit to the firm but mainly to boost loyalty as a marketing tool.

Usually loyalty schemes did not offer extended credit. But in the 1990s they moved to the credit-granting area too. In 1985 both Visa and Mastercard offered affinity cards of three different types: product benefit, lifestyle and personality cards. The product-benefit cards associate the use with a special bonus like the American Airlines card. The use of lifestyle ones provides an extra income for a third organization or institution, such as a University, a Club or a Charity. Finally the personality card is related to a certain individual or group of individuals like the Rolling Stones or Elvis Presley and its use provides these individuals with extra income.

The main contribution that affinity cards offered to banks was a useful database enabling them to target a particular group of customers, in other words a niche market. In order to apply any successful targeting banks need two types of information: accurate historical data concerning its customers and reliable demographic information. It is crucial to tailor its products in relation to the particular characteristics of the different sub-markets or in other words apply a micro-segmentation of the market.

At the end of the 1980s affinity cards had tremendous success but the market seemed to be saturated (Bright 1988). The most important world issuer apart from Visa and Mastercard is MBNA which specializes in affinity cards.[30] This financial institution initially was the MNC Financial but in 1990 it was closed due to bankruptcy and regrouped its activities around the affinity business already created in 1982 (*Forbes* 1996).

In 1989 AT&T decided to convert its proprietary telephone cards into a credit card called Universal without any annual fee and taking advantage of the tremendous

information that it already possessed acting as a credit check. The final step in that direction, i.e. non banks entering financial services, not in order to boost or safeguard their sales but to diversify their activities, was made by Sears in the US in 1986. They launched their own credit card called Discover after the acquisition of the Dean Witter brokerage firm in 1980s as the first step in providing a wide range of financial services to its customers as a consequence of disintermediation.[31] In the UK, Sainsbury's in 1996 and Tesco in 1997 with the assistance of Bank of Scotland and Royal Bank of Scotland respectively, offered a significant range of financial services.[32] It was estimated that in the 1990s Sainsbury's had 8 million potential customers per week and Tesco 11 million at very low establishment costs (less than 20 million pounds). Furthermore, they had very low operational costs since they have two or three employees in each superstore dealing with basic banking transactions and the rest of the business is conducted by phone, and post, and internet in the foreseeable future.

All these developments had a common feature. They were a potential source of income for already-established issuers of credit cards possessing the appropriate know-how (intangible asset), since essentially they could offer their expertise to other non-financial firms. We are going to elaborate on this more in the final section. In the following section, we shall discuss other plastic cards such as debit and smart cards.

6.2. Other plastic cards

During this section, we shall discuss two other important financial innovations: debit cards and smart cards. Both of them emerged during the proliferation of credit cards, and banks were heavily involved in their development.

6.2.1 Debit cards

We have initially to distinguish between ATM access cards and debit cards. A debit card is a card that is acceptable from a third party as a mean of payment. The first debit card was issued by the First Federal Savings Association of Lincoln, in 1968, which later introduced terminals in supermarkets.[33] Later in the mid 1970s other financial institutions, initially especially Savings and Loans,[34] launched their own debit cards in co-operation with chain stores. By 1975, 12% of commercial banks were offering debit cards to their customers. The National BankAmericard Service Incorporated (NBI) in 1975 offered its own debit card called 'Entree' and in 1976 Interbank Card Association (ICA) offered its 'Signet' debit and cheque guarantee card.

After the launch of its own debit card (Entree) later in 1993, Visa launched the Visa Cheque Card, replacing Visa Debit, and in two years (1995) had issued more than 16.5 million cards. Mastercard in 1976 also issued its debit card called Signet and later in 1991 issued its on-line card called Maestro reaching in two years 8.6 million holders and the off-line card, called MasterMoney having 3.2 million holders. Many banks and financial institutions adopted these debit cards, as had happened with the initial credit cards (Mandell 1990). Visa and Mastercard had already acquired national - which later become international - fund transfer networks such as Cirrus, Interlink, and Plus.[35] In the mid 1990s these two networks combined, accounting for 77% of all debit transactions in US.

In the United Kingdom in 1965 the National Provincial Bank issued the first cheque guarantee card within prescribed limits. In 1971 it was estimated that there were almost one million cheque cards in the UK, and in 1981 they reached 16 million (Hanson 1988). Barclaycard was the first credit card in the UK that introduced, in 1972, the dual-role card for credit transactions and cheque guarantee. In 1987, Visa launched its debit card and

Barclays called its own one 'Connect'. In 1988 SWITCH was launched by Midland, NatWest and Royal Bank of Scotland as a response to the Connect card.[36] This fact combined with the above mentioned involvement of Visa and Mastercard networks, provides us an indication that *research spillovers*, and possibly *learning curves*, could exist in the credit card industry.

Initially the card's main purpose was a medium of obtaining cash from ATMs using a PIN or to obtain some basic information such as the current account balance (Drury and Ferrier 1985). Later they enabled their holder to buy goods, by presenting the card to the appropriate point of sale (POS). The holder nowadays could obtain cash and make more elaborate transactions, such as transfers among accounts or other payments, and obtain bank statements. Payments are directly debited from the holder's bank account. The development of debit cards was linked closely with the development of Electronic Fund Transfer (EFT). It is clear that these routine innovations were conditioned by the emergence and application of adequate *information technology* systems.

We have to make clear that the purposes of debit cards, in contrast with the credit card, were primarily to reduce the cost of cheque processing and then to sell more financial products and decongest branches. We could say that the first goal especially was attained since in the US during the 1990s a relative reduction was observed in the usage of cheque books[37] and it was predicted to decrease further in the future (Bank Marketing 1994). The cost of a direct debit is also comparable with the cost of credit cards. It was estimated that an on-line debit transaction in the 1990s cost 14 cents, an off-line transactions $2.00 and a credit one $2.50.[38] Cashless instruments in the US such as direct debits and paperless transfer increased considerably in the 1990s. Both almost doubled in five years, when the value of cheques increased only by 2 and direct debits increased threefold during the same period (Kennickell and Kwait 1997).

Debit card holders in the UK during the 1990s were able to use their cards in ATMs that belonged to other banks, since British banks had formed big networks in order to accommodate their customers. Both in the US and the UK debit cards in the 1990s were by far the most fast-growing product (*The Economist* 1997).

Initially the whole Visa philosophy was to provide together a payment mechanism and an instant loan. Developments such as debit cards and the launch of Visa and Mastercard debit or connect (1987) cards or the creation of the SWIFT network in the UK, enabled banks to separate these two functions and leave it to the discretion of the bank to assess whether it was going to offer to its customers one or both of these financial products.[39] Hence by dis-bundling the features of the initial innovation (credit card) a further innovation took place (debit card).

Based on the US experience, Savings and Loans (S/L) institutions opted more for debit cards based on the Visa or Mastercard networks than credit cards. Building societies in the UK initially followed their example using the SWIFT network. It was believed that the impact could be significant if we take into account that the advantage of debit cards is that they do not offer free monthly credit, hence the cost impact could be significant (Frazer 1985).[40] But as the difference between building societies and banks blurred due to disintermediation, building societies began in the 1990s to offer credit cards belonging mostly to the Visa network.

Concluding, in terms of our model (2.1), the main causes for debit cards were potential *reductions in the cost structure, disintermidiation* and *competitive forces*. They were *responsive*, both *instruments* and *processes*, *off*-balance-sheet, that *enhanced liquidity*, *filled the spectrum* of intermediation and *reduced costs*. Their emergence was shaped *by technological development* and they were also based on features of *existing*

routines (for credit cards) of financial institutions. In the following sub-section, we shall discuss smart cards.

6.2.2 Smart cards

Smart cards were created in the early 1970s by Roland Moreno (Spectrum 1984) although a similar innovation was registered in 1970 in Japan by Dr Arimura.[41] The main problems with existing magnetic strip cards was their 'passive' or basic approach, in other words the lack of any on-board intelligence, small storage ability, and it was easy to counterfeit them. But they presented some crucial advantages, such as low cost, heavy investment already undertaken and an acceptable level of security.

Smart cards could be described as plastic cards that carry an extra microchip instead of the magnetic strip that conventional plastic cards have. This microchip is a microprocessor and can compute as well as hold data. It enables the identification of the holder through a PIN number, as well as the encryption and transportation of information. French banks were the first to use smart cards in large numbers at the end of the 1980s mainly in order to reduce their cheque processing costs and off-line fraudulent activities.[42] Later it was observed that fraud was reduced by more than 35%.[43]

In the US one of the first trials was undertaken by Mastercard in 1985, and Visa in 1988 (Financial Services Yearbook 1998). During the same period Citibank launched a special pilot for up-market clients offering immediate access to large funds around the world. The two main problems were the lack of an international standard, at least between the two large networks and the heavy cost of transformation or substitution of existing POS and ATM.[44] Mastercard approached the issue by testing a more basic smart card where Visa tested a super smart cart requiring very high costs.[45] It was also expected that cost per card was going to increase significantly.[46] The first mixture of smart cards and Home

Banking (discussed later) took place in 1982 from First Bank System of Minneapolis, targeting a group of farmers.

In the UK, Midland Bank in 1987 ran a pilot scheme highlighting the electronic purse aspects of the card. Later in 1994, Midland joined forces with NatWest and British Telecom and made a joint venture called Mondex promoting a particular aspect of smart cards: the electronic purse. Later in 1996, Mastercard joined the venture and acquired 51%, providing the real international perspective.[47]

One significant advantage is that a smart card's memory is not volatile; in other words information is not deleted when the power is shut off (*Spectrum* 1984). The holder could chose his own PIN code and smart cards could be used off-and on-line. When they are on-line they have an encryption device that codes all the data before sending to the terminal. The security is further enhanced if we take into account that the estimated cost of counterfeit is exponential in relation to magnetic strip cards.[48] When the card is used as electronic money, banks have a unique opportunity to manage the funds of the customer until the actual moment of the transfer (*The Banker* 1994). Combining the electronic purse attributes with Home Banking, it is the first time that customers will be able to *receive* and not only to transfer money from their account. In accordance with the 1985-1987 Mastercard pilot, there is also a customer demand for additional non-financial services that could be incorporated in the smart card (Bright 1988).

Many non banking institutions were also involved in the development of smart cards, for example ATT joined by Chemical bank in 1993 to access ATM and perform debit transactions (*The Banker* 1994), or IBM created a joint venture with Sears. It was estimated that in 1995, 688 million smart cards were in European wallets.[49] In 1997, in the US, a special report to Congress discussed the implications for Electronic Stored-Value Products from the latest legislation (Regulation E).[50] The existence of economies of scale

still to be reaped, highlighted the limited experience from this type of product and some risks not addressed, such as the unauthorized use or issuer's bankruptcy. It is fair to say that they still are in an infant stage.

In terms of our model (2.1), therefore, smart cards were tested and partially adopted by banks in order to remedy problems emanating from the existing *limitations* of plastic cards. Smart cards are responsive, *new* financial *instruments.* Since they are not yet fully developed, it is very early to classify them as *radical* or *incremental.* But since credit cards already included non-financial features, they are closer to be considered as *incremental* innovations. They were *technology-shaped*, and *strategic objectives* defined their particular features and they will probably present *positive network externalities*. Finally, they contributed to the *filling* of the *intermediation spectrum* and enhance the *risk management* of financial institutions.

6.3 Reasons affecting the proliferation of plastic cards

The reasons that enabled the development and proliferation of plastic cards are of a diverse nature. They could be allocated into three main types: technologically-oriented reasons, new channels of providing financial and non-financial services, and particular developments in the US and the UK and their consequence for the evolution of the product.

6.3.1 Technological reasons

Technological reasons are related to the development of two main information systems: the Electronic Fund Transfer and the Automated Teller Machine. During the discussion of EFT we will mention briefly the emergence of Home Banking which is associated with the emergence of EFT. We are going to discuss in the same section as the ATM, the introduction and over the last decade's proliferation of point of sale (POS).

6.3.1.1 Electronic Fund Transfer (EFT) and Point Of Sales (POS)

The main concept of Electronic Fund Transfer is to eliminate unnecessary transactions and paperwork. It transfers funds from one account such as the customers bank account to another bank account such as the merchant's, through a terminal such as Point of Sale (POS).

In the US the idea of establishing national electronic data interchange or fund transfer networks emerged at the end of 1960s. It was used for the creation in 1972 of the first Automatic Clearing House (ACH) dealing with transfers, ATM's, POS and government-related payments.[51] After this event, many other clearing houses and networks were created. The most important electronic system of fund transfer are: CHIPS, SWIFT, Bankwire and Fedwire.

During the 1990s, as we already mentioned above, the paperless transfers and direct debits using the above EFT networks thus doubled during the period 1990-1994, and debit cards tripled their amount (Kenninckell and Kwast 1997). The above systems and the fragmented nature of the US banking landscape permitted non-financial institutions, like Merill Lynch, Pierce Fenner and Smith and Sears Roebuck to offer banking services including credit cards (Drury and Ferrier 1985). The idea of an Electronic Fund Transfer Point of Sale (EFTPOS) was discussed in the UK in 1980. In 1985 English and Scottish clearing banks reached an agreement to implement it. The significant contribution was the payment of purchases without any paperwork at the point of sale.

The development of Home banking was based on the proliferation of EFT and data storage and the processing capacities of banks. The first initiator of Home Banking in the US was the Chemical Bank in New York in 1981[52], the Nottingham Building Society with Bank of Scotland from 1979[53] and Midland Bank in 1983 in the UK. The experience was not initially successful in the US since, in the mid 1980s while 30-35 different banks

offered home banking facilities, the majority stopped or slowed down their promotion (Choraffas 1988). The Home or Office banking service required a TV set or a PC terminal. The customer was able to check his balances, transfer funds, pay bills or even apply for loans. In the 1990s the picture changed considerably for many reasons: PC prices decreased considerably, telecommunications tariffs decreased too and customers became accustomed with electronic banking through their exposure and use of ATM. Hence technology related reasons enabled Home Banking to emerge.

