SECURITIZATION AND THE GLOBAL MARKET

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ABSTRACT

'Securitization and the Global Market' presents a thorough investigation into the evolution of securitization and its adaptation to the international market. Additionally, we provide some insight into its future applications. Securitization is a relatively new form of financial intermediation, which allows the three functions of financing — origination, funding and servicing — to be separated and each placed with the most efficient provider. Since this method of financing promotes efficiency in the financial markets, it has shown remarkable growth in the United States, United Kingdom, Canada, France and Australia.

The thesis explains how mortgage-backed securitization evolved in the United States and how this method of housing finance is being integrated into international markets. Additionally, we explain how securitization is used to fund receivables other than mortgages.

Because we address cross-currency transactions, we also discuss foreign exchange rate risk management by reviewing the history, development and application of financial products used in hedging various risks. Also a review of mortgage-prepayment modelling is presented, because prepayment creates the most uncertainty in the cash flow that is to be hedged.

Using the evidence presented in this thesis, the final chapter argues for the creation of a multicurrency sterling collateralised mortgage obligation. This product can serve to aid the development of the global market via securitization — a proven method of financial intermediation.

DEDICATIONS

I would first like to thank the staff of The London School of Economics and Political Science for allowing me the opportunity to study at such a magnificent institution. It will be an experience I shall cherish for the rest of my life. Next, I want to thank my supervisor and friend, Dr. Michael J.P. Selby, for guiding me up a learning curve that resembled Mount Everest. Without his support, encouragement and non-yielding persistence, these pages would still be blank.

I would like to dedicate this thesis to the memory of my father:

JOSEPH MONROE SMALLMAN

and to my family:

Angelyn Marie Keller-Smallman — a loving wife who inspires me to become the best I can be.

Ann Gordon Dempster Smallman — for the love and support that can only come from a mother.

Janet Kittral Smallman — a sister who has always believed in her little brother

Amber Kristen and Morgan Lee Smallman — loving daughters who understood and supported their father's dreams.

Elliott Heath — a friend who has filled in for my father.

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CHAPTER 1
INTRODUCTION

The purpose of this thesis is to provide the reader with a thorough understanding of securitization and its potential application in developing the global market. Securitization is a relatively new form of financial intermediation which was developed in the United States and is currently being used in most industrialized nations. As this method of financial intermediation evolves, it will enhance the efficiency of the global market. Securitization isolates the three functions of financial intermediation — origination, servicing and funding — and allows each to be handled by the most efficient provider. Just as securitization has excelled in the United States by serving as an efficient conduit for transferring funds across state borders, so can it serve as an effective method of transferring funds between nations.

To show how this process works, we develop an hypothetical instrument that we call a multicurrency collateralised mortgage obligation. At the time of writing, multicurrency securitization instruments do not exist, but we shall argue for their creation. This study focuses on just one instrument, but the methodology presented is not limited to UK mortgage-backed securities. Our model could be applied to any type of securitized debt instrument, regardless of the country of origin or type of underlying security. For illustrative purposes, we have chosen the UK because this country's mortgage-backed securities market represents the largest and fastest-growing market in Europe.

The multicurrency aspect of this research is used to derive a cost-effective hedge against the risk of fluctuations in the foreign exchange rate. Once funds are allowed to flow

freely across national boundaries without foreign exchange rate risk, multinational securitized products could be developed. This study provides a method of financing that can serve as a conduit to enhance the efficiency of global financial markets. Market efficiency is enhanced when a financial instrument is capable of tapping multiple capital markets without exposing investors or underwriters to exchange rate risk. Additionally, we have found that there is a lack of research on hedging long-term stochastic[1] cash flow, and our thesis will expand this body of knowledge.

The dissertation is divided into ten chapters, this chapter being the introduction. Chapter 2 examines the origin of the mortgage-backed security (MBS), reviewing its history and development in the United States of America. Chapter 3 discusses the global development of MBS, reviewing the countries that have adopted them and showing how social norms have been integrated into the MBS structure. Chapter 4 explains how this method of financial intermediation has expanded to include other products. Once we have established the significance of securitized debt instruments in the international financial community, Chapter 5 will review the history and development of the futures markets. This chapter gives the reader a fundamental understanding of the elements used to develop the foreign exchange rate hedging instruments that are reviewed in Chapter 6. Next, problems in hedging MBS are discussed in Chapter 7. To stress the complexities involved in hedging MBS, we critique an hedging methodology offered by Salomon Brothers Inc. in the next chapter, Chapter 8. Chapter 9 presents our

[1] A stochastic process is a statistically random sequentially process in which the probability of each step depends on the outcome of previous steps.

multicurrency collateralised mortgage obligation, which provides an economical and functional structure for hedging foreign exchange rate risk associated with MBS. This dissertation will conclude with Chapter 10.

CHAPTER 2
MORTGAGE-BACKED SECURITIES: ORIGINS AND DEVELOPMENT

MORTGAGE-BACKED SECURITY

A general term describing a capital market instrument issued from a special purpose company whose assets consist primarily of mortgages.

The purpose of this chapter is to explain the origins, development and structure of mortgage-backed securities (MBS). MBS evolved from the United States' complex, but efficient, mortgage market. To demonstrate the significance these financial instruments play in the US economy, we will describe how this system works. It is important to understand how the US market is unlike the traditional UK mortgage market, in that US mortgages receive government support and are traded on a secondary market.[2] Even with these fundamental differences, securitization is being used successfully in both markets.

The first Section, 2.1, gives a brief history of the evolution of mortgage-backed securities. The following Section, 2.2, describes the federal and quasi-federal government organizations which participate in and support the US mortgage market. Section 2.3 examines the structures and characteristics of the various instruments that are traded in the secondary mortgage market and provides a table with definitions of technical terms. Section 2.4 discusses the effects that market changes have had on credit supply for US housing finance, and the final section will summarise this chapter.

[2] The term 'secondary market' refers to the trading of existing mortgages after origination.

2.1 The Beginnings of the Mortgage-Backed Security

The origins of housing finance can be traced to the late Roman Empire, where the concept evolved of exchanging property rights for money *(pignus)*. Under this legal structure, land was obligated in lieu of transfer of title. Following the demise of the Roman Empire, Germanic law developed the concept of using land as a security deposit. This contract was called a *gage*. Later, when William of Normandy introduced the Germanic system into English law, the French word *mort* ("dead" or "frozen") was combined with *gage* to describe a "locked pledge," or *mort-gage* on property.

US mortgage-banks are the primary originators of mortgages that are securitised. Their origin is to be found in the nineteenth century, when mortgage lenders funded US Midwest farmers by selling debenture bonds to insurance companies. Farms were the dominant type of residential housing in the US that represented any significant value. By 1900 there existed approximately $4 billion worth of farm mortgages outstanding, originated by 200 mortgage companies.

During the roaring twenties the real estate market boomed, with appreciation ranging from 50 per cent to 75 per annum. This fuelled the demand for a secondary mortgage market, where mortgage bankers would sell short-term mortgage participation bonds in units of $500 to $1,000 to retail investors. The mortgages paid interest only with maturities ranging from one to five years and were held by a trustee who would service the loans. In the event of default, the trustee would foreclose on the property.

In 1929, the real estate market crashed along with the stock market. The fall in the stock market wiped out a considerable amount of the liquidity in the financial markets,

which directly affected the funds available for mortgages. As funding sources for real estate dried up, the mortgagors were unable to roll-over their short term mortgages. This spurred foreclosures which flooded the depressed real estate market with new property, helping to drive down prices. Mortgage bankers wrongly assumed that in the event of foreclosure, the sale of the property would more than offset the mortgage debt. As a result of this error in judgement, virtually all these mortgage companies went bankrupt.

In an attempt to stabilise the economy in 1933, the federal government established the Home Owners' Loan Corporation (HOLC). This organisation sold government-guaranteed bonds, the proceeds of which were used to refinance defaulted mortgages. HOLC was the first major lending institution to grant long term amortising[3] loans with monthly payments. By amortising the loan, borrowers are able to make low monthly payments over long periods (normally 30 years in the US), making mortgages more affordable. HOLC helped a million families to save their homes within the first three years of its existence.

In response to the continued demand for residential housing finance caused by the Great Depression of the 1930s, the US government created the Federal Housing Administration (FHA) in 1934. Its purpose was

1. to encourage the improvement of the nation's housing standards and conditions;
2. to provide an adequate home financing system;
3. to exert a stabilising influence on mortgage and residential real estate markets.

[3] Amortisation refers to the reduction of debt by regular payment of interest and principal sufficient to pay off a loan by maturity.

The FHA stimulated and continues to support primary market activity by offering lending institutions strong incentives to lend their funds to home buyers. The FHA establishes lending standards and offers an insurance programme that protects lenders from losses due to default. FHA charges the borrower (the mortgagor) a small insurance premium of one-half of one per cent per annum on the outstanding balance of the loan. By standardising and insuring residential mortgages, FHA has provided the mortgage market with a transferable, low-risk mortgage which was essential to the development of a national mortgage market.

The FHA programme helped stabilise the mortgage market, but new single family housing construction was at a minimum between 1926 and 1946. Then, following World War II, when five million men came home, housing demand escalated. To help the returning servicemen adjust to civilian life, the government enacted the Servicemen's Adjustment Act. The Veterans Administration (VA) programme was founded under this Act, and the VA guarantees mortgage loans made to US military personnel. It differs from the FHA programme in that it guarantees (rather than insures) the home mortgage loan and requires no down payment. Moreover, the VA is not dependent on the collection of insurance premiums to pay for losses due to default on loans, therefore, VA does not charge the veteran (borrower) for its services. The FHA and VA programmes were able to meet the huge demand for mortgages and funded the unprecedented postwar housing growth.

In order to continue its promotion of home ownership, the US Congress has focused on stimulating secondary market activity in order to provide liquidity to the FHA, VA and private mortgage market. The US government has formed an array of organisations

to participate in the secondary markets, with names that sound like a country and western family: Fannie Mae, Ginnie Mae, and Freddie Mac. These organisations issue various forms of MBS, and are backed through either implicit or explicit US government guarantees.

These government-guaranteed MBS have been well received by investors because they offer higher returns than does other conventional government debt. The increased yields are primarily due to a unique call option that allows the mortgagor to redeem his mortgage before maturity. A feature that will be explained in detail later. For now, it is important to know that this call feature has value and that this value is reflected in the higher yields.

In the following section, we shall discuss in detail the government bodies that participate in the US mortgage market.

2.2 Government Participants in the Secondary Mortgage Market

According to Mr Mark Boléat, Secretary-General of The Building Societies Association, 'The American housing finance system is the most developed, particularly in respect of a secondary market.'[1] The US secondary market receives support through special agencies that receive implicit and explicit US government guarantees. The following three sections will discuss these agencies' development and functions.

2.2.1 The Federal National Mortgage Association

The Federal National Mortgage Association (FNMA or Fannie Mae) was formed as a subsidiary of the Reconstruction Finance Corporation in 1938. Its mission is to

provide additional liquidity to the mortgage market and improve the distribution of investment capital for financing the construction and sale of housing by providing a secondary market[4] for FHA-insured loans. (It later adopted VA guaranteed loans too.) Fannie Mae provides liquidity for lending institutions so that they may always have funds available for new home loans.

As of June 1990, Fannie Mae reported a principal balance of $110,138 million in its portfolio, making it the largest holder of mortgage loans in the United States. Recently, it has been authorised to purchase conventional loans[5], but its portfolio consists primarily of FHA and VA loans.

In 1968 Fannie Mae was split into two entities. One is a federally chartered corporation owned by public shareholders, which retained the Fannie Mae name. The second is the Government National Mortgage Association (GNMA or Ginnie Mae). Fannie Mae receives an implicit government guarantee whilst Ginnie Mae retains the explicit government guarantee.

Ginnie Mae is responsible for providing liquidity, primarily through guaranteeing total and timely payments on mortgage-backed pass-through securities, which represent interest in FHA, VA and Farmers Home Administration (FmHA) mortgages. Additionally, Ginnie Mae supports special government subsidy programs.

2.2.2 The Government National Mortgage Association (GNMA)

GNMA is a wholly government-owned corporation that functions within the

[4] A secondary market is where lending institutions sell existing loans to another entity. These are loans that have been originated.
[5] Conventional loans are residential mortgages without any government guarantees or subsidies.

Department of Housing and Urban Development (HUD) and whose president is appointed by the US President and acts under the secretary of HUD. GNMA operates from Washington, D.C., and offers mortgage bankers and other lending firms an efficient and profitable way to market FHA, VA, and FmHA loans.

GNMA mortgage-backed pass-through securities represent an undivided interest in a pool of residential mortgages. The mortgages are similar in interest rate, maturity, and the type of property in which they are secured. The pooled mortgages must have a minimum aggregate value of $1,000,000 for single family loans or $500,000 for manufactured home[6] and project loans.[7]

Lenders, in their capacity as issuers of securities, must complete the required GNMA commitment documents and forward them to GNMA. Upon review by GNMA, and a favourable evaluation, GNMA issues a commitment and assigns the pool a number. The lender will then send the mortgage documents to a custodial agent, and the required pool forms to GNMA. Upon acceptance, GNMA will guarantee the mortgage-backed certificate, which then will be sold to investors, who consist primarily of institutional investors. After the sale of the certificate, the lender will service the pool. He will collect monthly payments on the pooled mortgages and remit that amount, less servicing fees, to the certificate holders, along with monthly accounting statements. GNMA also offers different types of issues that are collateralised by mortgages other than single family loans. These project market loans, as they are called, include

[6]Manufactured homes are built in a factory then moved to their permanent location. They are also called mobile homes.
[7]Project loans are loans made on a housing estates.

multifamily housing, nursing homes, hospitals, low-income projects and senior citizen housing.

The GNMA 223(f) multifamily security program was introduced in 1975 and represents fifty per cent of the total project market. It has issued over $3,400 million worth of securities, with approximately $2,500 million worth of issues outstanding. However, this program was discontinued in 1990 because of the saturated US housing market.

These instruments were designed to help fund middle- to upper-income multifamily housing projects. Investors demanded a higher yield on GNMA 223(f) instruments than on standard GNMAs because of the thin market. The higher yield offsets investors' liquidity risk. These securities will generally yield approximately 230 basis points (bp)[8] over a ten-year Treasury bond and 20 bp over a standard GNMA.

2.2.3 Federal Home Loan Mortgage Corporation

Federal Home Loan Mortgage Corporation (FHLMC or Freddie Mac) was created by Congress in 1970, conforming to Title III of the Emergency Home Finance Act of 1970. This act provided the savings and loan (S&L) industry with a secondary market for its conventional loans.

Because S&Ls raised funds using short-term variable rates and were lending money at fixed rates over thirty years, they were caught in a lending fixed long and borrowing short trap which exposed them to interest rate risk. When short-term rates exceeded

[8] A basis point is equal to 1/100 of one percent (i.e. 100 bp = 1%).

the long-term rates, the cost of funds exceeded their revenues, and the S&Ls needed an active market in which to liquidate their loans. The act served as a lifeline for the S&Ls. Its mission was to enhance the liquidity of mortgage investments and to increase the availability of funds for conventional residential mortgage lending by developing and maintaining a nationwide secondary market. Freddie Mac accomplished its mission by standardising conventional mortgage instruments, forms and underwriting guidelines, and it continues to facilitate the growth of the conventional secondary market through innovative financial development.

Freddie Mac purchases conventional mortgages primarily from savings and loans associations, pools them, and then sells mortgage pass-through securities called Mortgage Participation Certificates (PCs) in capital markets. As of 31 March 1989, Freddie Mac reported $234,694.7 million worth of PCs outstanding. As described in the introduction to this chapter, these instruments represent an undivided interest in the mortgage pool and entitle the owner his prorated share of all interest and principal.