The first effort to develop a POS took place in 1966 with the Bank of Delaware. Since then many aborted efforts took place, such as Citibank's in 1978 and Banc One Corporation's fruitless effort in 1979.[54] The development of Point of Sale (POS) had the double function of debiting an account and crediting another. In the beginning of the 1980s, many oil companies were involved in most of the pilot programs and some wide base joined ventures appeared.[55]

It was crucial for banks to get involved in the development of POS for at least two reasons: the excessive cost of processing cheques, and catching the free riders who were using the float and paying the full balance at the end of month. Both were side effects of the proliferation of credit cards. In 1982 it was calculated that 34.4 cents out of the total 53 cents of cheque processing costs, are labour-related costs. The main barriers to the massive adoption of POS were the lack of common standards and the high costs involved in having an on-line connection between banks and customers. But after 1985, a significant increase took place and merchants began to invest in POS as they had done the previous decade by accepting credit cards.

A significant boost, as we already mentioned in the debit card subsection, came also from the acquisition of fund transfer networks from Visa and Mastercard, in the 1980s, combined with the offensive marketing campaign undertaken later by them. In the 1990s

we had two types of POS: the off-line and the on-line. The on-line is a one-step transaction (transfer), the off-line a two-step transaction (authorization and later settlement) (*Bank Marketing* 1994).

In terms of our model, *cost structures* can therefore be said to have caused the emergence of the Electronic Fund Transfer and Point of Sales. They were *responsive process* innovations that enhanced *liquidity,* partially *filled the spectrum of intermediation* and *reduced costs*. Especially in the case of POS, negative effects from the proliferation of credit card instruments, boosted their emergence. In the following sub-section, we shall discuss the ATM and POS financial innovations.

6.3.1.2 Automated Teller Machines (ATM)

ATMs are significant applications of the EFT concept. The first application, as a particular case of the EFT/POS innovative process, was the Docutel cash dispenser in 1969 in the US.[56] In 1975 Amex added a magnetic strip to its gold card (Mandell 1990). In the UK the first cash dispenser appeared in 1967 from Barclays Bank.[57] ATMs were highly successful during the 1970s; in 1985 52,000 were operating in the US and over 80,000 by 1988; 3,300 were operating in the UK in 1985, and 10,000 by 1992. Their cost has been reduced by almost 70% in the last ten years. The On-line Teller terminal could be classified as a more basic and less sophisticated ATM and is extremely successful in the US where it was estimated in 1985 to operate 255,000 units.

During the 1970s, the ATMs in the US presented three advantages: it was a *cost-reduction* innovation, it provided the customer with more convenient access (place and time) and could be a *marketing advantage*; due to Regulation Q, banks could not compete on the level of interest rates they offer to their clients. In the UK on the other hand, ATMs initially were used in order to by-pass the problem of government *restrictions* in the 1970s

in relation to the time and days (Saturday forced closure) bank branches were allowed to operate. Hence directly or indirectly, *government intervention* or *regulation* boosted their expansion but not their creation.

Initially ATMs operated by credit card, but in 1972 the first special debit card was introduced in the US by City National Bank of Columbus in Ohio. Automatically millions of new debit bankcards were used and banks on both side of the Atlantic formed or joined national networks (six in 1982 in the US). These ATM networks were designed to provide cash and balance services for their customers, like LINK and MATRIX in the UK (late 1980s) and Cirrus internationally. Very recent research in the UK found that institution's size, growth in deposits and profitability were positively related with the adoption of ATM technology by British banks (Gourlay 1998). The existence of learning-by-doing effects was identified, but this was not significantly related with labour-saving effects. Information *technology spillovers* were also observed during the development of ATMs. The diffusion process presented epidemic signs and institutions' expectations (for future demand) also influenced the adoption of the innovation during the period 1972-1992. Hence financial institutions' particular characteristics could influence the adoption of the innovation.

The tremendous expansion of ATMs in the UK is detailed in our table [T-6.2]. It is worth-noting, the fivefold increase in the first ten years and the significant increase of building societies' ATMs after 1986, doubling their number in three years. After 1990, a slower increase in both banks and building societies was observed. Another observation could be made in terms of the number of the ATM cards in the UK, from 1975 until 1980 they increased tenfold and in 1985 they were forty times more than ten years before (Ingham and Thompson 1992).

Thrift institutions in both countries joined immediately and participated in the innovative process by locating ATMs for the first time in different places than the location

of the bank. Very soon many of these ATM networks acquired (Cirrus and Plus in late 1980s), or became accessible to, the Visa and Mastercard network (Mandell 1990). From 1976 they issued their own respective debit cards (Entree and Signet). Amex soon (in 1977) used banks' ATM network in order to deliver traveller cheques.

During the 1980s competition between banks also embraced the domain of ATM and they began to offer more sophisticated ATM machines. These machines were based on *existing routines* of previous models and *research spillovers*. But this competition involved significant cost and ATMs were operating below break-even level.[58] Many banks began to charge either a transaction fee or an annual fee to their customers.

In terms of our model (2.1), Automated Telling Machines were thus caused by the *cost structure*, the potential *competitive edge* and partially to circumvent *regulation*. They are *responsive*, financial *instrument* and *process* innovations, *off* balance sheet that enhance *liquidity*. They are shaped by *existing routines*, *IT spillovers, positive network externalities* and *strategic objectives* of the financial institution such as the existence of *economies of scale*. Their main features are that they *support existing innovations* (plastic cards and EFT) and partially they fill the *spectrum of intermediation*. In the following sub-section, we shall discuss banks' profitability and other developments.

6.3.2 Banks profitability and developments

We are going to discuss development that took place over almost thirty years in the US and the UK which determined the evolution of credit cards in term of bank profitability. We are going to summarize at the end of this sub-section the emergence, proliferation and further dynamic development from credit cards.

6.3.2.1 The US developments

In the **US,** after the clear-out of the end of the 1960s, the main credit card networks were BankAmericard and MasterCharge. Consequently it was expected that in the early and mid 1970s, profits would be reported in the industry. A significant part of the profits came from the interest charges which accounted for two third of income. Interest was charged in the case of outstanding balances. An important difference between the UK and the US banks was that Access and Visa in the UK charged interest for the whole amount in the case of an outstanding balance; in the US initially banks used to charge for the outstanding amount only, but later in the 1980s they adopted the same method of calculating the interest charge (Mandell 1990).

In 1976 Citibank tried to find counter-measures in order to obtain revenues from cardholders that paid their full balance at the end of the month. It introduced a 50 cent monthly payment for these holders, but customers' reaction and Congress's censure forced them to abandon it (ibid). It is possible to view it as an *unsuccessful incremental* financial innovation. Annual fees initially were not imposed in the US during the 1970s because banks feared that they might lose customers and in 1973, despite the unsolicited mailing that took place at the end of 1960s, only 11 percent of all credit cards were bank issued.[59]

During the same period predators were invading the market, since Savings and Loans institutions after 1972 were able to offer cheque accounts to their customers. In 1973 NBI, and in 1974 Interbank, offered Savings and Loans the possibility of joining its network, while Credit Unions had to use the intermediation of a bank. At the end of the 1980s approximately 3,000 credit unions were issuing their cards through banks (Steiner and Teixera 1990). A typical example of *expertise-generated* income took place in 1977. Visa offered the first proprietary card to a Savings and Loans institution and they started to compete with banks offering lower interest rates. They introduced many innovations and

opted more for the debit-charge card structure. Many of them used their clients' savings account in order to pay the full balance.[60] They also followed a strategy of applying a lower finance rate to all their customers in order to compensate for the users who were paying their balance in full, or they applied a type of security in the form of a credit limit of only 50% of deposits for the customer.

In 1977 bank credit cards still accounted only for 6% (Hanson 1988) of outstanding commercial credit. An American consumer had many alternatives and could use budget accounts, retailers accounts, trading cheques, hire purchase and T/E cards. The distribution of credit card during the above mentioned period in the US was: Store cards 50%, Gasoline cards 33%, and Banks cards and T/E cards 16%.

Later, at the end of 1970s and early 1980s, losses occurred due to the high interest rates which caused many bad debtors (ibid) This had not occurred for T/E cards due to the better selection of holders and restricted credit facilities; remind ourselves that extending consumer credit is considered as very risky during high interest rate periods. During this period, the US banks made an *incremental* innovation and introduced fees in order to compensate for the considerable problems from Carter's administration in 1980, when it forced banks to create a special non-interest bearing reserve for all credit accounts they possessed; and this was combined with the interest rate ceiling based on usury law (Mandell 1990). These problems caused a credit crunch, but not the initially-feared significant reduction of cardholders. This is illustrated in table [T-6.3] which includes information on consumer revolving credit during the period 1968-1996. During the years 1980-1982 a slowdown in consumer credit was observed. But after 1983 a geometrical increase took place, reaching in five years an amount five times the 1982's level. Commercial banks were by far the more significant provider of this credit and non-finance

firms were clearly the second most important, while credit unions and savings and loans were not significant market participants.

These fees, combined with the reduction in interest rates after 1981 and the abolition of usury legislation (*Forbes* 1991), led to massive profits from 1982 until 1986 in the US, since banks did not pass this reduction on to their customers (Mandell 1990). A significant sluggishness and stickness in the interest rate that banks charged from 1975 until the 1990s was observed in the US. A reason advanced by research by the Federal Reserve Board in 1988, covering the period 1975-1990, was that imperfect information caused a variation in the interest rate in anticipation of higher risk undertaken by banks when offered their revolving credit facilities (Wooley 1988).

The graph in appendix [A-6.1] on spreads of the US banks for the period 1975-1995 makes this pattern clear. The spread between cost of funds (CDs) and the credit card rate fluctuated from 6% to almost 14% apart from the three years we have already discussed (1979-1981). Initially cardholders were not insensitive to interest rate changes (Hanson 1988), but in the mid 1980s US holders were so accustomed to the use of credit cards that they did not act against the maintenance of high charges despite the low cost of funds. That enabled banks during the 1980s, where consumer loans fell by almost 6 percent, not to reduce the number of credit cards.

From 1976, 34 of the top 100 volume shops accepted bank credit cards (ibid). Then a major blow came from J.C Penny's in 1979 when, despite being one of the most successful store issuers, they decided to join the Visa network directly without using any financial institution as a middleman.[61] The main problem for the banks previously was that the regional retailers in the US tried to join together and use a financial institution to provide their card management. In 1981, after J.C.Penny joined Visa, half of the country's major retailers accepted bank credit cards, while Amex was accepted by three quarters of

department stores. After the J.C.Penny case, it was obvious that credit card networks were able to operate without the help of a bank, and the banks lost significant scope for providing their expertise.

During the 1980s in the US the situation changed considerably in favour of banks because store cards reached saturation point. Travel and Entertainment cards (notably American Express), increased steadily but bank credit cards sky-rocketed. Especially in the installment credit area, bank credit cards were covering 9.5% in 1980 and 17.4% of the total in 1988.[62] The total amount charged jumped from $14 billion in 1973 to $183 billion in 1988 (Steiner and Teixeira 1990). In the same period it was estimated that 28 percent of holders were convenience users, in other words they were paying their balance at the end of the month. At the end of the 1980s in the US, after a further clearing that took place in the 1970s, the top five banks were issuing 40 percent of cards.[63]

It was calculated in the US that during the 1980s, the profits for banks which got involved in the credit card business were around 2.5 percent of transactions or, based on a different source, an average of 3 percent of assets (*The Economist* 1990) and in particular, 2% for inefficient issuers and 5% for low-cost issuers (*The Economist* 1992b).[64] Additionally, the potential profit margin in the early 1980s was estimated at around 85 basis points (0.85%), and in 1990 it was estimated to be around 70 basis points (0.70%), a reduction of 20 percent.[65] Particularly earnings were significantly reduced from 3.45% in 1986, to 3.10% in 1990 and reached the 2.14% in 1996, of the assets.[66]

It was also observed that the card industry enjoys significant economies of scale in the range of 25,000 to two million cards equal to almost to 400 basis points, and it was estimated that ten million is the optimal efficient level. The processing business could also be perceived as the development of *new organizational* structures. This observation is in accordance with the US transaction processing market at the end of 1980s. It was

dominated by Amex (27%), Citicorp (14.6%), Sear-Discovery (8.1%), Total Systems Services (7.6%) and Chase Manhattan (5.2%) processing more than sixty percent of the 155 million outstanding credit/charge cards (Steiner and Texeira 1990).

During the slowdown in profitability observed in the 1990s, a few institutions abandoned their card issuing activities and concentrated on the processing business (*The Economist* 1992b). In other words a *process* innovation became a *product* or service for sale by banks i.e. a source of income. Consolidation in the US at the end of the 1980s applied also to the processing business, since in 1987 the top ten credit card issuers accounted for 37% of the market and in 1989 accounted for 55% (*The Economist* 1990). Secured credit cards were launched at the end of the 1980s in order to attract lower-income applicants. The applicant makes a deposit, used by the bank as collateral, and he has access to credit of equal amount (Mandell 1990).

Interest rates tended to move in tandem for all banks but lately, during the 1990s, the situation changed dramatically. Banks began to follow more independent strategies and an explosion of *incremental* or *routine* innovations took place during this period. Banks began to publish their interest rates and even engage in comparative advertising. Some offered a fixed rate and some a variable rate - connected with bank's prime rate - which could differ by more than 10%; some banks charge an annual fee of $40 and others do not.[67] Practices like fee-waiving for the first year and fierce competition on interest charged broke out in the 1990s (*Forbes* 1991). If we distinguish further between secured and unsecured cards the difference is even more impressive, reaching 14%.[68] The concept of secured cards was very similar to the original credit cards. Consequently, *existing routines* and *research spillovers* facilitated its emergence. A final point is that many US banks, issuing credit cards, applied different *pricing strategies* in the mid 1990s depending on the credit risk of their consumers (Report FRB, 1997)

It is worth mentioning that the main initiators of this interest rate war were the specialized or 'monoline' issuers that had an extremely low cost base and were able to reduce their rate and squeeze their gross margins and their profitability in order to expand their base.[69] Institutions involved in these competitive practices could face serious problems due to reduced credit criteria already applied and in relation to fixed and variable rates, since their cost of funds is not normally fixed. The average US adult had 8 credit cards of which 2.5 were from banks (*Forbes* 1991). In the US in 1990 only 30% were paying the full outstanding amount (*Fortune* 1991).