2.3 Secondary Mortgage Market Instruments

As mentioned in the beginning of this chapter, mortgage-backed security is a general term used for any security which is supported primarily by mortgage collateral. MBS can be divided into two broad categories: pass-through and pay-through. What distinguishes a pass-through from a pay-through is its legal structure. Table 1 defines the principal features of the MBS and the variations which have evolved from the these two basic structures.

TABLE 1

PRINCIPAL FEATURES OF MORTGAGE-BACKED SECURITIES

	Pass-through	Pay-through
Nature of Issuer	Grantor trust	Corporate issuer, which may be a special purpose corporation (bankrupt-remote entity)
Nature of ownership	Ownership represents a fractional undivided interest in a pool of mortgages	Ownership of a debt instrument secured by a pool of mortgages
Principal Variations		
Single Class	**Straight Pass-Through:** the security holder receives principal and interest actually collected by the servicing agent. **Modified Pass-Through:** the security holder receives interest due, whether or not it has been collected, and principal as collected. **Fully Modified Pass-Though:** the security holder receives principal and interest due, whether or not they have been collected.	**Pay-through bonds:** bonds whose debt service is determined by the cash flow from the collateral pool of mortgages
Mulitclass	**Real Estate Mortgage Investment Conduit (REMIC):** allows pass-throughs tax entities to issue multiple-classes of ownership interest to investors.	**Collateralised Mortgage Obligations (CMO):** Mulitclass issue of pay-through bonds where certain tranches have maximum maturities and priority as to principal payment. **REMIC:** allows CMOs to be structured with 'zero equity'

2.3.1 Pass-Through Securities

Pass-through securities are legally structured under a grantor trust[9], which requires pool managers to take a passive stance towards the management of cash flows.

[9] Trusts whereby the grantor retains control over the income or corpus, or both, to such an extent that such grantor will be treated as the owner of the property and its income for income tax purposes. (However, trusts for MBS are exempted from income tax.)

Management's function is to service the portfolio of mortgages by receiving the monthly payments and any prepayments and then "passing through" the prorated share to the owners of the security. Hence the name pass-through.

GNMA originated the first publicly traded pass-though security which represents an undivided interest in FHA and VA mortgage pools. All mortgage-backed pass-through securities offer higher yields than US treasuries of similar term because of embedded call options. These pass-through securities resemble a fixed-rate bond with a series of incremental calls. The calls are exercised every time a mortgagor prepays his mortgage or in essence 'calls his mortgage'. When the call is exercised it lowers the principal balance of the security, which may expose investors to interest rate risk. If a mortgagor prepays a mortgage that has a higher rate of interest than the current market, the investor will suffer a loss (i.e., if the mortgagor's interest rate is 15 per cent fixed-rate and the current rate for fixed-rate mortgages is 12 per cent, then the investor will lose 3 per cent). The call feature creates a great deal of uncertainty regarding the timing of the cash flows, making the security difficult to value and to market.

Pass-through MBS are traded mainly among traditional mortgage investors. Monthly payments and volatile cash flows are not acceptable to most non-traditional mortgage investors, who prefer half-yearly payments. In order to expand the investor base for MBS beyond the traditional mortgage investors, financial intermediaries developed pay-through structures. The legal structure and its benefits are explained in the next section.

2.3.2 Pay-Through Securities

A pay-through security is a general obligation bond[10] issued from a thinly capitalised special-purpose vehicle company, whose primary assets consist of a pool of mortgages. This structure allows the cash flow to be dynamically managed by tailoring cash flow to investors' needs which were not met under the pass-through structure.

Prior to the pay-through structure, issuers of mortgage-backed bonds were required to overcollateralise their mortgage pools by 150 per cent (i.e. for every $100 worth of bonds issued, there had to be $150 worth of mortgages in the pool). This proved to be expensive to issuers. After resolving numerous legal, tax, rating and accounting issues, PHM Credit Corporation issued the first pay-through MBS in April 1981. This issue was for $39 million and was well received by the market.

2.3.3 Collateralised Mortgage Obligation

In June of 1983, hoping to attract a broader range of institutional investors, the Federal Home Loan Mortgage Corporation, assisted by First Boston Corporation, issued the first collateralised mortgage obligation (CMO). The CMO is a mortgage-backed pay-through security consisting of a number of pass-through MBS or a pool of whole mortgages, and by paying quarterly or half-yearly payments, resembles a standard debt instrument. A CMO also has multiple 'tranches'[11] of senior debt, i.e. bonds of differing maturities, but it can only have one tranche of junior (i.e. subordinated) debt, which is termed the 'residual'. This residual has all the characteristics of equity and bears the highest risk. Under the CMO structure, all principal payments from the

[10] A general obligation bond is a bond backed by the full faith and credit of the issuing entity.
[11] A block of shares. From the French for "slice".

underlying mortgages go to the first class or tranche of bonds; once that tranche is paid off, the next tranche begins to receive principal payments. This continues until all the bonds are paid off. The amount of money left over, the residual, represents the profit the issuer receives.

The CMO was developed to broaden the investor base by offering different classes of maturity. According to the market segmentation hypothesis, investors are grouped as short-term, medium-term or long-term investors and will only invest in instruments within their maturity bands. The standard mortgage-backed security only attracted a small group of traditional mortgage investors who were accustomed to prepayment uncertainties. Prepayments from an MBS occur throughout the life of the security, which ranges from 0 to 30 years and has an average weighted maturity of 7 years. These prepayment characteristics are complex and will be explained later in Section 7. However, one way to mitigate the prepayment uncertainty of the cash flow in the CMO is to segment the cash flow into short-, intermediate- and long-term maturities.

This new structure has attracted an array of new investors: commercial banks and money market funds are purchasers of the short-term class, insurance companies are attracted to the intermediate-term class, whilst pension funds and retail investors are most interested in the longer-term instrument.

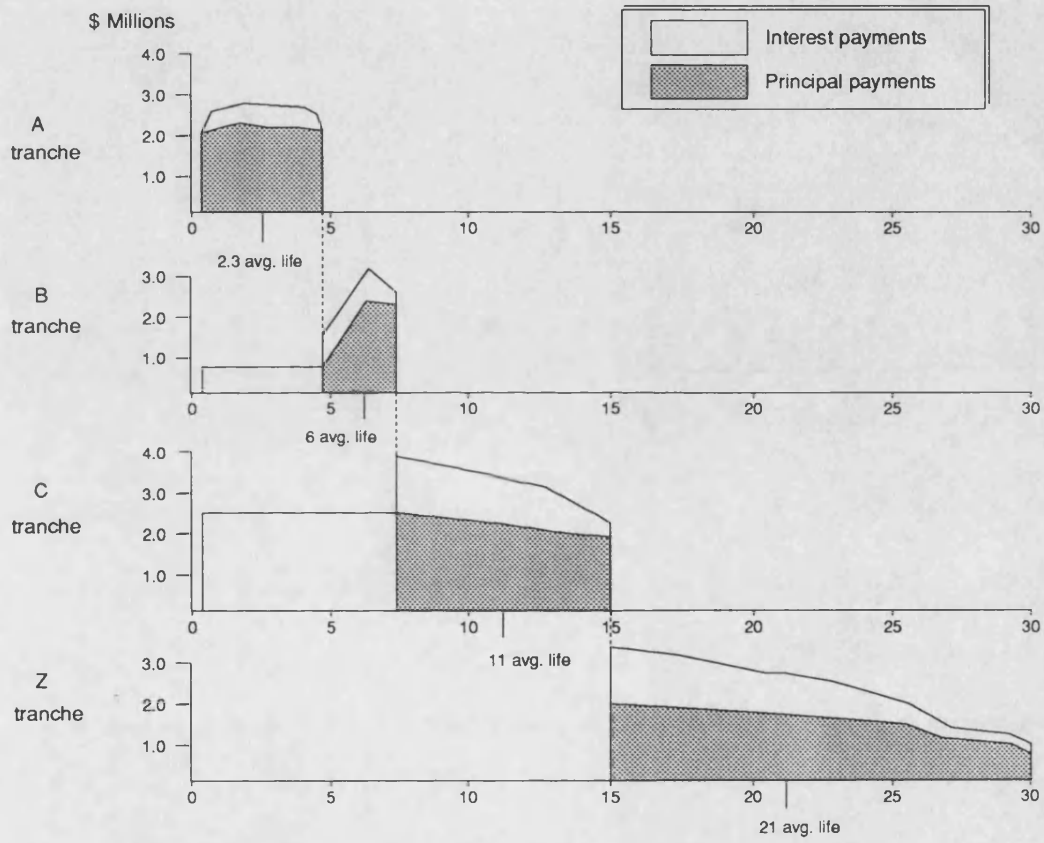
In order to demonstrate the main characteristics of a CMO, Figure 1 displays the hypothetical cash flow of a 'plain vanilla' CMO structure. Each issue is uniquely structured to satisfy clients' maturity preferences. In this example, Tranche A pays principal and interest for almost five years with a 2.3 year average life. Tranche B

receives interest income until Tranche A is fully paid, after which it starts receiving principal payments. This process continues until all the tranches are retired. Notice that the 'Z' Tranche does not receive any cash flow until the fifteenth year. The Z Tranche resembles a zero coupon bond with a twenty-one year average life. The purpose of this last tranche is to absorb any negative cash flows which may occur in the CMO structure. This will be explained in detail under the 'Z' bonds, Section 2.3.3.1.

It should be carefully noted that this structure tightens the prepayment boundaries in the following sense. Consider Tranche B in Figure 1: the holders of this bond receive their first interest payment six months after the bond is issued and continue to receive interest only payments until the fifth year, which is when they receive a partial principal repayment. The investors in Tranche B will continue to receive interest and 100 per cent of the pool's principal repayments until their bonds are fully repaid in or about year seven. Therefore, Tranche B has an average life of about six years. Additionally, the investors in Tranche C will receive interest starting six months after the bonds are issued but will not receive any of their principal until the Tranche B bond holders are repaid in full. However, the Tranche Z bond holders do not receive any cash flow until all the previous bond holders are repaid in full. The reasons for using the Z Tranche are explained in the following section. Interest payments in Tranche Z accrue during the life of the CMO, and when all the other bonds are repaid, then Tranche Z bond holders receive interest and principal payments until their bond is completely retired. Any monies left after all the bonds are retired is paid to the owner of the

residual. This illustration clearly shows that the CMO structure is more resilient to prepayment uncertainty than the pass-through structure.

Figure 1
Cash Flow of a CMO



Since the introduction of the CMO, there have been many variations to the basic structures as shown in Figure 1 . The following subsections will describe different CMO structures, review the market size and discuss the tax issues that arise from the CMO.

2.3.3.1 'Z' Bonds

'Z' Bonds were first introduced by Pulte Homes, a major US property developer, as a method to manage cash flow problems caused when trying to securitize graduated payment mortgages (GPMs). A graduated payment mortgage is one in which the mortgage payments start at a lower level and then increase over the life of the loan, causing the loan to be negatively amortised[12] (this type of scheme in the United Kingdom is often called a 'low-start' mortgage). The GPM mortgage is attractive to home buyers because the mortgagor's income qualification ratio is based on payments made in the first year (which are low), thus enabling the mortgagor to borrow more money.

Pulte Home's GPM mortgage pool created a cash flow problem because CMOs require level payments. The negatively amortised mortgage payments are unable to sustain the CMO's cash flow requirements. To eliminate this cash flow mismatch, Pulte created the 'Z' bond (named 'Z' because it is the last bond to become due in the series) to deal with this problem. The 'Z' bond is similar to a zero coupon bond or an accrual bond. It does not pay out any principal or interest until all the preceding tranches have been paid (see Figure 1). Because of its resemblance to a zero coupon bond, the "Z" Tranche is most attractive to investors who desire a long-term investment with minimal reinvestment risk.

2.3.3.2 Calamity Clause

Cash flow from CMOs are not uniform, which can present a problem in making

[12] Negative amortisation means that the principal balance will increase during the beginning, but when payments are increased later, they will then start paying down the principal.

coupon payments if prepayments are made while interest rates are low. If the issuer receives large prepayments from the underlying mortgages during a time of low interest rates, he loses money by being caught in a yield mismatch. For example, assume that the CMO pays 14 per cent per annum and interest rates drop to 10 per cent per annum. In this lower-rate environment the issuer receives high prepayments immediately following the last instalment paid to investors. In this case he would lose 4 per cent on the prepaid funds. To resolve this problem, the 'calamity clause' was introduced by Pulte Homes, the first issuer of 'private'[13] CMOs.[2] This clause allows the issuer to make monthly principal payments to the bondholders in the event of a significant drop in short-term interest rates.

2.3.3.3 Planned Amortising Class (PAC)

Section 2.3.3 described how the CMO structure provides investors with some call protection by narrowing the prepayment boundaries. However, many investors were not content with this improvement. The planned amortising class (PAC) is a CMO tranche that was developed to further reduce the risk of prepayment uncertainty. The PAC has a preset retirement schedule which takes priority over all other CMO tranches. It maintains a stable cash flow under a wide range of prepayment environments. The following examples illustrate the robustness of this instrument with prepayments ranging from 75 per cent to 200 per cent of the Public Securities Association (PSA) prepayment index.[14]

[13] "Private" refers to the absence of any government agency acting as guarantor for the bonds.
[14] See Section 7.2 for explanation of Public Securities Association (PSA) index.

Note that in Figure 2, where prepayments are slow (25 per cent below the norm or 75 per cent PSA), the PAC tranche payments stay fixed. This holds true when the PSA is at its norm as in Figure 3, or when it doubles as in Figure 4. All the payments from the other tranches move, but the PAC cash flow remains constant under extreme prepayment conditions.

Cash Flow of a PAC

Figure 2

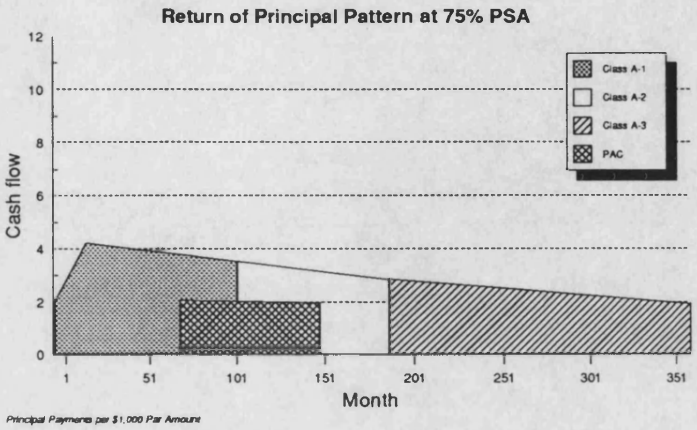


Figure 3

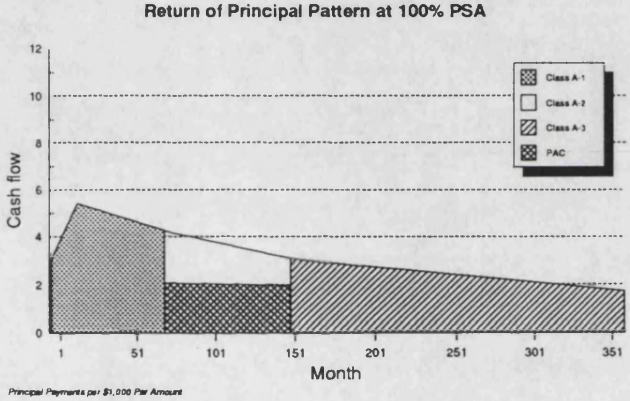
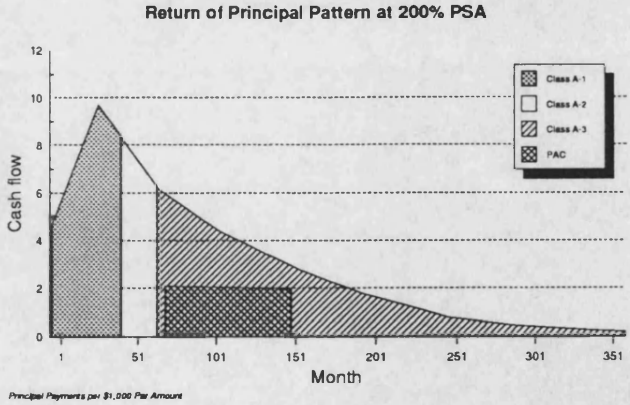


Figure 4



2.3.3.4 Market size

The collateralised mortgage obligation (CMO) securities market size has almost doubled every year since its inception. In 1983, when First Boston Corporation underwrote Freddie Mac's first CMO issue, the total market size for that year was only $4,000 million. By 1988, over $175,000 million worth of CMOs have been issued. The CMO has also expanded the secondary mortgage market by meeting the demands of investors through offering a broader range of maturities. This has been accomplished through the creation of a multitude of mortgage-backed securities that can compete in the high quality fixed-income market by offering higher yields than US Treasuries.