A final point is about *regulation* in the US, since regulation very often shapes financial innovation. Apart from the Carter administration's special reserve imposed in the mid and late 1970s, and the different state usury laws applicable until the mid 1980s, the banks did not face any particular monetary pressure from the Federal Reserve.

During the next sub-section, we are going to discuss the British approach to the credit cards business and summarize the features of credit cards and their dynamic development.

6.3.2.2 UK developments

In the UK the first years of issuing credit cards were characterized by heavy installation, training and huge promotional costs. In 1974 in particular, banks failed to increase their rates in spite of extremely high market rates. Later, at the end of the 1970s significant government regulation of a retrospective nature occurred (Hanson 1988). From the beginning of the 1980s significant profits occurred.

In the UK, Barclay's considered in 1976 applying charges for any individual transaction, but based on the US experience it was believed that cardholders would just switch cards. [70] As we have already mentioned, the duality principle was allowed in the US

from the mid 1970s. But by the end of the 1970s, and in the early 1980s, Barclays' fears were proved inaccurate as it was observed that cardholders were extremely insensitive to interest rate changes (Hanson 1988).

In the UK during 1978, credit cards covered only 2 percent of outstanding credit (ibid). But in the UK during this period almost 95% of outstanding credit cards were bank cards and the types of alternative available to the British consumer were minimal. He did not have access to the plethora of budget accounts, retailers' account, trading cheques, hire purchases and T/E cards that the US consumer had. It was a more oligopolistic situation in two ways: less available options and a concentrated banking sector (the Big Six). The oligopolistic approach and tacit price fixing are obvious in the graph in appendix [A-6.2] which shows the main British banks' prevailing credit card rates during the period 1975-1995.

As we could observe in appendix [A-6.3] spreads between cost of funds (CD) and interest charges for the period 1975 until 1995 were between 13% and almost 18%. They were significantly higher than their US counterparts (see comparative graph in appendix [A-6.4]). As we have already mentioned, Access and Visa in the UK charged interest payments for the whole amount in the case of outstanding balances, taking into account the prevailing card rates. We conclude that the profitability of credit card operations was considerable. During the 1980s total consumer loans fell by almost 6 percent but credit cards stayed almost at the same level (*The Economist* 1991a).

A nuisance for the UK banks took place at the end of 1970s when they were facing considerable government *restrictions* on extended credit and escalating cost of funds i.e. soaring interest rates (Drury and Ferrier 1985).

Additionally, on the other hand, there is not any clear reduction in the labour cost of British financial institutions, as we can observe in table [T-6.4] on employment in the UK

during 1974-1994. Until 1990, employment constantly increased, but then reduced thereafter. But since they are total figures, their significance is not overwhelming and we should restrain ourselves from extracting any major conclusion, other than that banks faced high costs during this period and the proliferation of plastic cards did not manage to reduce them.

By not allowing unsolicited mailing after the complaints rising from Access's actions, the British government effectively established Barclaycard and Access as the only credit cards networks. The only attempt to create a third network took place from Co-operative Bank in 1984 but with very limited scope and success. In the UK even from the late 1970s until the beginning of 1990s, it was believed that the majority of merchants accepted bank credit cards with the notorious exception of Marks and Spencer. In relation to regional retailers, both Mastercard and Visa tried to make them join.

In 1986 the Co-operative Bank was the first bank in the UK to offer *competitive* rates to cardholders that maintained credit balances (Hanson 1988). It was like a current account combined with the Visa network in indirect competition with the Swift network in the UK, allowing for the difference in the loan-granted element, partially compensated by the overdraft facilities of the current accounts in the 1980s.

In the UK existing holders were also - as in the US - encouraged to increase the use of their cards[71] or, especially in 1990s, to transfer balances. They were encouraged by either waiving annual fees - equal to 10 pounds where it was applicable - in case they charge more than a predefined annual benchmark or by offering low interest rates for the first year.[72] Banks followed different *strategies* - as in the US - and adopted offensive comparative advertising. Another strategy targeted non-holders either by reducing the credit criteria as in the case of students in the UK,[73] or by using the wide acceptance of cards in order to attract late adopters and reluctant users.

At the end of this section, we can summarize some aspects of bank credit cards in relation to our model. They were caused by high *cost structures* and *competitive* pressure from other financial and non-financial institutions. The emergence of bank credit cards was conditioned by the *existing technology* in information-processing areas, *positive network externalities*, *research spillovers* (secured credit cards) and *strategic objectives* of the institutions. The *cluster* of later innovations, debit and smart cards, classify them as *partial radical* innovations. The dual nature of credit cards as a new *process* and *instrument* innovation *filled the spectrum* and provided the successful issuers with further *intangible assets* (expertise). These strategic objectives were also the source of many *incremental* innovations that *supported the existing* innovation and facilitated the proliferation of credit cards. These innovations took different forms, such as *advanced scoring* and application *screening process*, secured credit or combining many features in the same card. The short-lived government intervention in both countries did not create any persistent problem for this proliferation.

6.4 Conclusion

During this chapter, we have discussed the financial innovations related with plastic cards. We concentrated the main part of our discussion on bank credit cards because we consider them as the main innovation, encompassing many aspects of other plastic cards and as the most important for banks' profitability.

The main causes of bank credit cards were the competitive or disintermediation pressure from financial and non financial institutions, whereas the main cause for debit cards was cost structure.

Their design was shaped by technological developments in the information technology area (particularly smart cards). Some of these development were also financial

innovations such as Electronic Fund Transfer, Point of Sales and Automated Teller Machines which were conditioned by similar reasons and meeting similar objectives to the plastic card innovations. Bank cards faced positive network externalities. It is also possible to observe research spillovers and existing routines between original credit cards and the emergence of debit cards and secured credit cards or in ATM developments. Finally, strategic objectives such as additional features (especially smart cards) and pricing influenced the development mainly of the credit cards.

Bank credit cards could be classified as responsive, on-balance-sheet financial innovations that generated credit. They have the characteristic of both a new financial process and a new financial instrument and they generated credit. But in the case of debit cards, they enhanced liquidity. Credit cards could also be perceived as a partially-radical innovation since a cluster of innovations followed their proliferation.

Bank cards filled the intermediation spectrum and initially took advantage in the US of regulatory imperfections. Further features of successful innovators were the reduction on costs (debit card and EFT/POS) and intangible assets in the form of expertise, especially used for store and affinity cards. Bank credit cards created some additional problems in terms of competition, limitations, cost and fraud. Many incremental innovations took place in order to remedy them such as multipurpose cards, smart cards, advanced scoring systems and secured credit.

During this chapter, we have provided additional evidence in support of our model and in accordance with our analytical framework, demonstrating that it can encompass, and illuminate the analysis of our fourth cluster of innovations. Following the detailed analysis of four clusters of innovations in this and the preceding three chapters, we turn now to make a final assessment of financial innovation in relation to the framework developed in chapter 2.

Endnotes of plastic cards

[1] Joshua Kelly Waddilove issued in 1880 redeemable cheques to local shops (Drury and Ferrier 1984).
[2] Payments of these vouchers were made in weekly installments (Hanson 1988).
[3] It was offered to their employees and selected customers and was based on a special agreement with different establishments and not in the current form of extended credit. (Drury and Ferrier 1984).
[4] In the UK initially stores like Mark and Spencer provided pre-printed cheque books and cheque guarantee cards accepted only in their stores. The Citibank Tandem or Mark and Spencer's Scheme of minimum monthly payments even when the customer's account is in credit (Drury and Ferrier 1984).
[5] From the establishment of reciprocal arrangements between Finder's Dining Club and Diner's Club Inc in America.
[6] Diner's had less than 70,000 cardholders in 1967 and American Express less than 35,000 but things changed considerably later and by 1984 Diner's had 300,000 and Amex almost 800,000 due to an extremely intensive marketing campaign.
[7] The same definition was used in order to describe credit cards which the holders had to deposit an amount and be allowed to spend the equivalent of this amount.
[8] Until 1957, 26 banks issued only 754000 cards which were accepted by 11000 merchants (Drury and Ferrier 1984).
[9] This fundamental change in banks' perception is highlighted by the fact that, in September 1967, 197 banks had plans to move into the credit card business and in June 1971, 1514 had similar plans (Mathis 1972).
[10] Wells Fargo Bank, United California Bank, Bank of California and Crocker National Bank.
[11] Something already tried by Standard Oil Of Indiana during 1930's and which caused significant losses due to fraud (Mandell 1990).
[12] Like the Marine Midland Bank in New York or Valley National Bank in Arizona (Drury and Ferrier 1984).
[13] Citybank also in order to circumvient the usury legislation of its native state (New York) moved its credit card operation to another (South Dakota) (Mandell 1990).
[14] The most famous case was Chase Manhattan Bank in 1979 (Mandell 1990).
[15] The INAS for Mastercard and Base I for Visa.
[16] The INET for MasterCard and Base II for Visa.
[17] Later they were joined by Royal Bank of Scotland and Williams and Glyn's Bank. Sharing cost could be very beneficial as in the case of Access case where security is assured. Each bank exercises discretionary control on the interest rate setting, fixed its limit and dealing with queries. The cost allocation is based on a system of applied discount for volume above a pre-arranged level and surcharge for lower level.
[18] That caused many complaints and the UK government followed the US example and banned this practice (Farzer 1985).
[19] After the first five years half of its holders (53,000) were not customers of the bank.
[20] The percentage depends on the type of goods, the profit margin of the merchant and the possibility of fraudulent transaction (Frazer 1985).
[21] That could be the reason that in the UK there was a strong bias in favor of bank credit cards (Frazer 1985).
[22] In excess of that, in accordance with British legal provision for defective goods, banks are considered liable for purchases undertaken by their card (ibid).
[23] The simple processing cost was around 40 cents, but the full cost was estimated to be $3.40, much higher than the cheque-related cost estimated at 80 cents (Steiner and Teixeira 1990).
[24] A typical example is the Leicestercard, which Citibank issued for the Leicester Building Society where it combines the credit facilities with a discount on 3,500 high street shops (Drury and Ferrier 1984).
[25] In accordance with the Federal Privacy Act in the US and the Consumer Protection Act in the UK (Mandell 1990).
[26] In 1970 bank card losses were estimated at $115 million, 50 percent higher than 1969 and significantly higher than $ 20 million charged in 1966 (Mandell 1990).
[27] The main contribution of neural networks is that could take into account factors and process significant more information that current non-neural models can not (*The Banker* 1996b).
[28] A coupon book issued against an initial deposit part of the Universal Air Travel Plan (Mandell 1990).
[29] The only important independent store card issuer in the UK was Welbeck Financial Services belonging to Debenhams and accommodating during the 1980s 40 other stores (Frazer 1985). Only for stores like Mark and Spencer in the UK or Sears Roeburk in the US which did not initially accept other credit cards.

[30] In 1995 it had 4,200 groups in the US and 250 organization in the UK (*The Economist* 1995).
[31] We have to mention that during the first years "Discover" achieved a large cardholders base of more than 30 million during the 1990s but the operation was not at all profitable for Sears until 1989 (Mandell 1990).
[32] They offered deposits, credit cards, mortgages and household insurance (*Financial Times* 1998).
[33] The state of Nebraska and the Nebraskan Independent Bankers Association in 1976 sued the bank unsuccessfully for violation of banking laws.
[34] By 1976 the Federal Home Loan Association had approved 54 applications (Drury and Ferrier 1984).
[35] Cirrus was acquired in 1988 by Mastercard, Interlink was acquired in 1994 and Plus in 1987 by Visa. It was even argued that Point Of Sale products were idle for almost twenty years until these network decided to invest in them and promote them (*Forbes* 1997b).
[36] After five years in 1992, Switch reached 13 million cardholders and Connect reached 11 million (*Marketing* 1992b). Then the following two years they stabilized their cardholders at these level (*Marketing* 1994).
[37] A slower growth was observed and not a reduction in absolute numbers (Kennickell and Kwast 1997).
[38] Off line debit was 62% of the total usage, and on-line 38%, in the mid 1990's (*Forbes* 1997).
[39] This is the case for Barclays Visa Delta connect card launched in 1987.
[40] This argument is simplistic and is based on the assumption that holders pay the outstanding balance and omits the point that the outstanding balance could yield significant returns.
[41] But he only applied for a Japanese protection patent, where as Moreno in 1974 had applied for an international patent (Bright 1988).
[42] French consumers used their cheques extensively as a mode of payment and French banks had to process at the end of 1980's more than 3 billion cheques (ibid).
[43] From FF467 million in 1991 to FF300 million in 1993 (*The Banker* 1994).
[44] Mastrecard ran a trial pilot scheme in 1985 and in 1987 decided to proceed further since they believed that there were significant benefits such as reduction of authorization cost, better credit control, reduction of fraud, expansion of merchants base and less replacement cards. Visa ran its own pilots and were less enthusiastic since they believed that the only improvement was in the fraud area, already under their own control (Bright 1988).
[45] Offering services as PIN, currency exchange table, log of transactions, notes, clock-calendar and a magnetic strip for ATM and POS (*PC Week* 1988). Visa estimated that they would need to spend $4 billion where Mastrecard only $2 billion "Financial services Yearbook" (1988, p5).
[46] From one dollar for old plastic cards to $2 -$5 for smart cards and reaching $5-$20 for super smart cards, (ibid, p6).
[47] When VISA already was running its own Visa cash scheme (*The Banker* 1997a). Mondex theoretically was international because it was franchised to 15 countries and 30 participating banks (*The Banker* 1994).
[48] In 1988 it was estimated that the cost of a counterfeited magnetic card was $14 and the mainframes necessary to create a counterfeit smart card required almost $2.5 million "Financial services Yearbook" (1988,p4).
[49] And the forecast for 2001 was to reach 3 billion and 450 million of them are going electronic purses (*The Banker* 1997).
[50] These products have one or more of the following features: a device electronically stored with funds, a device enabling access to an account or a device not connected with a particular account (Report on the Application of the Electronic Fund Transfer Act, 1997).
[51] In California, it is run by the local Federal Reserve Bank (Chorafas 1988).
[52] A TV set, a telephone and an Attari terminal were necessary in order to make the banking transactions
[53] A TV set and an adaptor were required in order to make the transactions with NBS and the Bank of Scotland with the Chemical Bank (1981).
[54] Citibank dropped its TransAction system, Banc One Corp. Discontinued its Post II project and First National Bank of Atlanta sold its own one in 1981 (Taylor 1984).
[55] It was introduced in 1983 by Exon and First City National Bank of Houston, where Exon was providing the machines and the bank had to provide the technology in the process of transactions (ibid).
[56] But the prototype was presented in 1965 also in the American Bankers Association (Mandell 1990).
[57] In 1965, the DeLa Rue instruments company starting from the concept of automated gas dispenser proposed to Barclays Bank the idea of a cash dispenser (Mandell 1990).
[58] It was estimated that an ATM should undertake at least 8,000 transactions per month and from 7,200 in 1982 transactions fell to 5,000 in 1987 (Mandell 1990).
[59] Retail cards accounted for 50%, oil company for 27% and T/E for 2% (Mandell 1990).