2.3.3.5 Taxation Issues and Regulations

The CMO gained popularity among investors for its increased predictability of cash flow; however, the growth of the CMO was limited due to restrictive regulations. Under the Internal Revenue Service (IRS) regulation, a grantor trust can issue only a single class instrument in order for its income to be exempted from income tax. To avoid taxation, CMOs need to resemble the debt obligations of the issuer; however, this debt resemblance applies not only to the tax status but also to the accounting treatment. Treatment as debt for accounting purposes requires the issuer to carry the entire obligation on his balance sheet. This accounting treatment tends to inflate the size of the issuer's balance sheet, causing an adverse effect on his capital-to-asset ratio.[3] Most originators in the US only maintain inventories until they build a large enough pool of mortgages to sell into the secondary market, which is about one million US dollars. If they were forced to carry all of their secondary market sales on their

balance sheets, the expensive capital required to support the assets would make it cost-prohibitive.

In an attempt to circumvent these limitations, the Mortgage Bankers Association and Fannie Mae lobbied regulators to amend the tax law and the Securities and Exchange Acts of 1933 and 1934 with the trusts for investments in mortgages (TIM) legislation. TIM provided a legal framework that allowed assets to be sold into a grantor trust which could then issue multiple-class equity holdings as opposed to the existing legislation that only allows a single-class instrument. By treating the TIM structure as a sale of equity, the multiple-class security would be treated as a sale of an asset, which would enable the issuer to take the transaction off-balance sheet. Unfortunately, this effort failed when the IRS ruled against a $500 million multiple-class grantor trust issued by Sears Mortgage Securities. This keynote case, known as the 'Sears Regulation', ruled that the trust was not exempt for tax and that it must pay tax on the income generated by the mortgage pool. The IRS argued that this 'trust' required active management, therefore disqualifying it from special tax status.[4] Although the TIM regulation failed, legislators appreciated the need for a legal structure that could issue multiple-class securities while allowing mortgagees to take mortgages off-balance sheet. The US Congress created the real estate mortgage investment conduit as a viable solution to this problem.

2.3.4 Real Estate Mortgage Investment Conduit

In an effort to remove the federal tax and regulator constraints from multiple-class mortgage-backed securities, the Tax Reform Act of 1986 authorised the creation of the real estate mortgage investment conduit (REMIC). As mentioned in the previous

section, pass-through structures were not allowed to issue multiple-class securities. The introduction of the REMIC enabled mortgage debt obligations to be structured in such a way as to have greater appeal to general capital market sources without forcing issuers to bear the added tax burden. As a tax-efficient version of the CMO, the REMIC was designed to increase the supply of credit for residential and commercial mortgage markets. In brief, the REMIC structure

- Creates a new pass-through tax entity that can hold mortgages secured by any type of property and can issue multiple-classes of ownership interest (senior/subordinated) to investors in the form of pass-through certificates, bonds or other legal forms.
- Allows multiple-class (similar to CMOs) mortgage pass-throughs.
- Allows CMOs to be structured with 'zero' equity and immediate pay through of monthly bond payments, which eliminates all reinvestment risk.
- Allows mortgage pass-throughs to establish reserve funds for added credit enhancement.
- Allows thrift institutions and others underwriters of mortgages to sell mortgages while treating the sale as a financing for accounting purposes, avoiding unwanted accounting losses.
- Allows mortgage-backed cash-flow bonds structured like CMOs to qualify as real estate investments for thrifts and Real Estate Investment Trusts (REIT).
- Applies to all real estate mortgages and to public as well as private offerings.
- Creates new information-reporting requirements for CMOs and similar debt obligations, even when they are sold to corporations.
- Eliminates withholding tax on foreign investors.

This act allows for a five-year transition period in which other structures may be used, but after 1991 the REMIC structure will be the sole means of issuing multiple-class US MBS without imposing double taxation.

2.3.4.1 Benefits of the REMIC

REMICs benefit both the issuer and the investor. The most significant benefit to the issuer is that when assets are transferred to the REMIC, the mortgages are treated as the sale of an asset for tax purposes and may be treated either as the sale of an asset or as a financing for accounting purposes, provided that they meet all applicable generally accepted accounting principles and regulatory accounting standards. This alleviates the problem of an inflated balance sheet, since the transfer of the mortgages into the REMIC is treated as a sale. The issuer also benefits from the provision that allows all real estate mortgages to be structured in senior/subordinated tranches with no restrictions on the sale of the subordinated class. Investors in the secondary market benefit from the increase in the volume and variety of multiple-class mortgage-related securities, as well as from greater liquidity in these instruments.

2.3.4.2 Effects on Foreign Investors

The most critical feature of the REMIC legislation is its effect on foreign investment in the seasoned secondary mortgage market. Traditionally, this market was prohibitively expensive to foreign investors, because of a 30 per cent withholding tax that was imposed on mortgage interest from instruments originated prior to July 1984. The REMIC legislation eliminated such barriers to foreign investors. The retroactive REMIC legislation eliminated all withholding tax on pre-July 1984 mortgages. This treatment made seasoned mortgages competitive with new mortgage originations, which were always more attractive to foreign investors in the pass-through market.

2.4 Effects on the Credit Supply in the Mortgage Market

Because of the increased investor base, multiple-class MBS are expected to be issued more aggressively, creating greater liquidity than previously issued CMO. The broader investor base will attract non-traditional mortgage investors and lead to an increase in the supply of funds available to mortgage borrowers. This increase in funds from the capital market to the mortgage market is partially offset by a decrease in the savings and loan industry's holding of mortgages. Savings and loans used to hold a large percentage of their assets in mortgages but they have diversified their portfolios and sold their mortgages. However, the growth in the holdings of mortgage securities by non-traditional mortgage investors outweighs any contraction in mortgages held by the thrift industry. This results in a net increase in the supply of credit to the mortgage market.

2.5 Conclusion

In this chapter we have shown the evolution of the US mortgage-backed securities market. As this market has evolved other developed nations have adopted this method of financial intermediation into their financial systems. We will review how securitization is being integrated into the international market in the next chapter.

CHAPTER 3
GLOBAL DEVELOPMENT OF MORTGAGE-BACKED SECURITIES

The purpose of this chapter is to explain how American securitization techniques are being integrated into the global financial market. This chapter begins with a brief overview of the global growth of mortgage-backed securities. Following this section, Section 3.1 examines the fundamentals of financial intermediation and how mortgage securitization enhances the traditional intermediation process. In Section 3.2, we explain what fuels international financial innovation and how securitization lends itself to global acceptance. Section 3.3 will examine in detail how the United Kingdom, Canada and Australia are adapting mortgage securitization into their respected housing financial systems. The last section will summarise this chapter.

Globalisation of mortgage-backed securities started in 1984 when US MBS were first offered internationally to the European market. To date $1.1 trillion worth of residential mortgages have been securitized in the US, and the process should continue to grow as other countries adopt this method of housing finance. Dr. Sylvan Feldstein and Dr. Frank Fabozzi predict that the US securitized debt market could surpass government debt, which has made the US the largest debtor nation in the world. As the US mortgage-backed securitization process has shown how to provide relatively inexpensive funds for home mortgages, other countries have also started to pursue securitization.

Adopting the framework of US mortgage-backed securities, the United Kingdom, Canada, and Australia have started the securitization of residential mortgages. The French government approved private securitization of mortgages in 1989, and it is

believed that the German government is considering privatising its secondary (or mortgage-backed) mortgage market operations. Finally, the Japanese government, which holds the world's largest pool of mortgages, is starting to provide legal structures that will promote securitization.

3.1 Intermediation

Historically, in countries which are implementing mortgage securitization, funds for residential housing finance were supplied by the local community. Through the collective efforts of the local investor base, small building societies or mutual savings banks were formed by pooling their members' funds. Only members were allowed access to the funds and usually they would queue for their mortgage. Members would mutually share the risks and rewards of the organisation. This was a very effective form of housing finance, given the then current technology and limited financial services.

As the financial services industry developed, the small mutual savings groups were replaced by larger private organisations. The purpose of these intermediaries was to provide an effective channel for savers' surpluses to meet borrowers' deficits. Benston and Smith (1976), for example, argue that financial intermediaries will exist as long as they reduce transaction and information cost between borrowers and lenders.

Intermediation provides the following management functions:

• **CREDIT/DEFAULT RISK**	Institutions are geared to assess, monitor and price the risk of a borrower.
• **LIQUIDITY/MATURITY RISK**	Institutions accept deposits in amounts and maturities that are different from the needs of the borrower.
• **INTEREST RATE RISK**	Institutions meet the different interest rate structure required by the saver and the borrower.
• **ECONOMIES OF SCALE**	Institutions have the infrastructure to handle higher volumes, leading to cheaper transaction costs.
• **DIVERSIFICATION**	The number of borrowers actually reduces the risks incurred by the savers in the lending process, and similarly lowers the borrowers' risk of an early repayment request from the savers.

The housing finance industry, the largest financial intermediation industry, has three distinct and independent functions:

Origination	The origination of the loan. This service is provided by building societies, banks, estate agents and mortgage brokers.
Servicing	The collecting, accounting and enforcement of the mortgage instrument. This service is provided by building societies, mortgage bankers, banks or may be provided by any collecting agent.
Funding	The acquisition of funds and ownership of mortgages. The two sources for funds are retail and wholesale. This service is provided by building societies, specialist lenders and banks who can hold or sell the mortgages in the secondary market.

It is not necessary for intermediaries to perform all three functions. Intermediation costs are lowest when the lowest-cost supplier of the housing finance function provides the service. By independent specialisation of services for each function, the system becomes more efficient and cost-effective. This could explain the rapid growth of MBS in various countries and across national boundaries. When securitization was first introduced in the UK, critics argued that MBS were a US phenomenon and were only viable because of the US government's guarantees. However, the MBS market has flourished under pure free market forces.

3.2 International Innovation

Dufey and Giddy (1981) state that international financial intermediaries provide four specific functions:

1. Liquid and standardised instruments for effecting payments in individual currencies,

2. instruments for monetary exchange between different currencies,

3. institutions and markets which provide a channel for savings and investments across national boundaries,

4. and structures for allocating, diversifying and compensating for risk.

Financial innovation occurs when an international financial intermediary provides a new technique which better serves one of the above mentioned functions. Since financial intermediaries are profit-making entities, these innovations must provide profit.

There are two schools of thought on what economic forces spur financial innovation. Ben-Horim and Silber (1977) argue that supply factors are the primary contributors to innovation, especially when effected by regulator constraints. They cite the introduction of negotiable certificates of deposit, which was a direct result of financial constraints on banks. On the other hand, Greenbaum and Haywood (1971) argue for the demand side, suggesting that the rise in nonhuman wealth per capita is the primary stimulus of financial innovation. They argue that since portfolio management costs are fixed, an increase in wealth will increase the demand for a wider diversification of financial instruments, thus spurring innovation. The arguments for both sides are valid and it is our belief that innovation is driven by both supply and demand. To cope with constantly changing economic forces, it is important to know that the need for financial innovation will always exist.

What kind of financial innovation will be introduced? Most financial innovation is in response to two elements: regulation or price. The first type of innovation occurs in response to the demand for products which circumvent government regulations on price, quantity, reporting and taxation of financial services. The latter results from changes in relative prices and perceived relative risks. The ability to quantify risk continues to improve with modern financial theory combined with advances in computer technology. These advances have served to develop better methods of assessing, classifying and disseminating risk. The innovative process of securitizing mortgages is driven by both by regulation and price. The following section will show how different countries have adopted securitization into their housing finance intermediation and will discuss the elements that have driven its growth.

3.3 Comparison and Contrast of Different Countries' Mortgage Markets

Even though the UK, US, Canada and Australia share a similar language, culture and legal system, their mortgages vary according to local norms. To appreciate these differences we first identify the main characteristics of a mortgage in the following list and then compare and contrast the countries' mortgages in Table 2.

The main characteristics of a mortgage are:

1. Term - the life of the loan.
2. Interest - the amount of interest paid on principal, may be fixed or variable.
3. Principal - the total money borrowed less any principal repayments.
4. Index link - some variable rate loans are 'linked' to a commonly used market interest rate. eg. London Interbank Offer Rate (LIBOR).
5. Forbearance - when the lender will refrain from foreclosing on a mortgage loan which is past due.
6. Tax incentives - many governments offer tax relief for residential home owners.
7. Government insurance - many governments offer direct mortgage insurance and pool insurance. This is to say that a government can directly insure the payments of a specific individual mortgage or it can insure the payments made from a pool of mortgages. Pool insurance is used to promote securitization.
8. Underwriting standards - lenders may conform to using standard forms and loan criteria, which promotes secondary market activity. When loans are homogeneous, they are easier to trade.

These characteristics and how they differ from country to country are represented in the table on the following page.

TABLE 2

TYPICAL CHARACTERISTICS OF THE MORTGAGE INDUSTRY				
Characteristic	**US**	**Australia**	**Canada**	**U.K.**
Term (years)	15 or 30	25	1,3, or 5	25
Interest	fixed and variable	variable	fixed	variable
Principal	amortising	amortising	amortising over 25 years[15]	non-amortising
Rate index link to funding source	direct	indirect	indirect	direct and indirect
Forbearance	uncommon	common	uncommon	common
Tax incentives	interest deduction	capital gains exclusion	exclusion on primary residence	capped interest deduction
Federal insurer	yes	yes	yes	no
Secondary market government insured as % outstanding	22%	less than 1%	1%	none
Underwriting standards	standardised	non-standardised	non-standardised	non-standardised

Source: Standard & Poor's Corporation[5]

Just as the underlying mortgages differ, so do the characteristics of the MBS that each country issues. They vary in term, type of interest paid (fixed vs. floating), and call provisions. The common tie that binds them together is that they are all being well received by the market, as is evident from their current growth. A review of each country's mortgage market and the securitization process follows, starting with the fastest growing non-dollar market.

3.3.1 United Kingdom

To make clear how the securitization process has been integrated into the U.K. housing finance market, this section will start with a review the different types of intermediaries

[15]Loans in Canada are amortized over 25 years but become due in 1,3 or 5 years. This allows payments to be low and the loans are 'rolled over' when they become due, thus allowing the lender to reset the fixed-rate of interest.

that are active in the U.K. market. We shall discuss their size and market share and will describe in detail the three largest intermediaries. Following this explanation, we shall describe how sterling mortgage-backed securities are structured and integrated into the UK housing finance market.

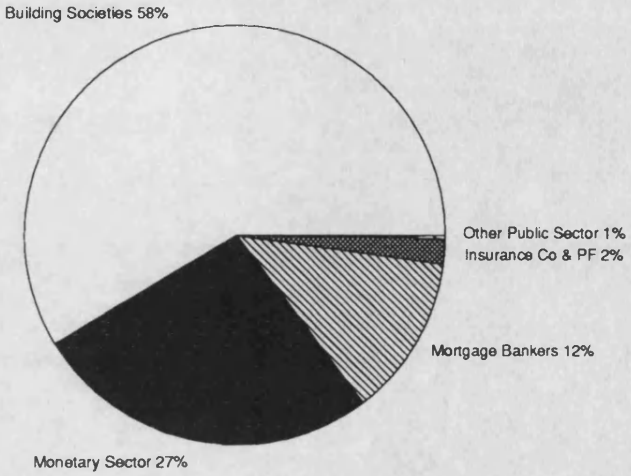
We have identified the following six categories of mortgage lenders in the UK, with the first three representing approximately 96 per cent of the market:

Building Societies
Monetary Sector (Retail Banks)
Mortgage Bankers (New Lenders)
Insurance Companies & Pension Funds
Local Authorities
Other Public Sectors

Categorising and quantifying the volume of mortgage business produced by certain lenders can be quite simple; for example, we can distinguish a building society's holdings from a bank's holdings. However, as regulation eases, and mortgage lenders merge, the lines that separate these entities are starting to fade. To illustrate, an insurance company will originate a mortgage and then sell it to a mortgage banker, who will securitize it and sell it to a bank. The current statistical collection services do not account for these transactions, so double counting may occur.

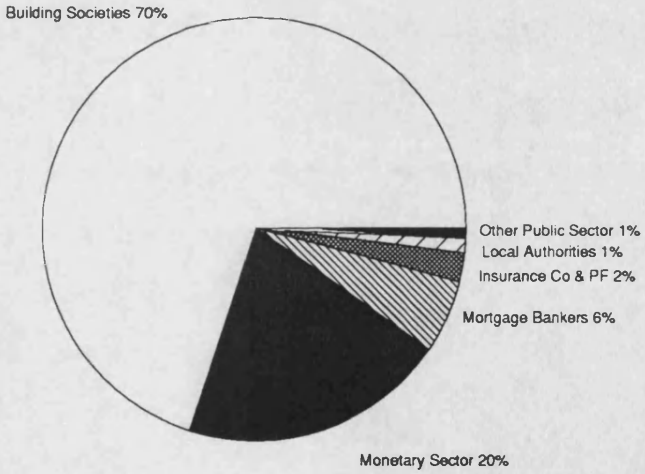
On the following page, Figure 5 illustrates the amount of new mortgages issued and Figure 6 shows the total value of all mortgages held by each category in 1988. The Central Statistical Office office publishes this information quarterly.

Figure 5
Net Advance for 1988



Source: Financial Statistics, Table 9.4

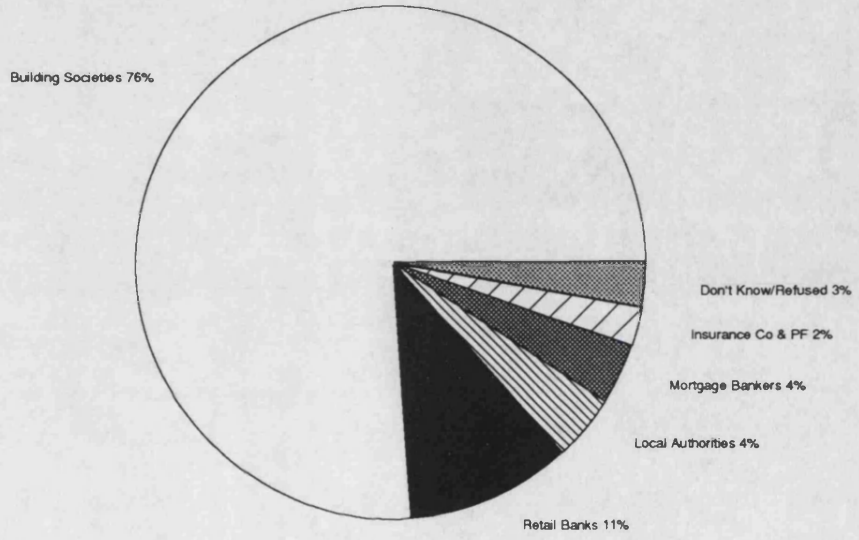
Figure 6
Total Mortgages Held in 1988



Source: Financial Statistics, Table 9.4

Figure 7 shows the mortgage distribution according to the Financial Research Survey. Note that this distribution shows the number of mortgages held as a percentage and is not representative of value. Apparently, the building societies are holding mortgages with smaller values as compared to the high street banks and the mortgage bankers.[16]

Figure 7
Survey of Mortgage Holders for 1988



Source: Financial Research Survey

3.3.1.1 Building Societies

Building societies are the oldest and largest residential mortgage lenders in the UK, holding £155,195 million worth or 69.92 per cent of the outstanding mortgages in

[16] This confirms the information gathered during an interview with Mr. Gary Cowdrill of National Home Loans, who stressed that they targeted their mortgage business towards the high end of the market while the buildings societies have been pursuing the larger volume, smaller value mortgages, consisting primarily of first-time buyers.

1988.[6] The first building society was established in Birmingham in 1775 and was formed by a small group of people who pooled their resources to provide funds to build their homes, hence the name 'building societies'. There were 131 building societies in the UK as of 1988.[7] The largest building societies during this calendar year were the Halifax, Abbey National, Nationwide Anglia, Woolwich Equitable, Alliance & Leicester and Leeds. They each reported assets in excess of £10,000 million in 1988, holding a total of £100,000 million in assets or 62.5 per cent of all building societies' assets.

The primary difference between the building societies' and the S&L's assets, that is the mortgages, is in the coupon interest rate structure. In the US, mortgage rates are generally fixed-rate, while in the UK they are usually variable and are set at the discretion of the lender. This insulates the building societies from the disaster their US counterparts experienced when the yield curve became downward sloping (inverted) in the early 1980s. The S&Ls' assets (mortgages) paid a fixed-rate that was lower than their cost of funds. Their being caught in this 'borrowing short, lending long' trap forced the US government to introduce new legislation to enable the S&Ls to compete with the banks.

The building societies maintained a pricing cartel until 1981. The cartel started to lose power because of Government intervention and was finally dismantled in 1983. Prior to 1981, the Building Societies Association would publish the current lending rate to which all building societies adhered. There would be no incentive for a

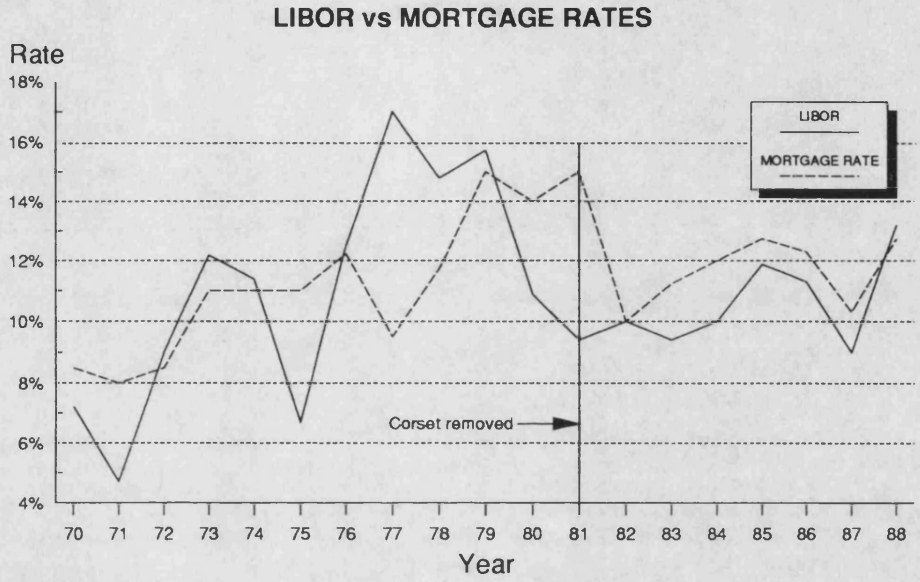
mortgagor to borrow from one building society as opposed to another. This caused a shortage on the supply side of mortgages and forced potential home buyers to queue for mortgages for periods ranging from six to eighteen months.

Not only were the building societies able to force customers to wait for their mortgages, but this cartel also enjoyed a large margin between their source and use of funds. Prior to 1981, building societies were able to borrow relatively cheap funds (i.e. retail deposits)[17] and lend them with an average of a 5.75 per cent spread.[8] Since the removal of the 'corset' from the clearing banks in 1981 combined with the 'Big Bang' in the City, fierce market competition has driven margins between retail funds and mortgage rates down to approximately 1.50 per cent while mortgage loans can be processed within 24 hours. Clearly, the consumer is reaping the rewards of free market forces.

The competition for retail funds has escalated between the high street banks, the stock market and the building societies. To attract these funds, market participants are forced to increase investors' returns. Market forces have driven up the cost of retail funds, bringing their cost closer to wholesale funds. This in turn has caused mortgage rates, which are required to service these debts, to follow the cost of wholesale funds. This is clearly illustrated by Figure 8 on the next page, which compares an industry standard wholesale rate, LIBOR, with the average mortgage rate.

[17] Retail funds are deposits made by individuals in their regular deposit account whereas wholesale funds are moneys raised via financial markets.

Figure 8



Source: Bank of England

Additionally, building societies' increased dependence on wholesale funds has also forced mortgage rates to follow LIBOR. Wholesale funding pertains to funds which are obtained via the capital and money markets.[18] As shown in the following Table 3, building societies have had to increase their dependency on wholesale funding.

Table 3

Net Inflow of Wholesale Funds 1985-88 (£ Million)

Period	Total Wholesale	Total Retail	Total Source of Funds	Wholesale as Percentage of Total
1983	1,584	6,839	8,423	18.81%
1984	2,231	8,572	10,803	20.65%
1985	3,096	7,462	10,558	29.32%
1986	6,142	6,592	12,734	48.23%
1987	3,159	7,487	10,646	29.67%
1988	5,419	13,554	18,973	28.56%

Source: The Building Societies Association

[18] Money markets are where large commercial debt instruments, which normally have a maturity of less than one year, are issued and traded. Capital markets are where longer-term debt (in excess of one year) and equity instruments are issued and traded.

We show in Table 4 that the building societies' wholesale funding comes from a number of sources. It is interesting to note that the bulk of the building societies' wholesale funding comes from the issuing of Eurobonds. This is the same market in which the mortgage bankers access their funds. Building societies' bonds are usually issued as a five-year floating rate note indexed at approximately 20 basis points (0.2%) over LIBOR.

Table 4

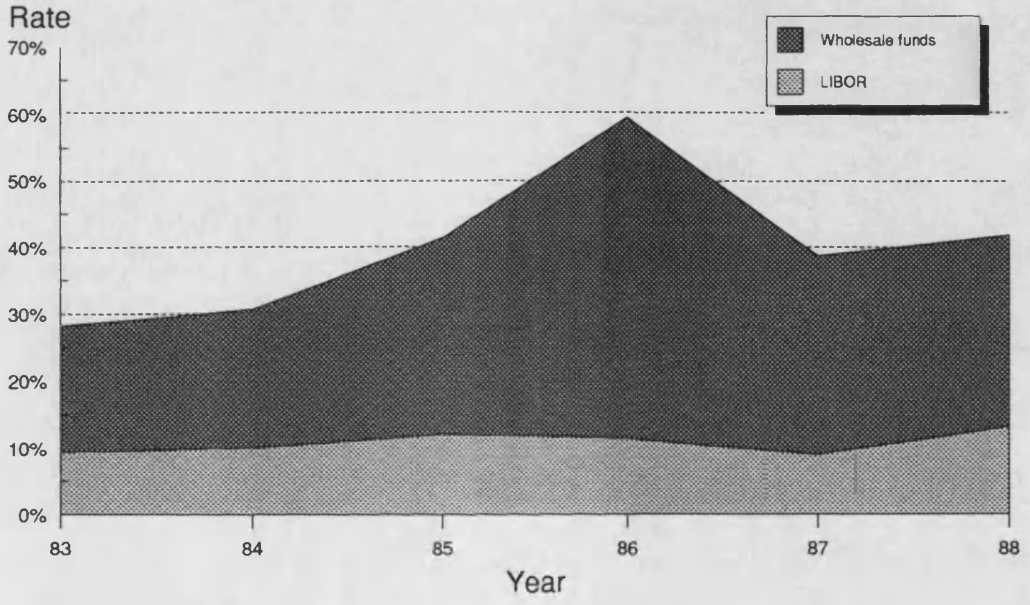
Net Inflow of Wholesale Funds 1985-88 by Product

Period	Certificates of Deposit	Time Deposits	Eurobonds	Index Linked Bonds	Negotiable Bonds	Loans from Banks	Other Non-retail	Total Wholesale
1983	793	423			368			1,584
1984	1,039	875			92	225		2,231
1985	717	646	1,125	15	(81)	674		3,096
1986	301	1,245	3,583	30	(12)	995		6,142
1987	1,016	960	710	2	(247)	587	131	3,159
1988	586	989	3,433		(73)	383	101	5,419

Financial industry experts from Baring Brothers & Co. Limited, Goldman Sachs International Corporation, National Home Loans and S.G. Warburg explained during interviews that the building societies increased their use of the wholesale markets because of the relatively low wholesale rates. On the surface this appears to be false when we compare the percentage change in the net inflow of wholesale funds to LIBOR as shown in Fig. 9, but Fig. 10 clearly shows that the relative change in LIBOR may be what prompted building societies to access wholesale funds. Additionally, wholesale funding by the building societies has been driven by the lack of retail funds.

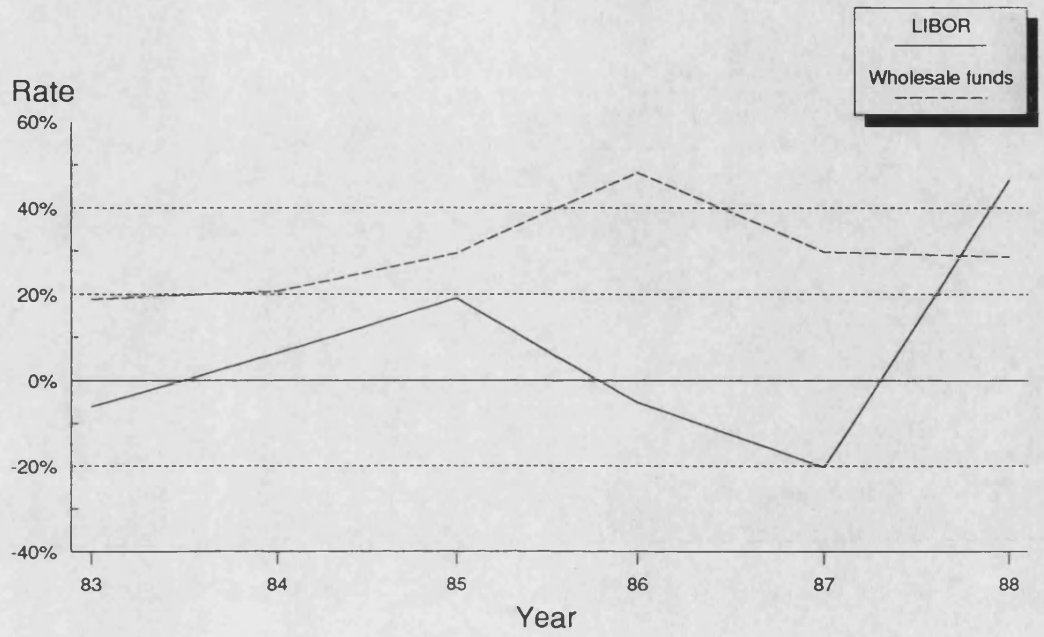
There was a 'flight of funds' from the building societies in 1986 when retail savers started to withdraw their savings from the building societies to invest in the stock market.