[60] The example of Home Savings and Loan Association of California, the biggest S&L institution in 1977 (Mandell 1990).
[61] The main reasons advanced were the better discount and the comparative advantages gained in relation to its competitors (ibid).
[62] Where the retailers percent dropped from 7.7% to 5.8%, (*Technology in Banking*, 1990, p118, table 5-3).
[63] The top two were Citicorp with more than 15 million and BankAmerica with more than 7 million.
[64] But this is a gross estimation because we have to allow for the particular characteristics of the banks portfolio (ibid).
[65] Potential profits were defined as the difference between the merchant's discount and Bankcard intercharge (http://multiplex.com.)
[66] Net before tax earnings over assets during the period 1986-1996 (Federal Reserve Board 1997).
[67] The Federal Reserve web page includes a survey and information on rates charged and annual fees. For Bank of Hoven has a fixed rate of 18.90% plus $49 annual fee, Capital One Fixed 9.90% and $20 annual fee, First USA 12.90% fixed no fee, or Homes FS&LA, variable 10.68% and zero fee. The main banks like Citibank offered 17.90% variable, Bank of America applied 17.99% variable and BANC One charged 16.50% variable and all of them no fees.
[68] The greatest difference is between Sterling Bank & Trust, secured card, charging 22% and $78 application fee to 7.99% for Pulaski Bank and Trust applying variable rate and 9.90% for fixed rate (http://www.credit.com.).
[69] These specialized issuers were Advanta, First USA and MBNA and their rates were falling as market nterest rates were going up (*Fortune* 1997).
[70]Card holders in the US gave up some of their cards and preferred to increase the credit limits on their other cards (Frazer 1985).
[71] An extreme case was the group of holders that considered that credit cards should be used only in emergency cases; in order to alter their perception "activation policies" were used.
[72] The prevailing interest rates in 1996 were around 22% and some financial institutions, mostly non banks offered as little as 9%, the Capital One (Federal Reserve System).
[73] Something already tried by T/E cards in 1960's and bankcards in beginning of 1970's in the US creating significant losses (Mandell 1990).

Chapter Seven

"...human history is determined by the eternal recurrence..."
F.Nietzsche, 'The twilight of idols", 1886

7. Conclusion

During the previous chapters, we introduced an analytical framework and model that encapsulates the many elements of the process of financial innovation. The novelty of the model is that it takes into account the integral process of financial innovation and adds concepts predominantly derived from the standard innovation theory. Furthermore, it highlights the potential for dual causality and introduces a new type of classification. Another contribution is the dynamic aspect of our model i.e. the shortcomings of existing innovations initiate further innovative activity. Finally, in order to support this model, we made a comprehensive presentation of four clusters of financial innovations: special liabilities, derivatives, securitization and plastic cards. During this chapter, we are going recapitulate the model and the supportive evidence and provide some directions for future research.

7.1 The model

We believe that in order to be able to better understand the phenomenon of financial innovation we are bound to use a more holistic and less reductionist approach than is frequently found in the innovation literature, providing information about the different stages of the innovative process.

Before discussing the model, we have to recapitulate some aspects and concepts from standard innovation theory. Remind ourselves that this is one of the contributions of our model. The available literature on innovation is extremely confusing and does not provide any definite conclusion in the form of a set of universally acceptable and coherent factors explaining the innovative activities. We therefore highlighted the

importance of factors such as the size of the financial institution, the importance of the available public and firm-specific technology, existing routines (especially for incremental innovations), research spillovers, appropriability, network externalities and strategic objectives.

In the following sub section, we shall discuss the first stage of the model, devoted to the causes of financial innovation, in the light of the detailed case studies in the last four chapters,

7.1.1 The causes of financial innovation

During this sub-section we shall discuss the diversity of causes that initialized the innovative activity of financial institutions in the US and the UK over the last thirty years. The financial burden theory (Silber 1975), provides us with a general concept that could embrace many of the causes of financial innovation. Within this concept, we are able to discern thirteen main causes and we allocated them, to two main categories: internal and external to the financial institution. There are also four causes that could be either internal or external to the institution.[1]

The mainly external causes were seven. The first two were volatility of interest rates and exchange rates observed after the abandonment of the Bretton-Woods system. This volatility was a significant reason for the emergence of Forward and Future contracts, swaps agreements and financial options. The third cause is related to the rapid economic growth that was observed during the end of the 1970's and the 1980's. Swaps, asset-backed securities such as CARS, CARDS and CCBNs are the typical examples emanating from economic growth. The next cause is related to regulative action. These

[1] We are going to use past tense, since we refer to examples of financial innovation that emerged over the last thirty years. By no means this grammatical approach, implies that our model has only a historic value. In the following sub-sections, we are going to illustrate the applicability of our model.

restrictions acted as shadow prices for financial institutions and forced them to innovate. Typical examples of this cause are NOW accounts, MMDAs, CDs, swaps and mostly in the UK ATMs, and supportive process innovations, such as SPVs and credit enhancements. The fifth cause is governmental initiative expressed under the form of special institutions backing particular financial assets. These assets were the Ginnie Maes, PCs, GMCs and CMOs, all of them related to securitization. Disintermediation is the sixth cause and the most prominent examples were the MMDAs as a response to the MMMFs, MINIs and HOMES' as a response to the heavy involvement of British banks in the mortgage business, and bank-originated credit cards as a response to Travel and Entertainment cards. The final pure external cause is competition, or the acquisition of a competitive edge, highlighting the importance of demand (Miller 1991 and Merton et al 1995). Innovation enabled greater competition (Levich 1987). Interest earnings deposit accounts in the UK, ATS, ATMs, credit and debit cards were the typical examples of that cause.

The first cause that could be either internal or external to the financial institution is the support for existing innovations. Typical financial innovations emanating from this cause are, the VaR, the SPV and credit enhancement, the POS, smart cards and ATMs. Another potential cause was liquidity enhancement. Automated Transfer Services, in the UK Certificate of Deposits, Ginnie Maes, PCs, GMCs and CMOs were examples of financial innovation emanating from that cause. A further cause was transaction costs and the most significant examples were swap agreements and financial options. The final cause from this category, was institutional requirements. Repos in the UK, SPVs and credit enhancement in the US, were the most prominent innovations, caused by these requirements.

The first purely internal cause is the institutional preferences that caused the emergence of NOW accounts, MMDAs, credit derivatives (initially), Ginnie Maes, and the British originated MINIs and HOMES. The second internal cause is the cost structure and this was the reason behind the emergence of debit cards, EFTs and EFTPOS, ATMs and Home Banking.

One significant observation that was made during the discussion of the above causes and corresponding financial innovations, referred to the fact that many financial innovations had more than one cause justifying their emergence. Amongst others, NOW accounts and MMDAs emerged due to regulation but also institutional preferences; ATS were caused by liquidity enhancement and the acquisition of competitive edge. Similarly swap agreements were caused by a mixture of regulation, market volatility and economic growth. Finally, Ginnie Mae emanated from government intervention, institutional preferences and liquidity enhancement and credit cards from a combination of disentermidiation and acquisition of competitive edge. Unquestionably there was a primary cause of larger significance such as regulation for NOWs and MMDAs or government intervention for Ginnie Mae, but other causes (probably secondary ones) also contributed to the emergence of the particular financial innovation. An additional observation is that the same innovation could have different causes in the US and the UK. Very illustrative examples were the interest bearing current account (non-uniform regulation) and the mortgage backed securities (non-uniform government intervention). The importance of these observations consists in underlining the *complexity* of the phenomenon of financial innovation and the necessity of taking into account as many factors as possible when we investigate it.

The following sub-section provides us with further detailed discussion of the factors affecting the emergence of the financial innovation, relevant to the financial

institution. The analysis continues to follow the pattern of the framework developed in chapter 2, concerning the factors which shape financial innovations, a classification of innovations, and the features which are associated with successful innovations.

7.1.2 Factors shaping financial innovative activity

During this sub-section, we shall discuss factors that contribute to the emergence of financial innovative activity. Most of these factors are related with concepts that we encountered in the standard innovation theories. Some of these factors are related with R&D relevant theories but we are not going to discuss at this stage whether R&D are important or not for the emergence of financial innovations since we are going to address this issue in the following sub-section.

The first aspect that could influence the emergence of financial innovation is existing routines. Innovations that were based on, or influenced by, routines were Futures, Super Now accounts, credit derivatives, CARS, CARDs, CCBNs and direct debit cards. All of them were incremental innovations based on existing ones. It is worth remarking that every financial instrument that follows the standardization process (Merton 1992), and further incremental innovation, was based on existing routines. The importance of existing routines is also in accordance with the evolutionary economics idea that many innovations have a cumulative characteristic (Dosi 1988) and involve path dependency (Hodgson 1995a).

Another aspect is knowledge, in-house and publicly available. The most illustrative example is the pricing of options based on the Black and Scholes and binomial models, and credit derivatives. A factor of paramount importance is technology, both institution-specific and publicly available. The following innovations are good illustrations of the impact of technology: NOW accounts, ATS, swap

agreements, financial options, CARS, CARDs, CCBNs and smart cards and Home Banking. These innovations were not feasible without the necessary information technology developments; some of them existed before such as Home Banking but their proliferation was connected with the introduction of the appropriate technology.

A further factor that shapes innovative activity is research spillovers under the more wide interpretation of benefit from existing research or innovations. Illustrative examples are NOW accounts, MMMFs, CMOs, smart cards, ATMs and secured credit cards. Research spillovers are closely associated with existing routines, when the financial institution has already undertaken research or has launched similar innovations. Creativity is another factor which is essential for the emergence of every novelty in business world, one of the most appropriate examples being credit derivatives.

Profitability is associated with appropriability (Hippel 1981); financial instruments do not have patterns and the "free rider" problem frequently occurs (Poyago-Theotoky 1996). Typical examples of even partial appropriability are options, securitized assets and credit-cards-scoring systems that confer on financial institutions intangible assets (to be discussed later). Another factor that shapes the emergence of financial innovation is positive network externalities. Typical examples of positive network externalities are Futures, swaps agreements, credit cards, smart cards and ATMs. Network positive externalities are also important for the diffusion of innovation (Katz and Shapiro 1985) and the innovator could even subsidize in order to increase network effect and shift demand upwards (Economides 1995).

Finally, strategic objectives of the financial institution could shape financial innovative activity. These objectives could be related to defending market share (NOWs), pricing policies (NOWs and MMDAs), potential cannibalisation (Super

NOWs), use of economies of scale (NOWs, MMDAs, credit card processing), particular needs of the customer (ABS), expanding to other areas of expertise (ABS), and including additional features in existing innovations (smart cards, secured credit). It is essential to mention that these strategic objectives could be additional reasons for the emergence of incremental or routine innovations based on pricing and features of existing innovations.

The financial innovative effort that we described above, taking place inside the financial institution, generates many 'mutations' or varations, not randomly but based on or guided by the prevailing conditions, structures and objectives. These variations contain information from previous endeavors or mutations and this process is a biased transmission taking into account these standards. It is essential to bear in mind that a concept of cumulativeness is also relevant, and many examples highlight this: the relation between NOW and Super NOW accounts, MMMFs and MMDAs, Forwards and Futures, financial options and credit derivatives, and Ginnie Maes and CMOs or even other ABS. This point could also be explained in terms of existing routines and spillovers in the case of incremental innovations.

In the following sub-section we shall allocate the product of the innovative activity in accordance with particular types and classification of financial innovations.

7.1.3 Types of financial innovation

During this sub-section, we shall illustrate the allocation of financial innovations according to some classifications. These classifications and potential taxonomies, enable us to describe a financial innovation in a very detailed manner, highlighting different aspects and attributes of the innovation.

The first type of classification divides financial innovation into two types: radical and incremental. A radical innovation is the creator of a cluster of innovations called incremental ones. The concept of radical innovation is closely associated with an evolutionary economics principle of 'innovation avenues' (Sahal 1985, Dosi 1988). Typical radical innovations that we encountered were NOW accounts, Forwards, financial options, swap agreements and VaR, Ginnie Maes, and partially credit cards (since they did not originally emerge in the banking sector). Incremental innovation could be endogenous to the financial firm (Richardson 1996) and a result of learning-by-doing improvements (Audretesch 1995). Product differentiation could be perceived as routine innovations (Knight 1967). The majority of innovations are incremental (Audretesch 1995) and closely associated with existing routines and learning-by-doing. Typical incremental innovations are MMDAs, Super NOW accounts, Futures, swaptions and credit derivatives, PCs, GMCs, CMOs, and other ABS as well as smart cards (since plastic and credit cards already included further non-financial aspects).