Figure 9
LIBOR vs Percentage Change in Inflow of Wholesale Funds



Source: Bank of England & BSA

Figure 10
Percentage Change in LIBOR vs Percentage Change in Inflow of Wholesale Funds



Source: Bank of England & BSA

Today, another key issue facing buildings societies is whether they want to remain building societies. Abbey National's recent transition from building society status to bank may indicate what the future holds for this industry. Abbey National's move decreased the total assets held by building societies by approximately 10 per cent.

Mr Keith Danko, the mortgage securitization specialist for Goldman Sachs International, points out that this move offered Abbey National the best of both worlds (wholesale and retail) regarding funding. When wholesale rates are low, the new banking statute allows Abbey National to access a larger portion of wholesale funds than they would be allowed under building society status. He added that during times of low wholesale interest rates, the equity markets flourish, thus attracting funds from

the retail sector. However, during times of high interest rates in wholesale markets, equity markets suffer, pushing retail funds back to the savings accounts. Under these conditions Abbey National is able to shift back to its low-cost retail source of funds.

Building societies' investment portfolios may be divided into three classes. Class one consists of all mortgages made on owner-occupied residences. Class two consists of loans made on property other than class one. Class three represents investments made in real estate and unsecured loans. They are limited to a maximum percentage of loans (other than class one) that they may hold on their balance sheets.

Date	Limit on Class 3 Assets	Limit on Class 2 and Class 3 Assets Combined
Initial	5%	10%
1/1/1990	7 1/2%	17 1/2%
1/1/1991	10%	20%
1/1/1993	15%	25%

Source: BSA Annual Report 1988

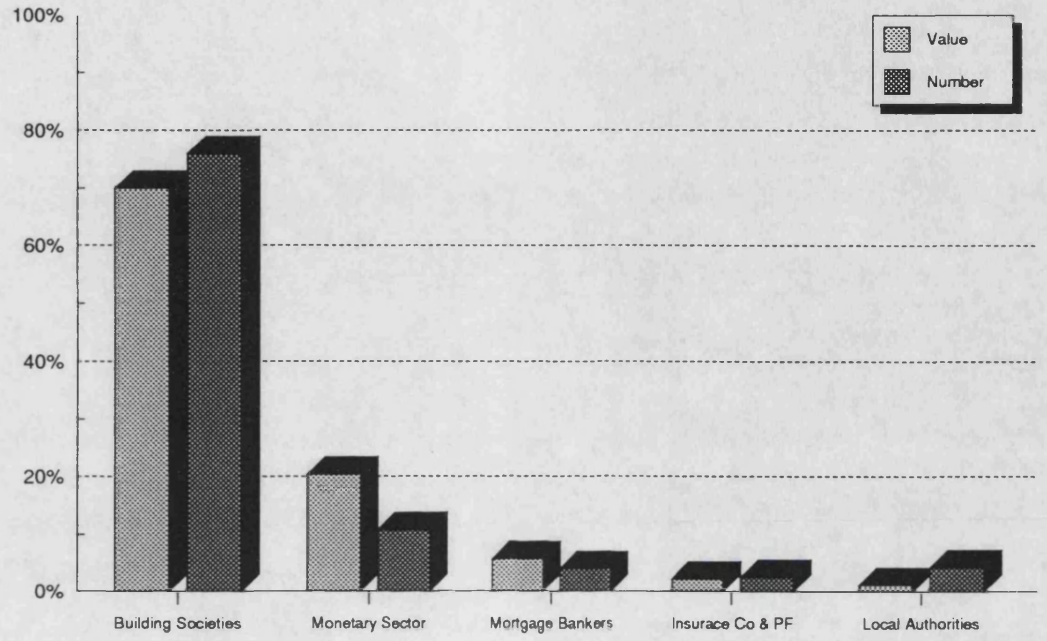
Independent survey data shows that the vast majority of the building societies' 1988 mortgage loans was to first time buyers. However, this was not found during the Building Societies Association's 1988 five per cent survey, which reported an average of 47.43 per cent. The Financial Research Services survey reported that between September 1987 and September 1988, 74 per cent of the first-time buyers who responded to the question said that they received their mortgage from a building society.

To confirm that building societies may be holding a larger percentage of first-time buyers' mortgages than the retail and mortgage bankers, one may look at the average size of mortgages held. Most first-time buyers' mortgages may be high in loan-to-value ratio but relatively small in value when compared to other mortgages. Therefore, if we compare the number of mortgages held to value held, building societies should have a higher ratio than the other lenders mentioned. According to the Central Statistical Office (CSO) Financial Statistics, building societies held a total of 58.92 per cent of the total value of mortgage while the Financial Research Services reported that 75.93 per cent of the respondents said their mortgages were with building societies. Additionally, the British Market Research Bureau's survey showed that the average mortgage outstanding from a bank was 42.03 per cent[19] larger than that from a building society. A further verification of the accuracy of the Financial Research Services' survey is the relationship which one would expect from mortgages made by the local authorities. Mortgages issued by the local authorities are normally very small in value. As shown in Figure 11, local authorities are holding a large number of mortgages relative to value. This should justify the other comparisons.

[19] Banks' average outstanding mortgage was £29,400 vs the building societies' average mortgage which was £20,700. Source: Council of Mortgage Lenders 'Housing Finance No. 4' October 1989 p. 13

Figure 11

Value of Mortgages Held vs Number Mortgages Held



To show the changes in the overall complexion of the building societies' financial position, we provide the consolidated balance in the following table:

Table 5

Building Societies: Assets & Liabilities (Book Value) End of Period

LIABILITIES

Year	Total	Shares & deposits	Interest accrued but not credited	Time deposits	Certificates of deposits	Bank borrowing	Bonds	Total Wholesale	Reserves, official loans and other liabilities
1985	121,239	104,870	1,611	1,878	1,499	1,106	1,798	6,281	8,477
1986	140,740	117,554	1,965	3,470	1,521	2,137	5,439	12,567	8,654
1987	160,543	131,963	2,329	4,318	2,051	2,640	5,983	14,992	11,259
1988	191,168	152,645	2,691	5,320	2,574	2,780	9,224	21,278	15,934
1985	100%	86.50%	1.33%	1.55%	1.24%	0.91%	1.48%	5.18%	6.99%
1986	100%	83.53%	1.40%	2.47%	1.08%	1.52%	3.86%	8.93%	6.15%
1987	100%	82.20%	1.45%	2.69%	1.28%	1.64%	3.73%	9.34%	7.01%
1988	100%	79.85%	1.41%	2.78%	1.35%	1.45%	4.83%	11.82%	8.34%

ASSETS

		Mortgages			Assets other than mortgages						
Year	Total assets	Total	Personal Sector	Commercial Sector	Total	Short-term assets	British government securities	Local Authorities Securities	Local Authorities Other	Overseas government securities	Other assets
1986	140,740	116,938	116,640	298	23,802	11,036	9,521	156	1,067	3	2,019
1987	160,543	132,328	131,766	562	28,215	17,245	8,308	62	568	0	2,032
1988	191,168	157,065	156,088	977	34,103	22,071	8,868	29	348	0	2,787
1986	100%	83.09%	82.88%	0.21%	16.91%	7.84%	6.76%	0.11%	0.76%	0.00%	1.43%
1987	100%	82.43%	82.08%	0.35%	17.57%	10.74%	5.17%	0.04%	0.35%	0.00%	1.27%
1988	100%	82.16%	81.65%	0.51%	17.84%	11.55%	4.64%	0.02%	0.18%	0.00%	1.46%

Source: Financial Statistics, Table 7.7

3.3.1.2 Monetary Sector

The monetary sector includes all banks in the United Kingdom. Before 1981 banks were not active in the housing finance market because regulation limited the total amount of mortgages they were allowed to hold as assets. This restraint or 'corset' was removed in 1981 and the banks aggressively pursued the retail mortgage market capturing approximately 40 per cent of the new mortgage loans in 1981.[9] As shown in Figure 6 (Total Mortgages Held in 1988), banks are funding approximately 20 per

cent of all mortgages. To appreciate the differences between the building societies and banks, we are providing the monetary sector's statistics as collected and reported by the Bank of England in the following Table 6.

TABLE 6

Monetary Sector's Balance Sheet as of 30 December 1988

£ million

Assets

			Market Loans				
Total	Notes & coin	Sterling Balances with Bank of England	Market Loans Secured money with LDMA	Other UK monetary sector	UK monetary sector CDs	UK Local authorities	Overseas
282,572	3,375	749	5,220	17,639	4,201	738	3,573

assets continued

Bills				Advances			Banking	Investments	
Treasury bills	Eligible local authority bills	Eligible bank bills	Other bills	UK public sector	UK private sector	Overseas	Department lending to central government (net)	British government stocks	Other
1,502	388	6,060	137	715	147,907	5,284	956	3,547	5,123

Assets continued

Other currency assets							Sterling
Market loans and advances					Bills	Invest-	& other
UK monetary sector	UK monetary sector CDs	UK public sector	UK local authorities	Overseas		ments	currency : miscel-laneous assets
10,007	234	33	7,616	30,165	436	6,143	20,824

Liabilities

		Sterling deposits					Other currency deposits				Sterling and other currencies
Total	Notes issued	UK monetary Sector	UK public sector	UK private sector	Over-seas	CDs&other short-term paper issued	UK monetary sector	Other United Kingdom	Over-seas	CDs & other short-term paper issued	Items in suspense & transmission, capital & other funds
282,572	1,407	20,165	4,080	137,467	17,609	11,965	6,373	6,883	26,211	3,549	46,863

3.3.1.3 Mortgage Bankers (New Lenders)

The year 1986 marked the beginning of 'Big Bang', a property boom and the creation of special-purpose mortgage lenders. These special-purpose lenders offered faster service with competitive rates and were the first to rely solely on wholesale funds as their source of funds. The laymen's term for them is 'New Lenders'; however, in this paper we shall address them by their proper name: 'mortgage bankers'.

Mortgage bankers are defined as mortgage lenders who depend on wholesale markets as their source of funding and who do not have a retail base on which to draw.[10] Mortgage bankers originate and service mortgages; however, the mortgages are sold or transferred shortly after origination. Therefore, we shall address these intermediaries as mortgage bankers.

According to the CSO Financial Statistics which report home loans under Table 9.4, the two subdivisions for monetary sector subsidiaries as follows:

1. 'Monetary Sector Subsidiaries' comprises specialised mortgage finance companies in the UK, not consolidated with their parent banks but which act as departments of their parents (and are in general largely funded by them); together with non-monetary sector banking institutions in the Channel Islands and Isle of Man which are members of UK-based banking groups.

2. 'Other' comprises UK mortgage finance companies which are not subsidiaries of monetary sector institutions, albeit they may borrow from the monetary

sector together with Channel Islands and Isle of Man banking institutions outside the monetary sector which are not connected with UK-based banking groups.

Although this sector only accounted for 5.62 per cent of the total value of mortgages held in the UK,[20] it has moved from issuing only 1.55 per cent of all mortgages in 1983 to an impressive 12.46 per cent of all mortgages originated in 1988, showing an 803 per cent growth. This sector introduced a new form of housing finance in the UK — securitization.

It is not necessary for an intermediary to perform all three housing finance functions — origination, servicing and funding. As we mentioned in the previous section, intermediation costs are lowest when the lowest-cost supplier of the housing finance function provides the service. Securitization allows independent specialisation of each function, which creates a more cost-effective system.[11] This could be the reason for the rapid growth of the mortgage-backed securities market in the United Kingdom. We shall explain the structure and relative elements of this new technique of financing in the following section.

3.3.1.4 Sterling Mortgage-Backed Securities

Sterling mortgage-backed securities (SMBS) are a notes issued from a thinly capitalised PLC whose assets consist of a pool of endowment-linked residential mortgages (see Table 7). The SMBS are issued as floating rate notes (FRN) and are

[20] It is not clear to us how the statistics are kept. It is assumed that even though the mortgages are sold, the CSO does not account for secondary market operations and therefore assumes that the mortgages originated by this sector are considered to be held by this sector.

traded on the FRN market. The sterling mortgage-backed security differs from the traditional FRN in that it has a series of embedded call options. Because of the structure of these notes, every time a mortgagor prepays his mortgage the principal is paid through to the note holder, which in effect triggers a call option. This call provision creates cash flow uncertainty, which presents an interesting problem when one is pricing the SMBS.

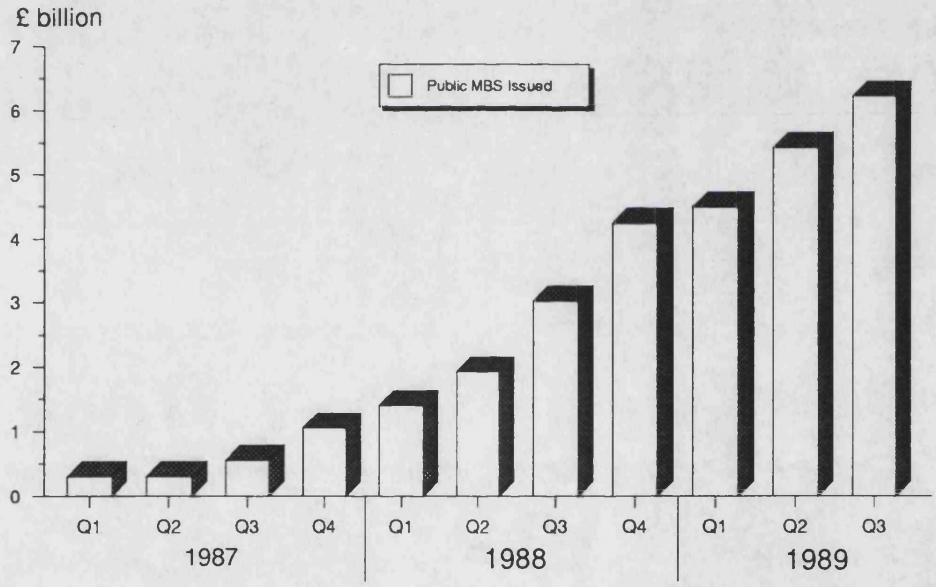
Table 7	
Capitalisation of the NHL Third Funding Corporation PLC	
Share Capital	
Authorised	£
Shares of £1 each	50,000.00
Issued	
2 shares of £1 each (Fully paid)	2.00
49,998 shares of £1 each (25p paid	12,499.50
Loan Capital	
£100,000,000 Mortgage-Backed Series A Notes Due 2014	100,000,000.00
£10,500,000 Mortgage-Backed Series B Notes Due 2014	10,500,000.00
Total Loan Capital	110,500,000.00
Total Capitalisation	110,512,501.50

A capital ratio (or gearing) of only .0113 per cent

The first public sterling mortgage-backed security was issued in January 1985 through a special-purpose company called MINI which was formed to fund mortgages originated by the Bank of America. This issue was not well received by the investment

community market, due to its complexity and small size (£50 million). Two years passed until National Home Loans Corporation PLC, a special-purpose mortgage lender, issued a sterling mortgage-backed security. This issue was well received by investors, and the market has grown rapidly, surpassing £9 billion as of January 1990. The SMBS have shown a steady growth ever since the introducing of NHL's first issue. For a listing of sterling mortgage-backed securities issued through 1988, see Appendix A.

Figure 12
Growth of UK Mortgage-Backed Securities Market



The growth of SMBS are significant when compared to traditional sterling FRN market instruments, which reported a total volume of £14 billion in January 1990. Additionally, the volume of SMBS traded surpassed the UK building society FRN

market in 1989.[12] This rapid growth can be partly attributed to the dwindling supply of Gilts. Investors who require high quality investment grade sterling paper find that the SMBS serve as good substitutes for Gilts.

The UK growth has been accomplished solely by private means, with no support from the Government. The rapid growth of sterling mortgage-backed securities confirms that MBS are not just a US phenomenon and that securitization offers a more efficient form of intermediation than the antiquated conventional intermediaries.