Then we used Schumpeter's definition of innovation for mainly two reasons: it encompassed all types of innovative activity i.e. product, process, structure, material and markets and, based on these definitions, it highlighted that competition through innovation enables other "external" players and potential competitors to enter the market. Schumpeter distinguished five different types of innovation and we adapted them to the financial innovative process. The first is new instruments (or products); the vast majority of our examples belong to this category. The most prominent examples were NOW and Super NOW accounts, Forwards, Futures, Options, CMOs and other ABS such as CARS, CARDS and CCBNs. The second type is new processes and illustrative examples were CC, ATS, VaR, SPVs and credit enhancement, EFTs and ATMs. The other three categories do not include so many numerous examples as the

instrument and process innovations. An example of new markets is credit derivatives; another example for new material is financial options as a completely new approach, and particularly the notion of option; and finally examples of new structures were the pricing teams or the SPV or even the processing departments of credit cards.

Many innovations could present more than one characteristic. A typical example is an option which exploits a new material, i.e. the pricing model, and is a new product or financial instrument; or a credit card could be described as both an instrument (for purchases) and process (instant loan). An extreme example is credit derivatives which include characteristics of three different types: instrument, material, market.

Our third classification allocates innovations into two groups: responsive, which is the vast majority, and exploratory ones. Before providing examples for this classification it is important to discuss the concept of exploratory innovations. We could analogize by highlighting the importance of market factors which appeared in the standard innovation literature initially from Smookler and the demand-pull economists. Extensive research (SAPPHO) provided them with satisfactory empirical results about the importance of understanding the "user's needs" for the success of an innovation. It is essential for the innovator to *know* the area (Rosenberg 1979). They proposed that a combination of both technological capabilities and user needs should be addressed, like "the two blades of a scissors" (Smookler 1966).

On the other hand, as we have already mentioned, the importance and impact of R&D for innovative activity is not universally acceptable. Some authors argued that they are positively related with innovations at a decreasing rate (Acs and Audretsch 1988), or the existence of a threshold (Symeonidis 1996). But their measure of R&D could omit the contribution of managers (Freeman 1982), since they show only formal research (Kleinknecht 1987 and Symeonidis 1996). But we circumvented the discussion of the

importance of R&D for financial institutions since we adhered to Pavitt's (1984) approach. Remind ourselves that he proposed that the diversity observed in innovative activity among sectors could be justified through the cumulative characteristic of technology and innovation. He distinguished three types: supplier dominated (little R&D), production intensive (considerable R&D) and science-based (high R&D). Financial institutions belong to the first category. The consequence is that R&D activities were neither well organized nor very intensive in comparison with other industries and only in the last years has an institutionalization of R&D activities been observed (BIS 1986). This institutionalization of Research and Development activities plus the existence of a relationship between them and the emergence of financial innovation, endogenizes the research activity of financial institutions.

As disintermidiation and evolution of the banking sector takes place, exploratory innovations emerge from these R&D departments. An exploratory innovation could in some cases be associated with types of new products, new markets, new materials or new organizational structures. The only example we encountered, and which by coincidence presents these characteristics, is credit derivatives. Despite the fact that their emergence was based on filling institutional preferences, their development showed the characteristics of an exploratory innovation. We are going to refer more to exploratory innovations at the end of this chapter. On the other hand, any innovation that was created in order to respond to any "burden" that the financial institution faces, internal or external, is a responsive innovation. A responsive innovation could be associated with a new product, process, market or organizational structure. All the financial innovations we encountered belong to this category (NOWs, MMDAs, Forwards, ABS, credit cards).

Furthermore, we could divide the existing types of financial product or organizational structure innovations according to this novelty is included in the balance sheet or is not included ("off" balance sheet). Whether typical on-balance-sheet examples are NOW and Super NOW accounts, MMDAs, CMOs and other ABS and credit cards. Example of "off" balance sheet in the strict notion are ATS, SPVs, credit enhancements, ATMs and debit cards and credit derivatives. During the discussion of financial innovations, we encountered examples of innovations that initially were OBS and later, due to regulative efforts, became "on" balance sheet as far as capital adequacy ratios were concerned. Typical examples were Forwards, swap agreement and financial options before the Basle accord (1988).

Finally due to the intermediation function, we divided financial instruments into three categories (instead of the five proposed in the BIS report in 1986): liquidity enhancing, risk transferring and credit generating. In the first category we could allocate NOW accounts, MMDAs, CMAs, ATS', Repos, ABS' and ATMs. In the second category, the transfer of risk, we allocated swap agreements, options, swaptions, credit derivatives, credit enhancement process, CMOs and other ABS. The credit generation innovations were mainly the FRAs and credit cards.

In the following sub section, we shall discuss the features of financial innovations that enable them to "survive" and become successful.

7.1.4 Successful features of innovations

During this sub-section, we shall discuss the features of a successful innovation. According to our previous chapters, we encountered seven main features that successful financial innovations include.

The first successful feature is filling the spectrum of intermediation. It is one of the most frequent features in our research. Typical examples were NOW accounts, MMDAs, financial options, swaptions and credit derivatives, Ginnie Maes, credit cards, debit cards.

The second feature of successful innovation is the enhancement of risk management. It is also one of the most frequently-cited aspects of successful financial innovation. Innovations enabled better risk management (Miller 1992) and a considerable reduction of the uncertainty that institutions faced (Bhatt 1986). Typical examples were Repos, Forwards, swaps agreements, VaRs, Ginnie Mae and credit cards and applicable new scoring systems.

Another feature is related to addressing regulatory imperfections. Very often it is of a temporal nature. Typical examples were NOW accounts, MMMFs, CMOs (tax implications) and the British CDs. Very often this regulatory imperfection ceased to exist or the market "clears up" without the need for government intervention (van Horne 1985).

A similar feature addresses market imperfections. The typical example was swap agreements (asymmetry of information) and reduction of transactions costs (Levich 1987). The fifth element is related to potential temporary monopolies. The existence of regulatory lags could encourage innovations and protect the first mover (Corkish et al 1997). But even if many researchers such as van Horne (1985), Artus and Boisseau (1988), Allen and Gale (1994) advanced this feature of successful innovation, in reality it is not common to encounter this type of temporary monopoly. The only potential examples were NOW accounts, initially in two states, and the designing and pricing of credit derivatives.

On the other hand, since the first mover advantage does not exist, then intangible advantages could apply. A very important aspect of successful innovations is the acquisition of intangible assets. Typical intangible advantages are the expertise and the reputation that accompanies it (Tuffano 1990). Typical examples were financial option pricing, issue of ABS and expertise on processing and managing credit cards, leading also to issue of affinity cards.

Finally a further successful feature is cost reduction. Typical examples of that feature were ATS, debit cards and EFTs. This feature could be associated with the overall cost structure of the institution. This is crucial for the ABS-related innovation, which significantly alters the portfolio, exposure and regulatory burden of banking institutions.

We have now summarized our conclusion as to how the numerous innovations that we encountered during the comprehensive presentation of the four clusters of financial innovations were successful applications of our financial model. We could mention that, apart from the financial model itself, the case studies themselves are offered as a further contribution of our research. In the following section, we shall discuss the dynamic nature of our model of the financial innovation process.

7.2 The dynamic nature of the model

A further key feature of our model is its dynamic and evolutionary dimension. The dynamic of thesis, antithesis, and synthesis which becomes a new thesis was explained in Kane's (1981), (1988) 'regulatory dialectic' theory. The main theme of this approach was a regulatory response such as the DIDMCA in 1980 in the US that addressed the issue of NOW accounts and the proliferation of MMMFs products.

This evolutionary approach could provide us with a more general dynamic view, where the dialectic process could be divided in four stages: the current status of the financial institution, then due to internal or external reasons an innovative process is initialized, a selection and diffusion of the financial innovation takes place and this innovation becomes part of the arsenal and routines of the institution until a new cause puts in motion again this process. The cause of this innovative activity could be one of the twelve causes already mentioned or a shortcoming, initially not anticipated, of a particular innovation.

Consequently new innovation is required in order to remedy these shortcomings. The nature of this new innovative activity could be determined by the past behavior of firms in accordance with the already-explained concept of cumulativeness. Remind ourselves that innovation is after all a "problem solving procedure" (Dosi 1988) hence this new innovation should take into account the particular characteristics of the problematic initial innovation.

Illustrative examples that we encountered during our research were, the emergence of VaR in order to reduce the risk and later the regulatory burden that financial institutions faced, due to their large amount of derivative contracts, the emergence of SPV and the credit enhancement process in order to allow securitization and the launch of ABS, and finally the creation of advanced scoring systems, smart cards and secured credit cards in order to address the shortcomings of the original credit cards. We can go even further and consider the whole phenomenon of securitization as a dynamic response to the proliferation of mortgages in the US.

During this section, we discussed the dynamic nature of our model. In the following section, we shall discuss the potential future research on related areas of financial innovative activities.

7.3 Further research

During this final section, we shall discuss potential further research that could be undertaken in relation to the phenomenon of financial innovation.

Banks have a unique role in the intermediation process and the economic development of a country. Their role is unique due to their expertise to grant, monitor and screen the credit granted (Davis 1993). The future of financial innovation is prosperous since there are areas of financial intermediation still underdeveloped (Merton 1986). Financial innovation is still not uniform to all countries (Artus and Boisseau 1988) and the next round of World Trade Organisation (WTO) negotiations is aiming to further open up financial markets. Due to market imperfections, policy or behavioural reasons, the law of one price does not apply (Levich 1987). Especially in developing countries a lot of financial innovation is expected to take place (Zahid 1995) during the process that financial systems move from government to banking and capital dominated systems (Cole and Slade 1996). Hence there is much scope for further research by extending the usage of case studies to a wider range of countries. Apart the countries' perspective, we could also try to use this model as an analytical tool for banking activities and their impact on the regional development (Chick and Dow 1988).

In addition, further research could be directed into two main areas: the financial institution and the financial system, in order to extend the reach of the model and use it to address specific questions.

It is possible to investigate whether innovative institutions are less susceptible than the rest to business cycle fluctuations as happens for non-financial firms (Geroski 1995). Another intriguing question is whether the shareholders' regime is important for the innovative effort as happens for other firms (Dosi and Orsenigo 1988). It is also

worth investigating the point that the business cycle and innovative activity are not independent and whether the innovative effort of financial institutions is affected by the profitability of the institutions.

In relation to the financial system, it is possible to investigate the diffusion of financial innovation and whether diffusion could be shaped by the concepts of profitability, scale of investment and communication with early adopters, as in the non-financial firms (Freeman 1988). It is also possible to discuss the distinction between endogenous and exogenous causes and factors (Arestis and Howells 1992) shaping the innovative activity.

Finally, it is possible in the light of these new areas for research to continue to study further our model, enriching it with other clusters of innovations such as banking assets i.e. loans and try to identify further causes, expand the classification and include additional types such as equity generating innovations (BIS 1986), and additional successful features of these innovations. It could also be possible to elaborate further and find potential interconnections among causes and particular types of innovation or discuss the concept of timing in the emergence of financial innovative activity.

Appendices (A)

Table of appendices (A)

[A-1.1] Classification of Innovations

Smith (3)	**Labour emanated**
(inventions)	**Technician emanated**
	Speculative, or combining existing technology
Veblen (2)	**Product (particular good)**
	Process (way of doing)
Schumpeter (5)	**New product**
	New process
	New market
	Exploit new material
	New Organisational structure
Pavitt (2)	**Process (used inside the sector)**
	Product (used outside the sector)
Freeman(4)	**Incremental (continuously generated)**
	Radical (discontinuous event)
	New Technological System (clusters of interrelated innovations)
	Changes in Technoeconomic system

[A-1.2] Firm's Structure and innovation

"Bigness wins"	Small and medium firms
◊ Schumpeter, from established leaders economies of scale. Galbraith, cost of innovation and structure of the new capitalist society.	
◊ Hambert (1963), large firms have higher percentage of commercialised innovations and better finance conditions.	◊ Hambert (1963),small firms due to their structure count for major innovations.
◊ Smookler (1966), the ratio of productivity over research is biased against large firms due to larger output.	◊ Freeman (1982), SAPPHO project in U.K during 1945-1976, highlighting the importance of other factors than R&D in innovative activity.
◊ Scherer (1968), large firms are the originators for most US innovations.	◊ Rothwell (1986), small and medium firms enhance the national rates of technological progress.
◊ Kamien and Schwartz (1982), highlighted the critical point on R&D investment and innovativeness.	◊ Kleinknecht (1987), formal laboratory research undermines the significance of small firms innovative activity.
◊ Cohen and Klepper (1994), R&D increase proportionally with size but large firms keep patterns.	◊ Symeonidis (1996), small firms do not undertake formal R&D hence underestimate their innovativeness.
◊ The CIS (1995) of the EU sustained the point that large firms innovate significant more than small ones.	◊ Audretsch and Feldman (1996), application of new economic knowledge is spatially concentrated.

Related studies	
♦ Arrow (1962), proposed that incentives to innovate are greater when purchasers are forming competitive market.	♦ Mansfield (1968), Large firms do not spend proportionally more than small ones.
♦ Pavitt (1984), innovation is positive associated with R&D and cumulative.	♦ Geroski (1988), competition and innovativeness are mutually re-enforcing.
♦ Acs and Audretesch (1988), innovation decreasing positive related with R&D, where concentration negative related.	♦ Dosi (1988), log-linear relationship between R&D and size and cumulative nature of innovation.
♦ Audretesch (1995), innovative activity could be incremental and alternative application of existing technology.	♦ Love and Roper (1997), highlighted the importance of transfer technologies and networking.
♦ Wood (1997), innovative activity is enhanced by R&D and technically skilled labour force.	