3.3.2 Canada

'Cannie Maes', the name given to the Canadian government's guaranteed mortgage-backed securities, made their debut on 1 January 1987. An amendment to National Housing Act (NHA) in 1984 permitted the Canada Mortgage and Housing Corporation (CMHC), a Canadian government agency, to guarantee NHA mortgage-backed securities or Cannie Maes.

NHA MBS were issued on the basis of a rigorous study conducted by the CMHC. This agency's two primary economic aims were to increase the supply of housing for Canadians by attracting more funds into mortgage lending and to encourage longer-term mortgages. CMHC concluded that its objectives would be best obtained through the stimulation of secondary markets via securitization.

The Canadian residential mortgage market is unique in that mortgages are usually originated at a fixed-rate interest with payments amortising over 25 years. However, the mortgage becomes due and payable in full (i.e. balloons) in six months to ten years,

with weekly, half-monthly and monthly payment frequencies. Furthermore, the lender guarantees to issue a new mortgage, or roll-over the mortgage, to the mortgagor at the current prevailing rate. This allows the lender to better manage his interest rate risk. Lenders do not charge front end fees, but there are prepayment penalties. Prepayment penalties are not standardised and vary from lender to lender. Table 8 represents the typical prepayment provisions.

Table 8

Typical Canadian Prepayment Provisions

1. The mortgagor has the right to prepay 10 per cent (some lenders now allow 15 per cent) of the original amount of the mortgage without notice, bonus or penalty, once in each calendar year;
2. Another typical provision allows borrowers to increase their mortgage payments once in each year providing that the cumulative increase over the term of the mortgage does not exceed 100 per cent of the original payments;
3. Also, in accordance with CMHC policy on its insured loans with a term of five years, the borrower has the right of prepayment in full after the third anniversary of the mortgage, subject to a penalty of three months' interest. The Canada Interest Act provides that all mortgages to individuals, whatever the term, are open after the fifth year, subject to a penalty of three months' interest.

Because of increased competition, lenders are becoming more lenient with prepayment penalties, thus causing a disturbance in the prepayment experience. Lower prepayment penalties cause the NHA MBS to become more sensitive to interest rates. The lower transaction cost will allow mortgagors to re-mortgage when there are relatively small downward shifts in the interest rates.

The Canadian residential mortgage market is dominated by large national financial institutions; approximately fifteen lenders hold eighty to eighty-five percent of the market share. The large lenders can easily gain access to low cost funds via the capital markets. However, small and medium regional mortgage lending firms, who are

unable to access wholesale capital markets, must pay more for their cost of funds. The additional cost is passed to the consumer as higher mortgage rates and causes the smaller lenders to be competitively handicapped regarding interest rate pricing.

Since the introduction of MBS, there exists what is referred to as a 'level playing field', which is to say that all mortgage lenders, regardless of size, are able to gain access to the AAA rated capital markets. The government guarantee allows any lender to securitize its mortgages, and with a AAA credit rating, provides a low cost of funds. During the first year of inception, seventy percent of the volume and fifty-five percent of the dollar value of all NHA MBS were issued by regional trust companies. The heavy participation by regional lenders is expected to continue.

Retail investors dominate the NHA MBS market. The securities are sold in $5,000 denominations, yielding about 175 basis points over Canadian treasuries, and pays monthly. These features have attracted individual investors, like pensioners, who are seeking a source of high yield, low risk and steady monthly income. Another reason for the growth of the retail market is that stockbrokers receive a one percent commission as opposed to the fraction of a percentage that they receive on treasuries.

The Canadian MBS market has shown a strong and steady growth, based on the following three factors:

- Securitization offers the regional lenders lower capital cost, which passes interest rate savings to the consumer.
- The market demand is strong from the retail sector.
- MBS allow lenders to transfer interest rate risk, allowing them to offer longer term mortgages.

The NHA MBS market surpassed $15,000,000 in 1987 and represented only 6.8 per cent of the $220,000,000 mortgages outstanding. Securitization should continue to develop as a cost-effective form of financial intermediation for Canada's housing financial market.

3.3.3 Australia

Australia has a high standard of living and the highest per capita rate of home ownership in the world. Savings banks provide the majority of the funds used to finance homes, with permanent building societies being the second largest lender. The Australian housing finance system is starting to use securitization as a method of financial intermediation with the support of the government and private sectors. This section will explain how securitization is developing in Australia

In Australia, mortgages are made with variable rates of interest and are amortised over 20 or 25 years. Before 1986 the Commonwealth capped the interest rate federally chartered institutions could charge. This limited the supply of funds for mortgages. Additionally, because state-chartered institutions are limited to conducting business within state boundaries, mortgages are not standardised, and rates may vary by as much as two per cent between states. The reason for this variance is because savings banks and building societies primarily depend on the local savings base to supply funds for mortgages.

In 1983, the newly elected Labour government commissioned a review of the Australian financial system. Not only was the government interested in the general economic condition, but it was extremely interested in what effects deregulation may

have on the housing finance sector. The government was interested in allowing greater competition in the banking industry by deregulating building societies and eliminating interest rate controls.

Mr Vic Martin, former chief executive of the Commercial Banking Corporation, chaired the review group and published the Australian Financial System, Report of the Review Group in December 1984. This report states that

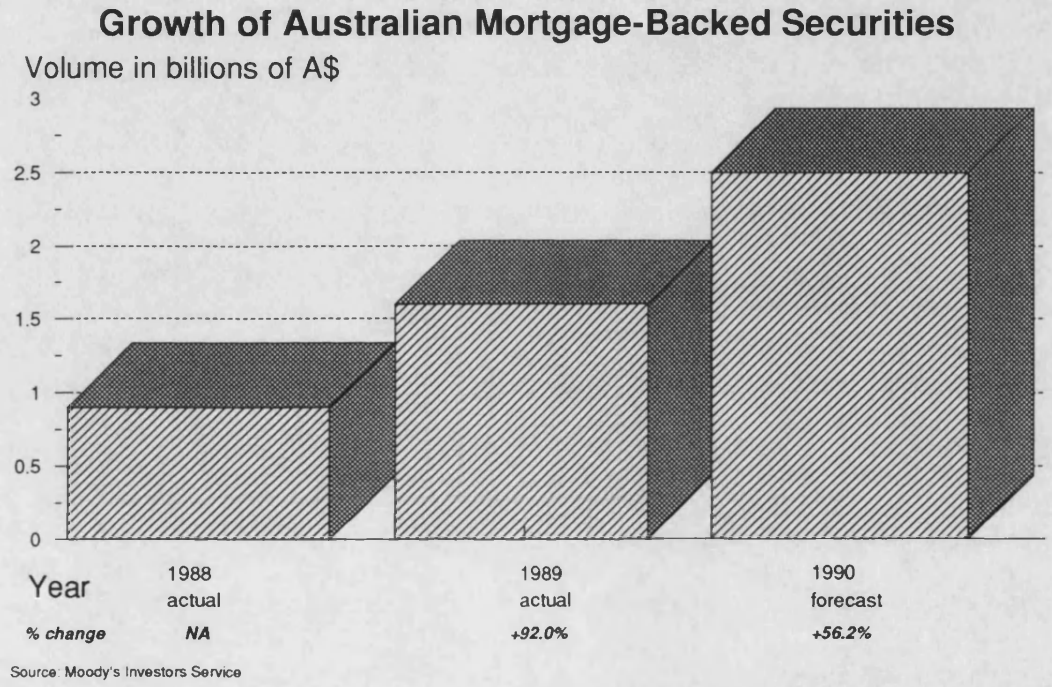
> 'It could be particularly valuable in attracting funds for housing from non-traditional sources and is a method much preferred to the imposition of direct controls over non-bank financial institutions or the establishment of special funds.'[13]

The Housing Loans Insurance Corporation (HLIC) was established by Australian parliament in 1965 to insure primary residential mortgages. Furthermore, to promote the secondary mortgage market, in 1985 the HLIC was empowered to insure approved dealers in the secondary mortgage market against losses, direct or indirect, relating to mortgage securities traded on the secondary market. HLIC is similar to the United States Federal Housing Authority, in that it is backed by the full faith and credit of the Australian government and in that it is self-financing through the insurance premiums it collects for its guarantees.

Within two years after HLIC started insuring mortgage pools, two mortgage conduit agencies were established with state assistance to securitize mortgages: the First Australian Mortgage Acceptance Corp. (FANMAC) in New South Wales and the National Mortgage Market Corp. (NMMC) in Victoria. In addition to these government supported securitization vehicles, several private entities like MGICA

Securities Ltd and Security Pacific Mortgage Australia Ltd have sold mortgage-backed securities into the Australian market. The growth of the Australian market is best illustrated in Figure 13

Figure 13



3.4 Conclusion

In this chapter we discussed the elements of financial intermediation and showed how securitization provides an efficient form of financial intermediation. To stress the efficiency of securitization, we provided examples of how securitization is being adopted into the housing financial systems of the United Kingdom, Canada and Australia. We would like to emphasise the level of activity with which each of these countries' governments is participating in the development of the securitization market.

In the UK, the Government is absent from market development, in Canada the mortgage-backed securities market was started and is dominated by the government, and in Australia, the government and private sectors are actively issuing mortgage-backed securities.

We have shown how securitization is promoting market efficiency in the housing financial markets throughout the world. In the next chapter we discuss how the process of securitization is being used to securitize non-mortgage related receivables.

CHAPTER 4
ASSET-BACKED SECURITIES

The purpose of this chapter is to give a general overview of non-mortgage securitization. All non-mortgage securitized debt instruments are referred to as asset-backed securities (ABS). In the previous chapter, we discussed how the securitization process is used to fund residential mortgages. However, this method of intermediation has evolved and is being applied to a host of other assets. By packaging homogeneous receivables for sale to investors via the capital and money markets, this new method of financing has grown exponentially because of the utility (savings and benefits) it offers issuers and investors.

This chapter is divided into three main sections. The first section presents a general overview of the US ABS market and examines the reasons for the its rapid growth, the legal structures of ABS and credit analysis considerations. Section 4.2 examines the pricing and cash flow of ABS with detailed illustrations of certain issues. Additionally, in this section we compare and contrast the ABS cash flows with those of mortgage-backed securities. Section 4.3 will close this chapter with a discussion on the potential development of asset-backed securities.

4.1 Overview of Asset-Backed Securities (ABS)

This section will provide an overview of asset-backed securities. We shall first discuss their growth and application. Following this discussion, we shall address the economic and regulatory elements that serve to perpetuate the market. Also, we shall examine the legal structure of ABS. This section will conclude with the role and activities that rating agencies have in the development of this market.

4.1.1 Growth of Asset-Backed Securities

Salomon Brother Inc. is a major international investment bank that is active in the mortgage-backed and asset backed market. During an interview with Mr. Mark McCoy, asset-backed specialist from Salomon Brothers, I asked what assets are appropriate for securitization.

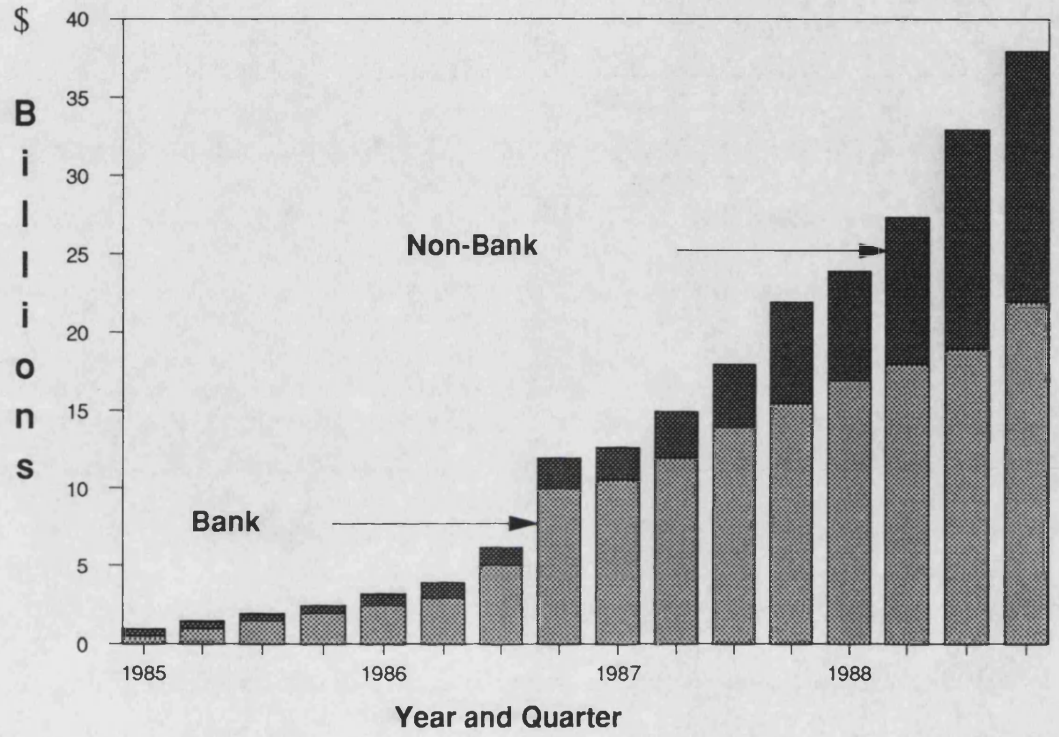
He replied, 'If it flows, securitize it!' By this he means that any receivable that generates a cash flow can be considered for securitization. Presently, the following receivables have been securitised:

- credit cards
- auto loans
- boat loans
- marine loans
- furniture loans
- home equity loans
- non-performing loans
- unsecured consumer loans
- manufactured housing loans
- auto leases
- truck leases
- utility leases
- computer leases
- municipal equipment leases
- trade receivables
- health care receivables
- Euro-trade receivables
- junk bonds
- insurance premiums
- recreational vehicle loans
- political subdivision bonds
- utility debt & common stock

American Telephone & Telegraph Co. is considering securitizing its customers' bills, whilst investment bankers are considering structured financing as a solution to Third World debt. As securitization technology evolves, we should see new types of assets financed by this method of intermediation.

Issues of asset-backed securities are growing at a dynamic rate. Over $17 billion worth of public and private issues were placed in 1988, a 70 per cent increase since 1987, with the cumulative growth exceeding $36 billion. Standard & Poor's Corporation (S&P) predicts that this trend will continue. Currently, S&P is predicting that in 1989 rated issues will surpass $20 billion, with total market growth exceeding $100 billion by 1992.

Figure 14
ABS Market Cumulative Issue Volume
Bank vs. Non-Bank Assets



The forces motivating this rapid growth are twofold: economic and regulatory. The economic and legal environment will continue to help spur the growth of ABS. The freeing of capital and lower intermediation cost are the two primary economic benefits that are fuelling ABS market growth. Ensuing regulatory reform will continue to motivate securitization in both the US and Europe. These areas are covered in detail in this section.

4.1.2 Economic Motivation

Securitization offers the following economic benefits:

- Low-cost source of funds
- Fee income
- Off-balance sheet financing
- Lower intermediation costs
- Risk management - Interest rate
  - Credit

4.1.2.1 Low-Cost Source of Funds

Securitization lowers the cost of funds by isolating risk. With asset-backed securities, investors buy a specific set of receivables with a known amount of risk. This is far safer for investors than lending to a low rated company which can then, at its discretion, fund existing assets or purchase riskier ones. This uncertainty leads investors to demand a higher rate of interest for general obligation bonds than for higher rated ABS. Issuing ABS may allow companies with low credit ratings to borrow funds at AAA rates.

On the surface, ABS financing appears to be dearer than traditional financing methods. As shown in Table 9, the ABS cost appears to be 25 basis points (25/100 of 1 per cent) dearer than a comparable traditional corporate issue.