[A-1.3] Causes of financial innovation

Author(s)	Causes
Silber (1975)	-Reduction of Utility
Kane (1981)	-Regulation
Van Horne (1985)	-Volatility of inflation and interests -Regulatory changes -Tax changes -Technological advances -Increased economic activity -New academic work
Miller (1986)	-Taxation and Regulation -Academic qualification -Government initiated innovations -Filling the spectrum -Reduction of transaction cost
Gardener (1988)	-Technology advances -Profit opportunities from temporary monopoly
Artus /Boisseau (1988)	-Financial deregulation -Marketization, Securitization -Desintermediation -Globalisation
Ross (1989)	-Tailoring the product -Institutional arrangements
Flood (1992)	-Transaction costs -Liquidity
Arestis and Howells (1992)	-Technological change -Deregulation -Competition -Cost of intermediation
Mishkin (1992)	-Interest rates volatility -Technological advances -Avoid tax regulation -Re-regulation induced
Miller (1992)	-Volatile exchange rates -Information technology advances -Economic growth -Regulatory activity
Merton (1992)	-Demand for more complete markets -Reduction of transaction costs -Increased liquidity
Davis (1993)	-Interest rate volatility -Restrictions on banks Bal. Sheets -Disintermediation
Merton and ale (1995)	-Cost structure -Demand requirements
Ford / Molluneux (1995)	-Competition -Technological advance
Blake (1995)	-Supply and demand interaction -Cost structure

[A-1.4] Further contributions based on the BIS classification

Author(s)	Types	Factors influencing the process
BIS report (1986)	Risk transferring	Technological progress
	Liquidity enhancing	Regulatory pressure
	Credit generating	Increased financial competition
	Equity-generating	Historical /evolutionary dynamics
Levich (1987)	BIS types	Policy oriented imperfections
		Behavioral barriers imperfections
Walmsley (1988)	BIS types	Intense competition
	Aggressive (demand induced)	The impact of regulation
	Defensive (response to environment or internal causes)	Technological advances
Llewellyn (1992)	BIS types	Increased wealth
		Alterations in portfolio behavior
		Change in suppliers or users preferences
		Changes in the market environment
		Regulatory policy originated
		Spectrum filling
		Technology advances

[A-1.5] Types of financial innovations activity

Author(s)	Types
Veblen (1896)	Product
	Process
Silber (1975)	Product/practice
	Adversity/ Success
Silber (1983)	Cash management
	Investment contracts
	Market structures
	Institutional Organization
Kane (1981)	Non Monetary
	Indirect Monetary
	Monetary
Niehans (1983)	Adoptive
	Technological
BIS report (1986)	On Balance sheet
	Off Balances sheet
Walmsley (1988)	Defensive
	Aggressive
Artus /Boisseau (1988)	Cash management
	Financial indermediation instruments
	New instruments to existing markets
	Instruments to new markets
Vilas (1988)	Special Debt instruments
	Debt-equity hybrid instruments
	Special equity
	Risk covering
Tuffano (1990)	Mortgage backed
	Asset backed
	Non equity debt linked instruments
	Equity linked instruments
	Preferred stock
	Equity products

[A-1.6] Potential benefits and problems from financial innovation

Benefits	Problems
-Abnormal profits (Van Horne 1985)	-Benefits not accessible to all firms (Vinal Borges 1988)
-Positive regulation (Corkish and ale 1997)	Large volumes required to amortize (Walmsley 1988)
-Positive complementarities (Corkish and ale 1997)	-Potential duplication (Pesendorfer 1995)
-Intangible assets (Tuffano 1990)	-Negative complementarities (Pesendorfer 1995)
-Enhanced risk management (Levich 1987)	-Problematic monetary control (Mishkin 1992, Llewellyn 1992)
-Reduction of transaction cost (Allen and Gale 1984)	-Limited information about the pricing (Conrad 1989, Detemple 1990)
-Enhanced liquidity (Levich 1987)	-Systematic instability (Raines 1992)
-Reduction of intermediation cost (Llewellyn 1992)	
-Reduction of uncertainty (Bhatt 1986)	

[A-4.1] Risk Spectrum of Derivatives products

Low Risk Area -Cash market Alternatives

-Selling options

-Brokering Futures and Options

-Forward Rate Agreements (FRA)

-Forward Exchange Contracts

-Interest rate Swaps (***)

-Selling Swaptions

-Currency Swaps

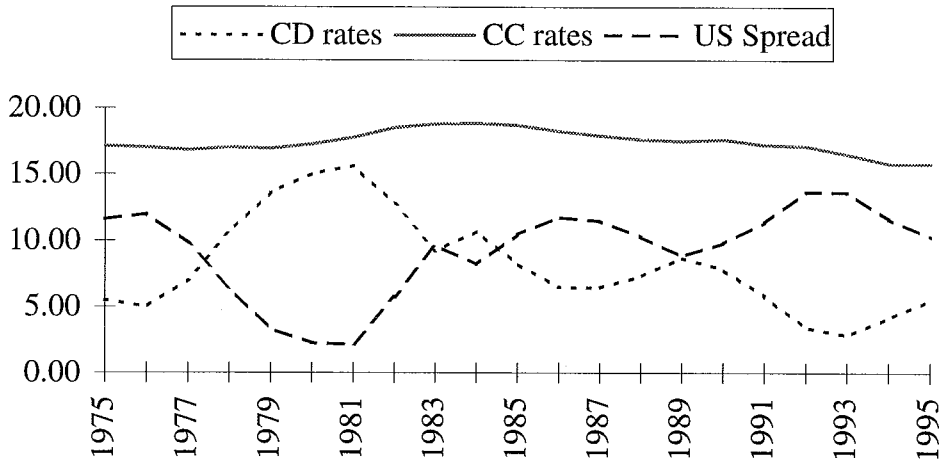
High Risk Area -Buying Options

(***)Interest Rate Swaps:

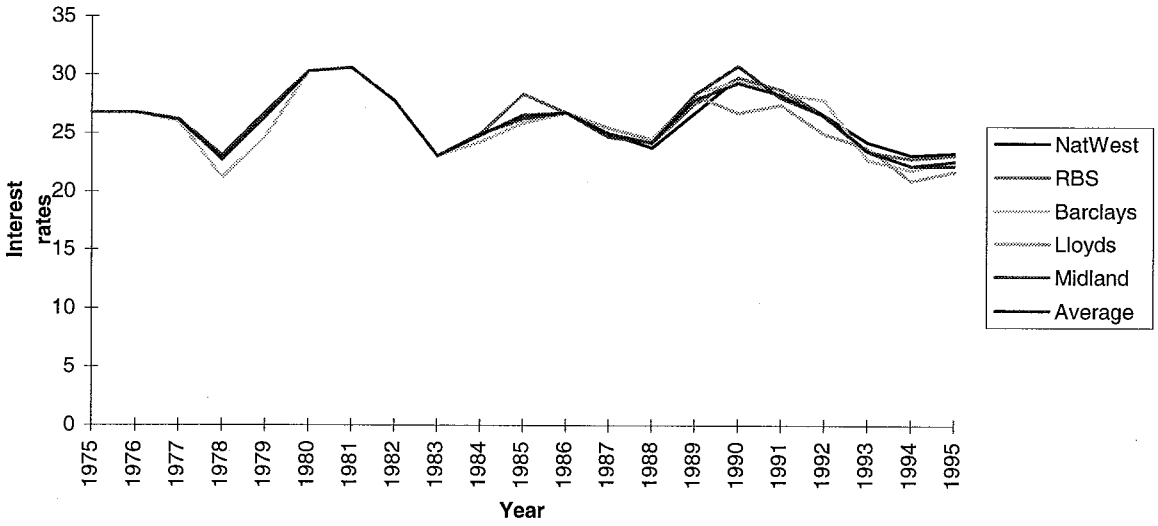
Low Risk Area
-Amortizing Swaps
-More Frequent Payments
-Zero Coupon Swaps
-Accreting Swaps

High Risk Area
-Forward Swaps

[A-6.1] Credit cards and CDs rates in the US (1975-95)

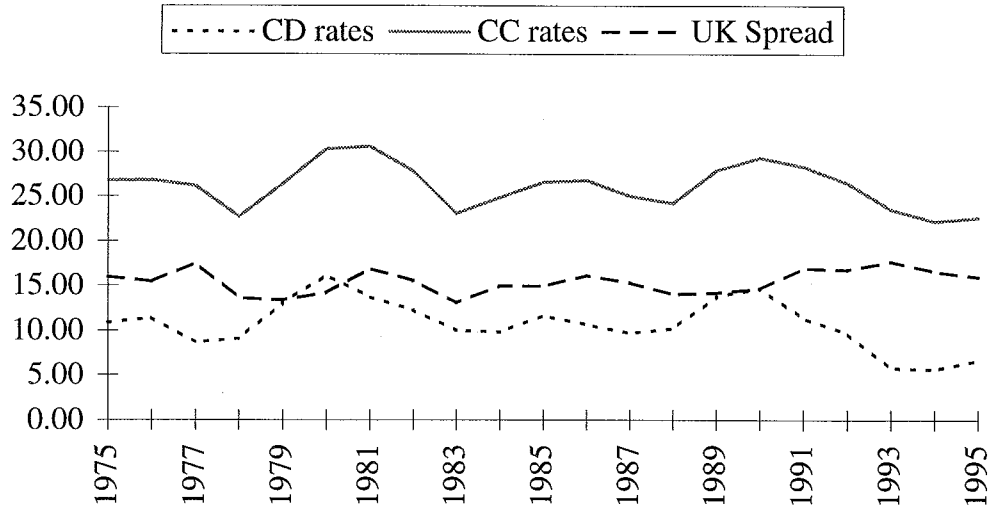


[A-6.2] Credit cards charge rates in the UK (1975-95) (%)

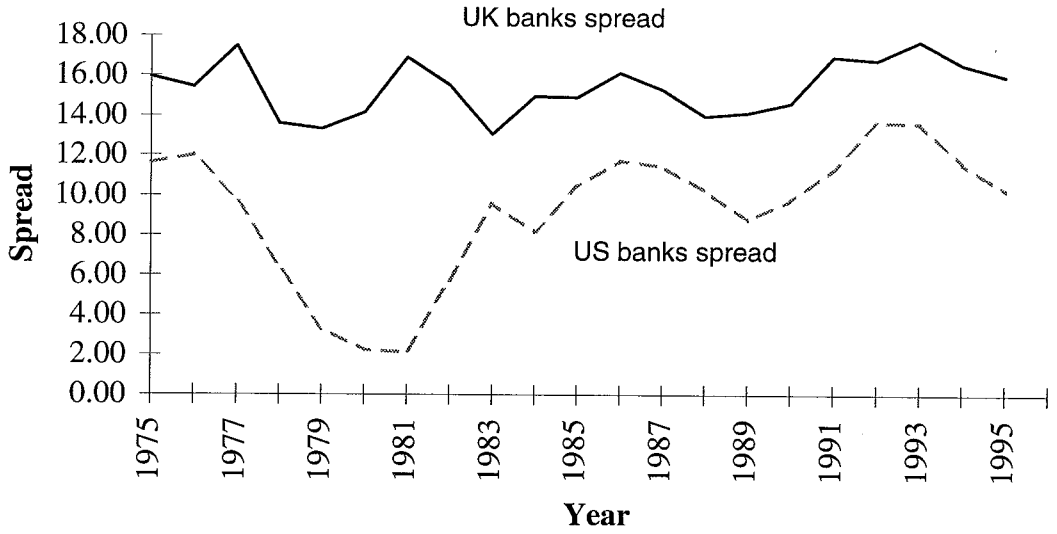


Source, ABN AMRO Bulletin, (1998)

[A-6.3] Credit cards and CDs rates in the UK (1975-95)



[A-6.4] Spread of US and UK bank credit cards



Tables (T)

List of tables (T)

[T-3.1] US Monetary aggregates during 1959-1992 (SA)

(in $ billion)

	M1				M1	M2	M3
			NOW accounts				
(Jan.)	Currency	Demand Deposits	Bank	Thrift	Total		
1959	28.5	110.0	0.0	0.0	138.9	286.6	288.8
1960	28.8	110.9	0.0	0.0	140.0	298.2	300.1
1961	28.7	112.0	0.0	0.0	141.1	314.1	317.1
1962	29.4	115.5	0.0	0.0	145.2	337.5	343.0
1963	30.4	117.4	0.0	0.1	148.3	365.2	374.2
1964	32.3	121.0	0.0	0.1	153.7	395.2	408.5
1965	34.0	126.1	0.0	0.1	160.7	427.5	445.8
1966	36.2	132.2	0.0	0.1	169.1	462.0	485.1
1967	38.2	133.0	0.0	0.1	171.9	481.6	509.1
1968	40.2	143.1	0.0	0.1	184.0	527.1	560.1
1969	43.1	154.7	0.0	0.1	198.7	569.3	607.9
1970	46.0	159.3	0.0	0.1	206.2	589.6	616.1
1971	48.9	165.6	0.0	0.1	215.5	633.0	685.6
1972	52.3	176.6	0.0	0.2	230.1	717.7	783.8
1973	56.6	193.4	0.0	0.3	251.5	810.3	896.3
1974	61.3	200.7	0.0	0.4	263.8	859.7	993.9
1975	67.4	204.2	0.1	0.4	273.8	906.5	1076.1
1976	73.2	212.2	0.4	0.6	288.6	1027.2	1182.5
1977	80.2	223.4	1.4	1.5	309.1	1166.7	1324.2
1978	88.0	239.5	1.9	2.4	334.8	1280.9	1487.4
1979	96.8	248.6	6.8	3.2	358.8	1372.7	1657.3
1980	106.0	258.8	13.1	4.3	385.7	1483.6	1819.0
1981	115.4	248.4	34.9	9.0	411.6	1608.5	2016.0
1982	123.3	234.2	65.5	16.3	443.4	1772.6	2265.2
1983	133.6	234.1	80.5	25.5	477.7	1965.5	2476.3
1984	147.3	240.2	97.6	35.2	525.0	2143.2	2702.6
1985	157.0	244.6	106.2	46.3	556.2	2337.3	3004.9
1986	168.6	265.0	126.0	55.7	620.9	2507.3	3221.6
1987	182.1	299.3	166.7	75.9	730.1	2750.0	3511.4
1988	197.9	289.9	180.7	81.9	757.1	2855.3	3698.3
1989	213.2	285.0	192.4	88.4	786.0	2999.8	3920.3
1990	224.4	278.1	198.5	87.3	795.3	3173.1	4072.5
1991	251.1	273.5	209.4	84.8	826.7	3293.4	4150.3
1992	268.9	295.9	245.4	92.1	910.0	3388.1	4189.6

Source, Federal Reserve System

[T-3.2] MMMF and other accounts in the US (1959-1992)(SA)

(in $ billion)

(Jan.)	MMMF						
	Retail	Institutions	Total	Eurodollar	RPs	Banker's Accept.	CPs
1959	0.0	0.0	0.0	0.7	0.0	0.6	3.1
1960	0.0	0.0	0.0	0.7	0.0	0.6	3.9
1961	0.0	0.0	0.0	0.9	0.0	0.9	5.1
1962	0.0	0.0	0.0	1.5	0.0	1.1	5.4
1963	0.0	0.0	0.0	1.7	0.0	1.1	6.8
1964	0.0	0.0	0.0	2.0	0.0	1.2	7.7
1965	0.0	0.0	0.0	2.4	0.0	1.3	9.2
1966	0.0	0.0	0.0	1.8	0.0	1.6	10.3
1967	0.0	0.0	0.0	2.2	0.0	1.8	15.1
1968	0.0	0.0	0.0	2.3	0.0	1.9	18.5
1969	0.0	0.0	0.0	2.8	0.0	2.4	22.7
1970	0.0	0.0	0.0	3.0	4.4	3.3	35.6
1971	0.0	0.0	0.0	2.3	3.2	3.6	33.8
1972	0.0	0.0	0.0	3.0	4.8	3.8	33.1
1973	0.0	0.0	0.0	4.2	7.5	3.4	35.3
1974	0.1	0.0	0.1	5.8	13.3	5.2	44.8
1975	2.1	0.2	2.3	8.5	13.8	13.1	50.5
1976	2.8	0.4	3.2	11.7	15.9	10.8	47.8
1977	2.4	0.7	3.1	15.0	24.2	11.5	52.4
1978	2.7	1.2	3.9	22.7	33.5	14.5	64.8
1979	8.0	3.7	11.7	36.1	46.2	22.2	82.1
1980	39.2	11.0	50.2	52.3	46.2	27.3	100.8
1981	65.9	16.6	82.5	59.1	60.1	32.4	99.1
1982	158.0	37.9	195.9	81.2	66.4	40.4	106.6
1983	171.4	47.6	219.0	90.3	70.4	45.0	111.9
1984	139.4	42.0	181.4	100.2	95.1	44.1	136.4
1985	172.9	64.4	237.3	96.1	104.7	45.3	161.3
1986	179.5	66.7	246.2	95.8	120.2	42.5	208.0
1987	211.8	83.9	295.7	107.7	146.7	37.8	237.0
1988	228.7	94.9	323.6	105.8	176.3	43.2	270.8
1989	247.6	92.2	339.8	115.1	188.9	39.8	341.8
1990	326.6	111.3	437.9	92.2	156.9	41.0	342.1
1991	365.0	146.5	511.5	90.8	135.8	35.1	362.0
1992	369.1	191.0	560.1	78.1	119.6	23.0	333.4

Source, Federal Reserve System

[T-3.3] US banks liabilities (1959-1992) (SA)

(in $ billion)

	MMDAS		Savings		Small Time		Large Time	
(Jan.)	**Banks**	**Thrift**	**Banks**	**Thrift**	**Banks**	**Thrift**	**Banks**	**Thrift**
1959	0.0	0.0	51.8	84.2	9.4	2.3	1.6	0.0
1960	0.0	0.0	54.5	92.1	9.0	2.6	1.2	0.0
1961	0.0	0.0	58.8	101.5	9.8	2.9	2.2	0.0
1962	0.0	0.0	64.6	112.0	11.9	3.8	4.1	0.0
1963	0.0	0.0	71.8	124.5	15.9	4.7	7.3	0.0
1964	0.0	0.0	77.1	138.5	20.1	5.8	11.3	0.0
1965	0.0	0.0	83.7	153.2	23.0	6.9	15.9	0.0
1966	0.0	0.0	92.5	165.1	27.4	7.9	21.4	0.0
1967	0.0	0.0	89.6	163.1	39.7	17.4	25.3	0.0
1968	0.0	0.0	94.3	168.9	51.7	28.1	30.7	0.0
1969	0.0	0.0	96.1	172.6	64.3	37.7	35.8	0.0
1970	0.0	0.0	93.7	169.0	71.3	49.3	19.1	0.0
1971	0.0	0.0	99.8	163.8	80.2	73.6	46.3	0.8
1972	0.0	0.0	114.1	180.6	95.5	97.4	56.7	1.6
1973	0.0	0.0	125.0	197.7	110.3	125.9	71.8	2.5
1974	0.0	0.0	128.6	198.9	117.5	150.8	111.4	3.7
1975	0.0	0.0	137.7	203.3	123.6	165.9	141.4	5.6
1976	0.0	0.0	164.8	229.5	142.9	198.7	120.8	6.4
1977	0.0	0.0	205.4	253.7	156.8	239.3	109.8	7.8
1978	0.0	0.0	219.7	274.9	168.4	280.4	138.4	10.7
1979	0.0	0.0	212.8	259.8	189.2	344.1	181.3	17.3
1980	0.0	0.0	192.5	224.7	240.0	401.5	192.0	33.7
1981	0.0	0.0	177.3	204.9	296.7	452.0	225.5	46.2
1982	0.0	0.0	159.7	186.8	350.9	473.8	252.3	54.8
1983	113.4	76.2	264.2	257.3	356.9	438.0	242.0	60.4
1984	232.1	150.2	364.3	321.2	353.8	439.4	220.4	101.4
1985	277.8	158.0	399.6	320.6	386.9	501.0	252.9	149.5
1986	333.7	183.5	459.0	358.2	388.4	501.2	279.1	152.4
1987	378.7	196.7	539.5	412.6	368.4	487.5	273.8	149.2
1988	356.8	168.4	536.4	400.1	395.3	537.8	301.8	164.1
1989	346.9	148.7	537.2	379.1	460.4	589.7	349.1	175.2
1990	355.9	132.1	548.1	352.5	535.7	614.9	379.3	159.6
1991	379.8	126.5	585.0	342.1	615.3	559.3	365.8	118.0
1992	*411.3*	*135.2*	677.6	387.4	589.8	454.2	330.8	82.1

Source, Federal Reserve System

[T-3.4] US banks assets and liabilities (1973-1996)(SA)

(in $ billion)

	Domestic Commercial Banks			All Commercial Banks		
(Jan.)	Assets	Liabilities	Capital	Assets	Liabilities	Capital
1973	703.6	639.9	63.7	722.6	660.9	61.7
1974	804.0	735.9	68.1	830.5	764.8	65.7
1975	870.2	792.6	77.6	903.8	830.0	73.8
1976	909.6	827.5	82.1	945.8	868.1	77.7
1977	977.2	893.6	83.6	1017.9	940.7	77.2
1978	1078.7	991.0	87.7	1130.1	1051.1	79.0
1979	1210.3	1107.0	103.3	1283.9	1196.2	87.7
1980	1355.0	1232.4	122.6	1452.0	1347.6	104.4
1981	1479.9	1363.7	116.2	1608.9	1515.0	93.9
1982	1594.5	1474.6	119.9	1729.6	1608.5	121.1
1983	1746.9	1632.0	114.9	1881.8	1764.6	117.2
1984	1903.3	1757.1	146.2	2031.7	1879.0	152.7
1985	2065.4	1900.9	164.5	2211.8	2040.1	171.7
1986	2278.9	2091.2	187.7	2438.9	2243.9	195.0
1987	2475.8	2268.4	207.4	2680.6	2463.6	217.0
1988	2534.8	2339.4	195.4	2769.9	2572.6	197.3
1989	2696.0	2495.5	200.5	2960.0	2758.4	201.6
1990	2863.6	2653.1	210.5	3164.9	2952.6	212.3
1991	2941.7	2709.3	232.4	3291.3	3058.4	232.9
1992	3011.6	2764.0	247.6	3401.5	3154.5	247.0
1993	3053.5	2770.1	283.4	3475.9	3190.1	285.8
1994	3235.2	2940.0	295.2	3657.9	3363.9	294.0
1995	3452.4	3139.1	313.3	3909.5	3597.5	312.0
1996	3695.5	3354.9	340.6	4245.6	3893.9	351.7

Source, Federal Reserve System

[T-3.5] Monetary Aggregates of the UK (1968-1996) (SA)

(in million pounds)

Q4	Coins/Notes	M1*	M1**	M2	M3	M3**	M4
1968	2859	N/A	8620	N/A	N/A	17900	N/A
1969	3006	N/A	9430	N/A	N/A	20280	N/A
1970	3320	N/A	10940	N/A	N/A	25690	27009
1971	3589	N/A	12320	N/A	24890	33040	31400
1972	4079	N/A	13120	N/A	31610	37230	38674
1973	4377	N/A	14550	N/A	34840	37080	47119
1974	5085	N/A	15170	N/A	35730	38080	52197
1975	5904	9724	17340	N/A	37200	40170	58983
1976	6714	10258	19150	N/A	40570	44540	64970
1977	7699	12691	23330	N/A	44660	48940	74595
1978	8733	14660	26860	N/A	51100	56150	85770
1979	9511	16026	29300	N/A	57640	63140	97700
1980	10239	16218	30490	N/A	68560	75110	114600
1981	10767	17781	35700	N/A	85270	95550	138200
1982	11232	19438	40130	124840	93550	106680	155000
1983	11908	21622	44700	140120	103360	120190	175600
1984	11543	23921	51560	156764	111957	132904	199700
1985	12071	24339	60960	176376	126976	147120	214700
1986	12824	28088	74694	199257	151147	179749	246300
1987	13592	31427	91866	219345	185623	216401	286300
1988	14756	35823	105048	255241	223674	257209	336100
1989	14877	31800	114388	270675	246312	288104	398800
1990	18172	N/A	N/A	308514	N/A	N/A	461000
1991	18643	N/A	N/A	334871	N/A	N/A	495800
1992	19233	N/A	N/A	372317	N/A	N/A	515900
1993	20361	N/A	N/A	393741	N/A	N/A	533100
1994	21702	N/A	N/A	409693	N/A	N/A	557300
1995	22996	N/A	N/A	436220	N/A	N/A	599200
1996	24556	N/A	N/A	458433	N/A	N/A	658000

M1* : Coins plus sight deposits (from 1975)
M1** : Note , coins ,sight deposits plus interest bearing
M2 : Notes plus no-interest bearing deposits plus other banks retail deposit and building societies deposits (M2 was published from 1992 until 1996)
M3 : Bank deposits in sterlings
M3** : M3 plus UK deposits in other currencies
M4 : Deposits in banks and building societies (started from 1989)

(-) In 1972 M1 and M3 breakdown published, in 1989 was discontinued
(-) In 1990 M5 was introduced but very soon was discontinued
(-) From 1991 only M2 and M4 are used as monetary indicators
(-) From 1992, an analysis of M4 components was published

Source, Bank of England, Quarterly Bulletin

[T-3.6] UK assets and liabilities (1975-1992)

(in million pounds)

Year	Cd's	Sight	Time	Advances
1975	1763	11090	19681	17523
1976	1900	12370	20922	19466
1977	2530	15177	22022	21439
1978	2256	17747	24448	25496
1979	2272	20936	29968	30981
1980	2754	19989	37835	37294
1981	2827	22630	45045	46014
1981	*3355*	*24935*	*47303*	*48891*
1982	5443	29990	60830	61816
1983	6204	34477	63905	70152
1984	6692	40200	67174	77679
1985	7400	51722	75394	90933
1986	9386	68162	89788	109585
1987	13489	79495	103025	132977
1988	14502	90206	127621	168771
1989	13398	107863	149993	200712
1990	18003	115820	169175	221594
1991	21177	141199	184341	263521
1992	22186	148169	184226	270172

(+) The figures are end December
(*) In 1981 the monetary aggregates were redefined

Source, Abstract of banking and financial statistics

[T-3.7] Interest rates in the UK (1970-1994)

Dec	Base Rate	7 day deposit rate	Sterling certificates of deposit 3 months	Treasury bill tender 91 day bills	Minimum Lending Rate
1970	7.00	5.00	7.25	6.82	7.00
1971	4.50	2.50	4.69	4.36	5.00
1972	7.30	5.75	8.74	7.76	9.00
1973	13.00	9.50	16.00	12.46	11.50
1974	12.00	9.50	13.15	10.99	11.50
1975	11.00	7.00	11.06	10.82	11.25
1976	14.00	11.00	14.26	13.78	14.50
1977	7.05	4.00	6.77	6.37	7.00
1978	12.50	10.00	12.27	11.57	12.50
1979	17.00	15.50	16.75	15.90	17.00
1980	14.00	11.71	14.64	13.07	14.00
1981	14.57	12.52	15.28	14.51	14.38
1982	10.06	6.81	10.49	9.96	10.00
1983	9.00	5.50	9.05	8.87	9.00
1984	9.69	6.63	9.92	9.10	9.50
1985	11.50	9.12	11.85	11.15	11.37
1986	11.00	8.15	11.24	10.66	10.87
1987	8.57	5.36	8.65	8.19	8.37
1988	13.00	8.29	12.38	12.54	12.87
1989	15.00	11.51	15.08	14.50	14.87
1990	14.00	10.74	13.69	12.96	13.87
1991	10.50	7.54	10.67	10.10	10.37
1992	7.00	3.55	7.02	6.39	6.87
1993	5.50	3.04	5.23	4.87	5.37
1994	6.15	3.14	6.25	5.87	6.12