TABLE 9

Security	Average life	Rate %	Spread over Treasury
Treasury	2 years	8.06	-
AAA Corporate	2 years	8.73	67 basis points
AAA ABS	2 years	8.98	92 basis points
Incremental cost of the ABS			25 basis points

Source: P. Zweig, *The Asset Securitization Handbook*[14]

This price differential, currently ranging between 20 and 25 basis points, is based on three factors. The first is that payments are received monthly as opposed to half-yearly. This increases the owners' administrative costs. Secondly, the embedded call option which is inherent in most ABS increases risk. Investors demand to be compensated for the prepayment uncertainty which exposes them to reinvestment risk. Finally, ABS are stated in terms of average life, which means that the actual maturity could far exceed the stated one.

When we consider the cost of capital, it appears that an ABS is dearer, but this analysis fails to consider the aggregate cost of capital. Traditional debt financing must have equity to support it when credit quality is evaluated; ABS are valued for their internal structure, independently from the company's balance sheet. In many cases the cost of structuring and funding an ABS is less than the aggregate cost of the traditional debt and the cost of the supporting equity.

To illustrate, let us re-examine the previous example. Assume that the ABS has a 7 per cent recourse rate. That is to say, in the event of default the originator will repurchase up to a total of 7 per cent of the ABS's principal balance, thus giving the ABS a 14:1 debt-to-equity ratio. Additionally, suppose that the corporation has a 10:1 debt-to-equity ratio and the cost of equity is 25 percent on a pretax basis. By identifying the all-in cost of capital, we find that the ABS actually offers a savings of 18 basis points to the issuer. We illustrate this savings in the following table[15]

TABLE 10

COST OF ADDITIONAL £100 RAISED THROUGH CORPORATE DEBT

		Rate %	Spread over Treasury
Debt	£100	8.73	67 basis points
Equity	10	25.00	
Total	£110		
Weighted average cost of capital		10.21	215 basis points

COST OF ADDITIONAL £100 RAISED THROUGH ASSET BACKED SECURITIZATION

		Rate %	Spread over Treasury
Debt	£100	8.98	92 basis points
Equity	7	25.00	
Total	£107		
Weighted average cost of capital		10.03	197 basis points
Savings through ABS			18 basis points

Source: P. Zweig, *The Asset Securitization Handbook*

4.1.2.2 Fee Income

Fee income represents a large portion of the net present value of revenues when one is evaluating consumer loans generated by credit cost utilisation and other loan methods such as hire purchase. Fee income may include the fixed charges for cash advances on credit cards, annual membership fees and servicing fees. Additionally, revenues are generated through the net positive funding over the life of the asset. By securitizing assets, companies are able to earn up-front fees and servicing fees without inflating their balance sheets. Another benefit to fee income is that it is immune from interest rate risk. Increasing fee income shifts portfolio earnings from interest rate-sensitive spread income to fixed fee income.

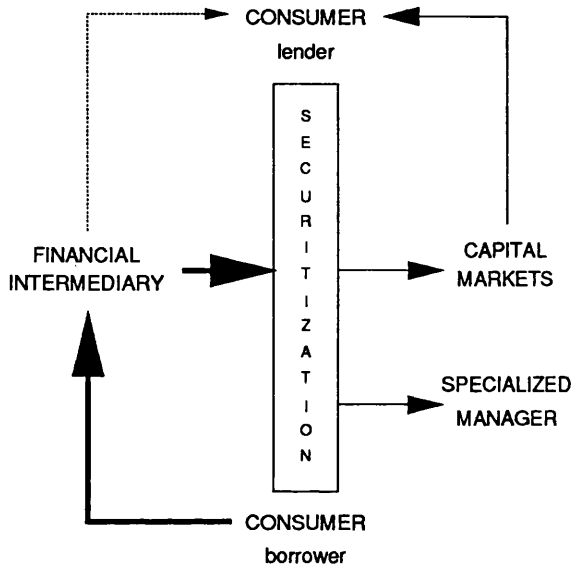
4.1.2.3 Off-Balance Sheet Financing

Securitization takes assets off the balance sheet, allowing banks with a tight capital structure to free capital. Taking assets off the balance sheet can significantly improve the return on equity.

4.1.2.4 Lower Intermediation Cost

Securitization lowers intermediation costs.[16] Securitization is simply a type of wholesale financial intermediation that re-bundles existing non-tradable financial instruments into new tradable securities and transfers risk. In Figure 15, we illustrate how risk flows via traditional methods and via securitization. The thicker the line the greater the risk. Our illustration shows that securitization transfers certain risks (i.e. prepayment, default and interest rate mismatch) from the traditional financial intermediary to a specialised risk manager and ultimately to the consumer. Special managers and the purchasers of ABS are able to manage the risk associated with these instruments at a lower cost than traditional intermediaries. We know that an intermediary's economic function is to reduce transaction and information costs between borrowers and lenders. Thus, intermediaries that provide this service at the lowest cost shall stay active in the market, while other intermediaries will cease to exist.

Figure 15
Wholesale Financial Intermediation



Securitization enables intermediaries to perform their services without the burden of many of the traditional risks they were required to bear (e.g. prepayment, default and interest rate). It is therefore a form of disintermediation with regard to the various risks. In Figure 15, the thickness of the line corresponds to the amount of risk. Without securitization, the financial intermediary assumes the bulk of the risk, whereas with securitization a large portion of the risk is passed through the financial intermediary into the securitization process. Not being burdened with these risks, intermediaries are exposed to less risk and are able to lower their costs.

4.1.2.5 Risk Management

- Interest Rate Risk

  Financial intermediaries transfer the interest rate risk to the holder of the ABS. This is extremely beneficial to finance companies that have mismatched funding and that are highly sensitive to interest rate fluctuations.

- Credit Risk

  Risky assets can be transferred off-balance sheet via securitization, which can help a company's overall credit standing. For example, Credit Commercial de France used the ABS structure to improve its credit posture by removing $500 million worth of high-risk third world loans from its balance sheet in March 1989.[17]

4.1.3 Regulatory Motivation

US banks share with their European cousins the target date of 1992 for a new wave of regulatory reforms. The new risk-based capital rules in the US are scheduled to take full effect in 1992. These capital rules will require US banks to include the total dollar amount of credit cards, automobile loans, boat loans and other consumer loans when calculating capital requirements. These loans require a risk weighting[21] of 100 per cent; mortgage loans are risk weighted at 50 per cent while Treasury securities carry a 0 per cent risk weighting. The risk-based capital rules have caused banks to

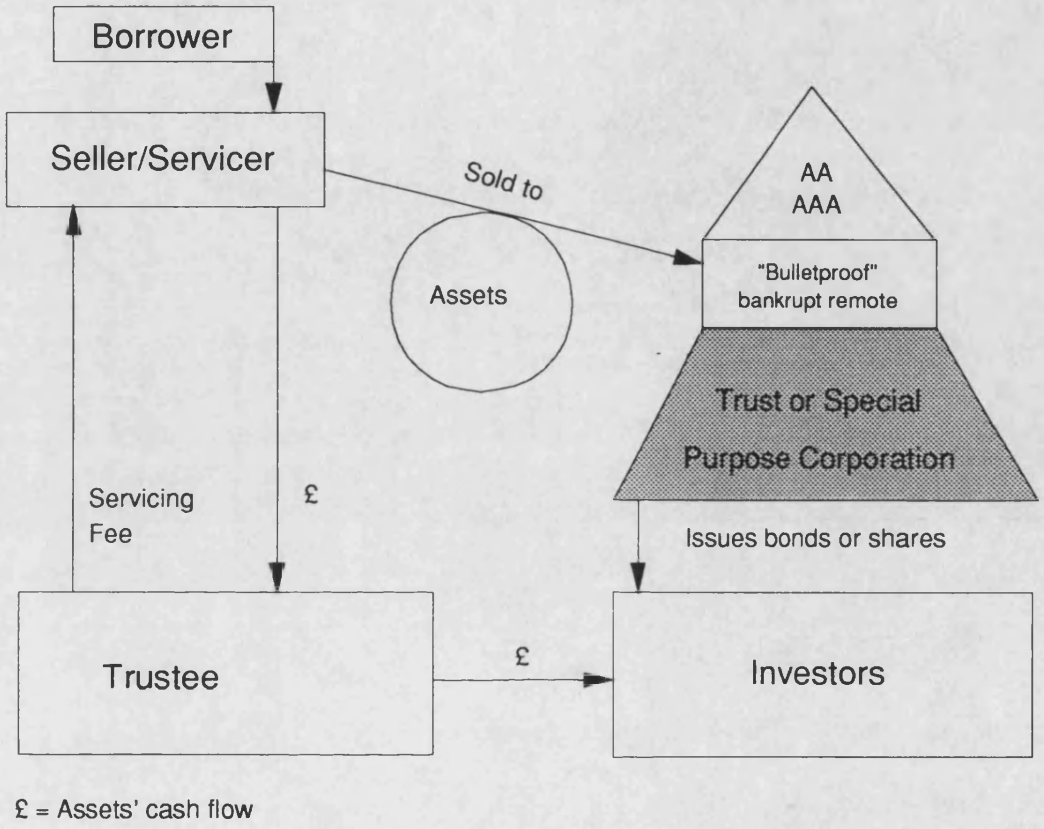
[21] Risk weighting refers to the amount of capital a bank must assign to a particular loan. For example, if the bank's capital ratio is 8 per cent and it makes a £100 loan with a 100 per cent capital weighting, then it must set aside £8 in capital for that loan.

sell their high risk weighted assets and invest the proceeds in lower weighted ones, which may earn a higher return on capital after the risk weighting is accounted for. As mentioned earlier, even after taking the 100 per cent risk weighted consumer credit off their balance sheets, banks can still earn fee income via securitization by servicing the loans.

4.1.4 Legal Structure

Asset-backed securities share similar legal structures with their mortgage-backed counterpart. Either a AAA or AA rated trust or a special-purpose corporation is formed to hold the assets. This legal structure protects the assets in the event that the seller becomes bankrupt or is unable to continue to service the receivables. Figure 16 illustrates the basic structure of an ABS.

Figure 16
Basic Structure of an ABS



In this diagram, we show how the seller/servicer sells the asset to a trust or special purpose corporation. These assets are combined with different forms of credit enhancement to produce a AAA or AA security that is sold to investors. The cash flow from these assets is collected and accounted for by the seller/servicer and is paid to the trustee less a small servicing fee. The trustee then distributes the cash flow to the investors.

The ABS may be issued from two types of legal structures — trusts issue pass-through securities and special-purpose corporations issue pay-through securities. Pass-through securities represent an equitable interest in a grantor trust or credit card trust (used for revolving credit) whose corpus consists of a pool of designated receivables. All monthly payments, minus a small service fee, are passed through to the owners of the trust; hence the name 'pass-through'. Pay-throughs represent a general obligation bond from a thinly capitalised special-purpose vehicle company whose primary assets consist of a pool of receivables. This method of securitization allows the cash flows to be dynamically managed, which allows for structures like multiple-class notes (similar to the collateralised mortgage obligation), varying coupon periods and bullet maturities (the total debt balance is due and paid at a specific date.)

Additionally, the assets of the trust or special purpose corporation (also referred to as the issuer) must be 'bulletproof' from claims made by creditors of the seller (originator). This is to say that the assets of the issuer must be completely immune from any claims the seller's creditors may have in the case of bankruptcy. To complete a successful transfer of assets from the 'originator' to the 'issuer', they must establish a 'true sale'. This topic will be further discussed under legal issues in Section 4.1.5.2 (Legal Issues).

4.1.5 Rating Agencies Considerations

The two largest and best known rating agencies are Moody's Investor Services (Moody's) and Standard & Poor's (S&P). Rating agencies serve as the investors' advocates by constantly monitoring the financial status of issuers of debt securities. As the 'market's watchdogs', they provide investors with credit analysis in the form

of ratings. This lowers the investor's evaluation cost and enhances market efficiency by providing a systematic identification of risk. Additionally, having multiple independent rating agencies maintains the integrity of the overall credit analysis by providing a means of checks and balances.

Securitization offers traditional and non-traditional financial intermediaries a source of low cost funds by packaging homogeneous receivables and then selling the package to investors via the capital and money markets. The package, which is represented as a marketable security, trades as investment grade rated paper. To receive this high rating by S&P and Moody's, AAA or AA and Aaa or Aa respectively, the package must be well insulated from varying risk. This is accomplished by underpinning the pooled receivables through a combination of overcollateralisation, letters of credit, insurance and senior-subordinated debt structures.

Moody's and S&P approach the rating of an ABS in similar ways. When evaluating an ABS security they look at three main areas of risk:

- Credit risk of the collateral - The credit strength of the receivables plus the originator's overall risk profile are reviewed.
- Legal Issues - Two key areas we consider: the perfection of the lien or assets (Is the lien legally enforceable?); and the legal structural weakness with regard to the 'true sale' of the assets (Are the assets bulletproof?).
- Cash flow risks - We consider the inherent risks in the payment structure with regard to the timing and amounts of cash flow under extreme economic environments.

4.1.5.1 Credit Risk

The risk analysis is achieved though the rating process. This starts when the issuer approaches the agencies to discuss the rating parameters before it registers the ABS

with the regulatory authorities. The issuer, or its investment banker, meets each agency to discuss the structure of its transaction and to introduce the agency to the nature of the issuer's business and its operations. Prior to this meeting, the issuer submits a package containing the company's background, strategy, operations, systems and five years of portfolio performance data.

During this preliminary meeting, the parties discuss the viability of the issue, the level of rating required and any potential weakness of the issue. When the parties agree that the issue is likely to achieve its rating goal, the issuer sends the agency a formal letter requesting a rating. Additionally, they agree to keep the rating agency fully informed of any alterations in the legal documentation or the asset-backed security's structure.

Following the rating request, the issuer forwards all initial drafts of the standard documentation, including

- the pooling and servicing agreement,
- the prospectus if it is a public issue,
- a private placement memorandum for a private issue and
- an indenture when applicable.

After reviewing the documentation, the agency performs an on-site examination. This involves meeting management to review the overall efficiency of the organisation. It is accomplished by interviewing the senior financial management, lending division managers, the underwriting or credit managers, collection managers

and the computer systems management. The control functions of accounting, auditing, documentation and management information systems are reviewed. This enables the agency to determine the efficiency of the credit and collection processes.

Furthermore, a delinquent receivable is traced through the system, from the first notification through collection, charge-off and liquidation of the collateral (if applicable). Particular attention is given to the work load of each collector, the duration of the process and involvement of upper management in the more difficult cases. Upon final assessment of the originator's system, the agency will make recommendations on procedures to segregate the pooled receivables for tracking and reporting purposes.

4.1.5.2 Legal Issues

When assessing the legal structure of an ABS, it is crucial to make sure the transaction is 'bulletproof' because the issuer could be exposed to losses if the originator went bankrupt. For example, under the US Bankruptcy Code, transfer of assets from the originator to the issuer must pass the 'true sale opinion', which is obtained from independent legal counsel. Therefore, when evaluating the 'true sale' of a structure, S&P makes the following key considerations:

1. Transfer is treated as a sale for accounting and tax purposes.
2. Level of recourse (direct or indirect) to originator is less than a reasonably anticipated default rate based primarily on historical default data. Recourse may take several forms including:
   - -repurchase of defaulted assets
   - -substitution of good assets for defaulted assets
   - -reimbursement of third-party credit provider
   - -retention of subordinated piece

3. Originator retains none of the benefits of ownership of the transferred assets, i.e., originator is not entitled to any appreciation of the assets and originator does not have the right to use the proceeds of the assets.
4. The documents are consistent and evidence the parties' intent that the transfer be characterised as a sale.
5. Neither the assets nor the proceeds of the assets are commingled with property of the originator.[18]

4.1.5.3 Cash Flow Risks

The cash flow of an ABS are predominantly dependent on the cash flow from its underlying receivables. If for some reason the cash flow from the receivables are impaired through delinquency or default there must be additional support. This support can be through overcollateralisation, letters of credit or repurchase agreements. By underpinning the pool of receivables with one or more of these supports, the investors' cash flow are guaranteed even during times of extreme economic uncertainty.