(*) In 1972 the Bank rate became MLR, in 1982 it changed to Min. Band 1Dealing rate

Source, Bank of England

[T-3.8] UK financial institutions balance sheets (1971-1994)

(in million pounds)

Years	BS	Top five	All	Concentration	Percent (all)
1971	N/A	24892	25849	0.963	N/A
1972	15246	31363	32509	0.965	0.469
1973	17545	42361	43878	0.965	0.400
1974	20094	49683	52009	0.955	0.386
1975	24204	54553	57425	0.950	0.421
1976	28202	63626	78039	0.815	0.361
1977	34288	71985	88166	0.816	0.389
1978	39538	80567	99685	0.808	0.397
1979	45789	101994	126314	0.807	0.363
1980	53793	122994	151127	0.814	0.356
1981	61815	163872	199510	0.821	0.310
1982	73033	199574	241605	0.826	0.302
1983	85869	219978	268993	0.818	0.319
1984	102689	257273	308414	0.834	0.333
1985	120763	254624	309325	0.823	0.390
1986	140603	279922	341466	0.820	0.412
1987	160097	287361	352766	0.815	0.454
1988	188844	332522	400574	0.830	0.471
1989	187012	391402	469242	0.834	0.399
1990	216848	405550	488305	0.831	0.444
1991	243980	415862	502154	0.828	0.486
1992	262515	488414	590803	0.827	0.444
1993	281152	512582	622561	0.823	0.452

B/S : Building Societes
Top Five : Barclays, Lloyds,Midland,Natwest and the RBS
All : All clearing banks
Concentration : Top five banks / All banks
Percent (all) : Building Societies / All, banks

Source, Abstract of banking financial statistics

[T-3.9] Profits of the UK banks during the period 1971-1992

Year	Million	Change	Banks behavior
1971	301		
1972	411	36.54%	**Tandem**
1973	623	51.58%	**Tandem**
1974	523	-16.05%	**Tandem**
1975	468	-10.52%	**Tandem**
1976	756	61.54%	**Tandem**
1977	977	29.23%	**Tandem**
1978	1167	19.45%	**Tandem**
1979	1668	42.93%	**Tandem**
1980	1577	-5.46%	**Tandem ex.L/R**
1981	1751	11.03%	**Tandem**
1982	1560	-10.91%	**Tandem ex.M**
1983	1758	12.69%	**Tandem ex.M**
1984	2010	14.33%	**Tandem ex.M**
1985	2829	40.75%	**Tandem**
1986	3283	16.05%	**Tandem**
1987	517	-84.25%	**Tandem ex.R**
1988	4752	819.15%	**Tandem**
1989	313	-93.41%	**Tandem**
1990	2679	755.91%	**Tandem**
1991	1421	-46.96%	**Tandem ex.M**
1992	1134	-20.20%	**Tandem ex.L/M/N**

L: Lloyds
R: Royal Bank of Scotland
M: Midland
N: Natwest
B: Barclays

Source, Abstract of banking financial statistics

[T-4.1] Exchange - traded and Over the Counter Derivatives

(in $ trillion)

	1986	1988	1990	1992	1994
Over the Counter instruments	**0.8**	**2.6**	**5.0**	**8.0**	**15.1**
-Currency	0.1	0.45	0.6	1.2	1.4
-Interest rates	0.7	1.8	4	5.8	13.8
**swaps*	*0.4*	*1*	*2.25*	*3.8*	*9*
**FRA'S*	*0.3*	*0.5*	*1.2*	*1.8*	*3.8*
**swaptions*	-	*0.3*	*0.55*	*0.6*	*1.3*
-Equity	-	0.05	0.2	0.4	0.5
Exchange traded instruments	**0.7**	**1.2**	**2.1**	**2.5**	**4.1**
Total	**1.5**	**3.8**	**7.1**	**10.5**	**19.2**

*(International Swap dealer association)

Source, FRBNY Quarterly Review Winter 1992-1993 and updated by the author from FRBS, internet address

[T-5.1] Securitized assets in the US (1987-1994)

(in $ billion)

Year	Consumer credit	Business loans	Trade receivables	Total
1987	-	-	5.1	5.1
1988	-	-	6.8	6.8
1989	48.7	2.0	8.0	60.2
1990	78.5	5.8	9.2	93.7
1991	103.3	8.8	11.3	123.7
1992	121.4	11.6	13.8	155.5
1993	130.7	21.3	15.2	155.6
1994	139.4	23.3	18.0	180.7

Source, OECD (1995)

[T-5.2] Securitized assets in the US (1989 - 1998)

(in $ million and not seasonally adjusted)

Year	Automobile	Revolving	Other	Total
(Jan)				
1989	14,903	10,773	3,456	29,132
1990	17,294	22,850	6,944	47,088
1991	24,785	45,221	8,009	78,015
1992	31,452	63,426	10,023	104,901
1993	33,485	73,802	10,836	118,123
1994	38,020	79,321	10,771	128,112
1995	35,033	97,548	13,533	146,114
1996	42,585	151,640	19,639	213,864
1997	48,659	194,549	25,303	268,511
1998	63,066	221,805	26,275	311,146

Source, Federal Reserve Statistical Release

[T-5.3] Mortgages providers in the US (1980-1994)

Year	Resint Total ($ bil)	Comm Banks (%)	S&L (%)	Pools & Trusts (%)	Comm Total ($ bil)	Comm Banks (%)	S&L (%)	Life Insur. (%)
1980	965	16.6	50.5	12.6	256	31.6	24.1	31.6
1981	1040	16.4	48.2	13.6	276	32.6	22.9	31.8
1982	1082	16.1	42.3	17.8	302	33.9	22.0	31.0
1983	1200	15.2	40.2	21.6	355	33.9	23.5	29.3
1984	1335	14.7	39.6	22.7	421	36.3	24.9	26.4
1985	1505	14.2	36.8	25.4	487	37.2	23.8	26.2
1986	1707	13.8	32.7	30.4	561	39.7	21.6	26.6
1987	1936	14.2	31.1	33.8	663	40.6	22.8	25.1
1988	2169	15.4	31.0	33.4	703	41.3	20.1	26.7
1989	2409	16.2	27.8	35.0	754	42.7	17.8	27.2
1990	2615	17.4	22.9	37.9	758	44.1	14.4	28.4
1991	2778	17.4	19.4	40.7	759	44.4	11.4	28.2
1992	2954	17.2	16.6	42.3	714	46.1	9.6	27.8
1993	3146	17.7	15.0	42.1	700	46.4	8.9	26.8
1994	3339	18.3	14.2	42.7	696	47.9	7.8	24.6

Resint : Residential
Comm : Commercial

Source, OECD (1995)

[T-5.4] Net Mortgage lending in the UK (1972-1992)

(in million pounds)

Year (Dec)	Banks	Building Societies	Total	Banks (%)
1972	345	2215	2560	13.48
1973	310	1999	2309	13.43
1974	90	1490	1580	5.70
1975	60	2768	2828	2.12
1976	80	3618	3698	2.16
1977	120	4100	4220	2.84
1978	276	5112	5388	5.12
1979	597	5269	5866	10.18
1980	593	5715	6308	9.40
1981	2448	6323	8771	27.91
1982	5078	8133	13211	38.44
1983	3531	10904	14435	24.46
1984	2043	14530	16573	12.33
1985	4223	14627	18850	22.40
1986	5200	19427	24627	21.12
1987	10104	14917	25021	40.38
1988	10879	23720	34599	31.44
1989	7034	24002	31036	22.66
1990	6400	24140	30540	20.96
1991	4790	20927	25717	18.63
1992	6485	13612	20097	32.27

Source, Abstract of Banking and Financial Statistics

[T-5.5] MBS and ABS issues in the UK (1987-1994)

(in million pounds)

Year	Residential Mortgages	Lease Receivables	Auto Receivables	Total
1987	1000	-	-	1000
1988	3301	-	-	3301
1989	2427	-	-	2427
1990	2246	-	328	2574
1991	2759	-	450	3209
1992	298	563	200	1293
1993	913	165	294	2266
1994	2563	88	-	3375

Source, OECD (1995)

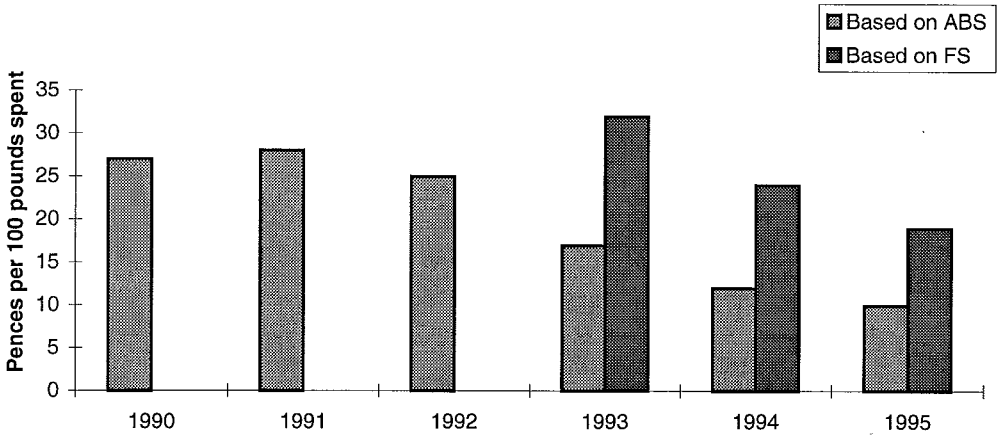
[T-5.6] Originators of ABS in the UK (1987-1994)

(in million pounds)

Year	Centralized lenders	Banks	Leasing Companies	Total
1987	900	100	-	1000
1988	2106	735	-	3301
1989	1777	475	-	2427
1990	1771	803	-	2580
1991	2219	-	450	3209
1992	360	370	563	1293
1993	463	1637	165	2266
1994	562	2538	88	3375

Source, OECD (1995)

[T-6.1] Card fraud in the UK (1990-95)



Year	Fraud only in bank (cc)**	Fraud (total)**	Outstanding*	Lending**	Lending*	Outstanding (%)
1990	76	125.6	9012	27742	(^)	------
1991	81.2	165.6	9786	29350	(^)	------
1992	76.7	165	9888	31272	(^)	------
1993	57.6	129.8	10461	33508	41039	25%
1994	43.5	96.8	11914	37330	41387	29%
1995	40	88	13836	39450	47697	29%

(in million pounds)

**: Figures from Financial Statistics and Quarterly Report of Bank of England*
(^): Figures before 1993 were not available from the QRBE or the Bank of England
***: Figures from Abstract of Banking Statistics*

[T-6.2] Branches and ATM networks in the UK

Year	Branches		ATMs	
	Banks	Building Societies	Banks	Building Societies
1974	14543	3099	1390	-----
1975	14483	3375	1768	-----
1976	14477	3696	1876	-----
1977	14460	4130	2156	-----
1978	14271	4595	2140	-----
1979	14735	5147	2141	-----
1980	14702	5684	2422	-----
1981	14718	6162	3065	-----
1982	14671	6480	3869	6
1983	14492	6643	5347	112
1984	14361	6816	6172	291
1985	14289	6926	7702	652
1986	14008	6954	8625	1286
1987	13813	6962	9885	2072
1988	13702	6912	11003	2654
1989	13467	6236	12390	2578
1990	12994	6051	13283	2921
1991	12306	5921	13572	3344
1992	11751	5765	13863	3531
1993	11445	5654	14094	3677
1994	11078	-----	14606	------

Annual Abstract of Banking statistics (1996)

[T-6.3] Consumer Revolving Credit in the US (1968-96)

(in $ million and not seasonally adjusted)

(Jan)	Commercial	Finance	Credit Unions	S&L	No-Finance
1968	1,401	-	-	-	-
1969	2,271	-	-	-	-
1970	3,907	-	-	-	-
1971	5,142	-	-	-	2,402
1972	5,915	-	-	-	2,552
1973	7,260	-	-	-	2,512
1974	9,274	-	-	-	2,517
1975	11,204	-	-	-	2,642
1976	12,382	-	-	-	2,731
1977	14,328	-	-	-	17,883
1978	18,644	-	-	-	20,151
1979	24,746	-	-	-	23,054
1980	29,801	-	-	-	26,363
1981	29,705	-	-	25	27,991
1982	32,542	-	-	341	30,541
1983	36,313	-	-	877	31,744
1984	43,118	-	67	1,713	36,616
1985	61,445	295	1,021	3,640	39,306
1986	79,308	2,875	1,704	6,185	40,275
1987	87,800	5,455	3,704	7,788	39,735
1988	103,981	8,035	4,423	8,848	43,047
1989	114,143	10,615	4,706	8,666	40,707
1990	128,481	13,195	5,050	7,037	41,288
1991	127,083	15,775	5,268	7,861	42,162
1992	133,939	18,355	7,504	8,266	38,930
1993	130,079	20,935	9,547	9,838	41,961
1994	146,196	23,515	11,111	10,058	47,879
1995	178,655	26,095	13,071	9,191	53,840
1996	200,080	28,675	15,223	8,532	50,520

Source, Federal Reserve System

[T-6.4] Employment in the UK banking sector during the period 1974 -1994

Year	Members of BBA	Part time	Building Societies
1974	265900	-----	32685
1975	273800	-----	34949
1976	274500	-----	37377
1977	279300	-----	41089
1978	292100	-----	44932
1979	297600	-----	49170
1980	315800	-----	52727
1981	322200	-----	55377
1982	347500	-----	58149
1983	342600	-----	61192
1984	346100	-----	63114
1985	350800	-----	65691
1986	372200	36600	69266
1987	391200	38700	74294
1988	417100	41100	80117
1989	427400	46700	74604
1990	444800	49300	76382
1991	430300	49300	79180
1992	406200	48200	79403
1993	382800	48700	106907
1994	371100	50500	-----

Annual Abstract of Banking statistics (1996)

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