The amount of credit enhancement is determined by exposing the pool of receivables to various stress tests. The maximum arrears and losses expected during times of hyper-inflation, or in times of severe recession and depression, must be offset by the credit support. Additionally, the liquidity and interest rate sensitivity of the receivables are tested under the same extreme economic conditions. This is to ensure that there will be enough cash value in the assets if the trustee or issuer is forced to liquidate the receivables to honour payments to investors. The par value of the asset-backed security less the worst-case environment price equals the amount of credit enhancement that will be required to receive the investment rating. The higher the rating the more severe the tests.

The issuer may use three types of credit enhancement:

- Overcollateralisation
- Letter of credit
- Repurchase agreement

Overcollateralisation is the amount of receivables placed by the originator in the ABS that exceeds its par value. This excess serves to cushion the cash flow from any seasonal fluctuations, delinquencies or defaults. The amount of overcollateralisation will vary according to the credit risk of the receivables. The issuer recoups the excess value once the ABS matures.

A letter of credit (LOC) is another method often used to support ABS. The main benefit of the LOC is that it allows the ABS to obtain a higher rating than its originator. This is accomplished when a high-rated bank or institution underwrites the LOC, guaranteeing a set percentage of the receivables from arrears and losses.

Repurchase agreements are made with the originator, who contracts to buy back a set percentage of the receivables at face value. This method still supports the ABS but does not tie up the issuer's assets, as overcollateralisation does. However, the face value of the repurchase agreement must be shown on the originator's balance sheet.

For instance, let us assume that Nat West is going to sell £500 million worth of its credit card receivables via an ABS structure. In the sales agreement, Nat West promises to repurchase or replace any account that is in arrears or default up to an

aggregate amount of £100 million. Under this agreement, Nat West would show a £500 million sale of assets and a £100 million contingency liability for the repurchase agreement, thus reducing the balance sheet by £400 million.

The rating agencies practice due diligence when assessing asset-backed securities and only give an opinion on the asset's risk sensitivity based on the information they receive. They do not serve as financial advisers. Also, they continue to monitor the ABS monthly throughout its life and will keep investors informed of any dramatic changes.

4.2 Understanding the Value And Cash Flow of ABS

The value of an asset-backed security is based on either the present value of its net cash flow or the aggregate face value of its underlying receivables, which ever is less. To prevent over-pricing, one must compare the face value of the receivables with the ABS net present value. For example, suppose there is a pool of receivables valued at a premium and this premium is used to value the security. If all the debtors of the underlying receivables decided to repay in full the day after the issue is sold, the cash flow would not be able to satisfy the ABS debt because the premium would be lost due to early prepayment. In this case the total face value of the receivables should have been used to value the ABS. Alternatively, when receivables are at a discount the present value method is appropriate.

The following three methods are used to determine the present value of an ABS:

GROSS-TO-GROSS

CONSTANT-TO-NET

NET-TO-NET

Applying these three present value methods to the same set of cash flow may yield different results. Therefore it is important to have an understanding of the different methodologies. All these methods assume no prepayment and use the same payment frequency for the receivables as for the notes.

The GROSS-TO-GROSS method discounts the gross cash flow at the gross rate. The gross rate includes the note rate (coupon rate), the servicing fee and other expenses. This method has a tendency to overstate the note's value.

The CONSTANT-TO-NET method discounts the gross cash flow, less a static servicing fee and other expenses, at the note rate. This method has a tendency to understate the security's value because it fixes the servicing fee based on the beginning balance of the pool of receivables. Servicing and expenses are normally charged as a percentage of balance outstanding, and since this balance is amortising, the expenses are overstated.

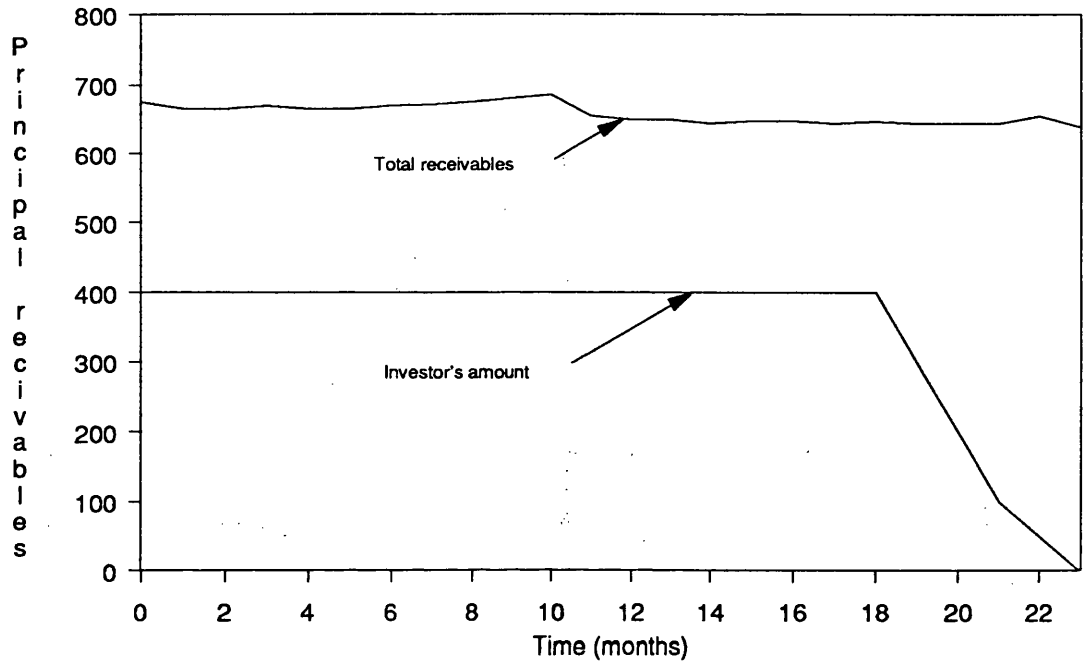
The NET-TO-NET method offers the best approach because it most accurately reflects the true cash flow. This method discounts the net cash flow (cash flow received by the security holder) at the note rate.

To explore every ABS structure would require reviewing every security issued — a total of 157 up to July 1989. Therefore, selected issues of credit card-backed securities, which are referred to as Certificates for Amortising Revolving Debts Securities (CARDS), and auto-backed securities, referred to as Certificates for Automobile Receivable Securities (CARS), will be examined. The reason we selected credit card receivables and automobile loan receivables is because credit cards represent the largest dollar value in total ABS issued and auto loans represent the largest number of ABS issued.

4.2.1 Certificates for Amortising Revolving Debts (CARDS)

CARDS are normally issued paying a fixed-rate of interest for the first eighteen months; they then begin amortising from the eighteenth month, paying out in a relatively short period. Over the past four years, average monthly repayment rates have ranged from 9.61 per cent for private label cards, which are historically slow payers, to 19.59 per cent for cards like VISA and MASTERCARD. The first issue structured as a sale for regulatory and financial reporting purposes was Bank of America's $300 million 8.20 per cent California Credit Card Trust 1987-A. As shown in Figure 17, this issue paid interest at a fixed-rate for the first eighteen months, and then fully amortised in the following three months.

Figure 17
Cash flow of California Credit Card Trust 1987-A



The graph shows that the overcollateralisation of the CARDS issue served to cushion fluctuations in the receivables, leaving the investor's cash flow intact. Additionally, the rapid amortisation was expected because of the traditionally high monthly payment rates the pool had previously experienced.

4.2.1.1 Spiegel Charge Account Trust No. 1

In this subsection we shall examine a specific credit card-backed security originated by Spiegel Inc., an American mail-order retail clothing company. By examining and explaining the various elements of this structure, we hope to make possible a thorough understanding of credit card securitization.

In December 1988 Spiegel Inc., a subsidiary of Otto Versand G.M.B.A., securitized its Preferred Charge credit card receivables via the Spiegel Charge Account Trust No. 1 (SCAT 1), offering $150 million in investor certificates, yielding a 9.6 per cent annualised monthly rate — a lower interest rate than Spiegel Inc. could have obtained through issuing its own debt because the company has a lower credit rating than SCAT1. This was the first credit card-backed security issued by a German-owned company that was underwritten by a German Bank. The issue received AAA ratings from both Moody's and S&P.

As a retail mail-order merchant, Spiegel Inc. provides open-ended revolving consumer credit to its customers. Spiegel has 61 billing cycles of which 1-16 were included in its first ABS issue. The Spiegel Charge Account Trust No. 1 cash flow is supported by overcollateralisation and letters of credit, which are explained in the following section.

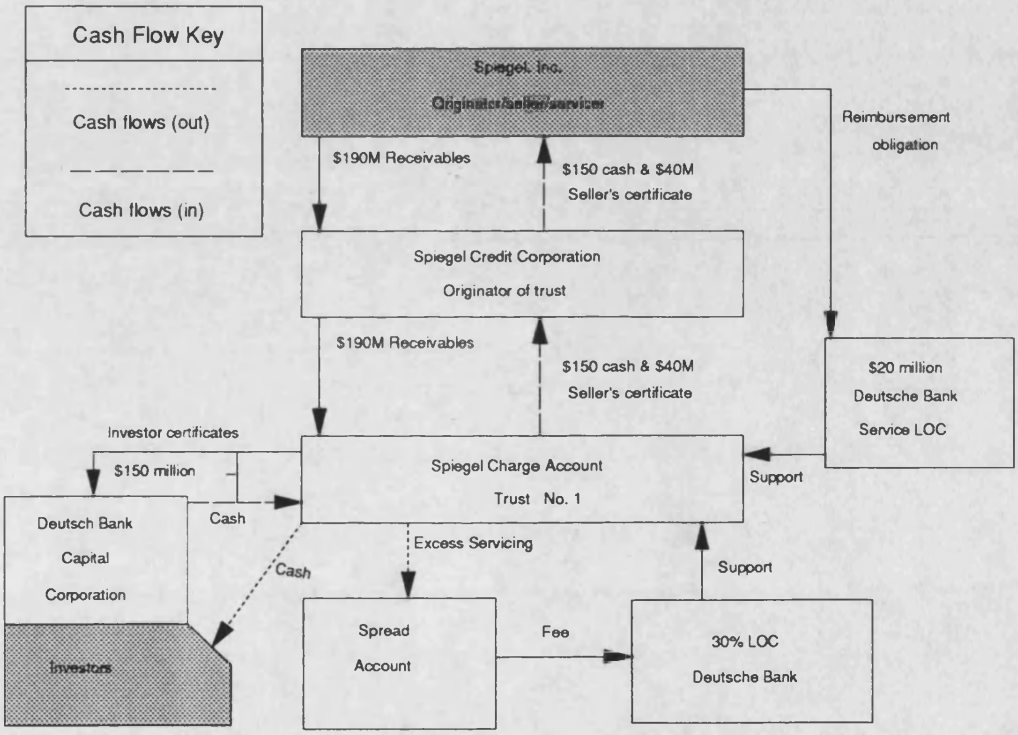
4.2.1.1.1 Structure

As shown in the Figure 18, Spiegel Inc. sold $190 million worth of credit card receivables to Spiegel Credit Corporation (SCC). This is a special-purpose corporation which serves as an intermediary in order to effect a 'true sale' of the receivables. Spiegel's selling the credit card receivables to SCC insulates the receivables from any claims Spiegel Inc.'s creditors may have against the assets in the event of bankruptcy.

SCC then sells the receivables to the Spiegel Charge Account Trust No. 1 credit-card trust for $190 million, which in turn issues and sells $150 million worth of investor

certificates to the lead underwriter, Deutsche Bank Capital Corporation (DBCC), the American investment banking arm of Deutsche Bank. The trust then channels the $150 million cash and a $40 million seller's certificate back through the structure to Spiegel Inc.

Figure 18
SCAT 1 Structure Diagram



Spiegel Inc. will continue to service the receivables, passing the cash flow down through the structure to the investors. Any excess servicing income will be paid to a spread account which funds the cost of Deutsche Bank's 30 per cent Letter of Credit (LOC). The 30 per cent LOC protects the trust's cash flow from default or

delinquent receivables. Given this support, the trust would have to suffer a $97 million[22] or a 51.05 per cent loss before investors would be affected. Considering the historical performance of Spiegel's credit card receivables and servicing capabilities, losses of this magnitude are most unlikely.

Also, Deutsche Bank issued an additional $20 million service LOC to protect the pool if the servicer, Spiegel, went bankrupt. The servicer accrues collected receivables on a monthly basis and then passes the accrued money through the structure to the SCAT 1 at the end of the month. If Spiegel Inc. goes bankrupt, Deutsche Bank will compensate SCAT 1 to a maximum of $20 million. This ensures a timely and prudent flow of funds to the trust. If for some reason Spiegel exceeds $20 million in accrued receivables, the excess must be remitted to the trust's account within two business days.

4.2.1.1.2 Payments

As shown in Figure 19, the Spiegel Charge Account Trust No. 1 investor certificates have a 4 year maturity with an average life of 3 $^1/_2$ years, and the payment streams are divided over two periods:

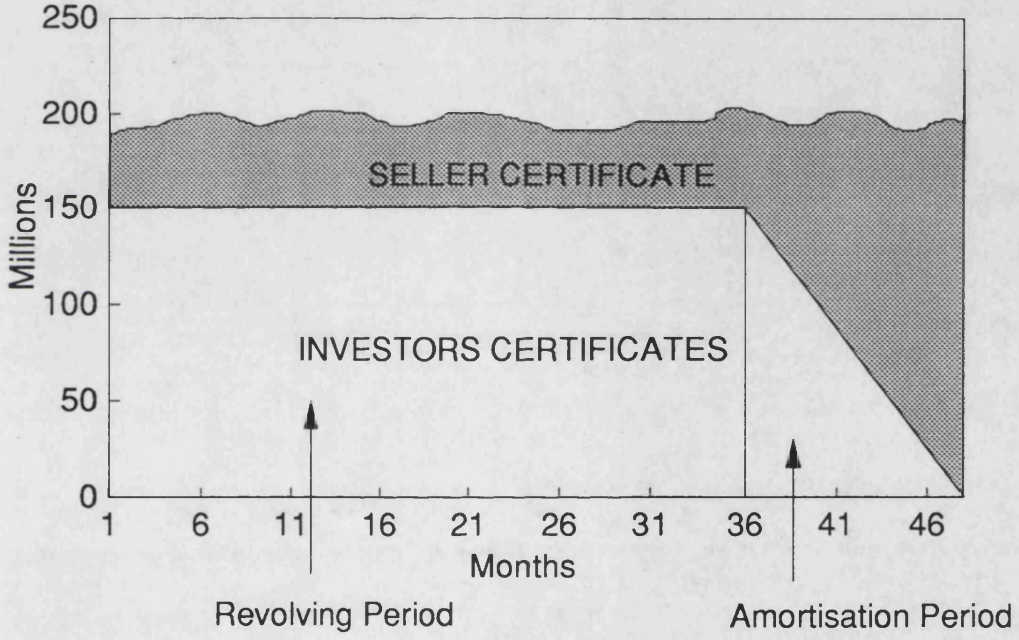
- 36 month revolving period when the principal balance remains constant
- 12 month controlled amortisation period were the principal is repaid.

During the first 36 months, SCAT 1 pays interest only. When the revolving period terminates, the pool will amortise over the next 12 months, paying interest and one

[22] Thirty per cent of 190 million plus 40 million equals 97 million.

twelfth of the principal each month for the next twelve months. Furthermore, Figure 19 shows that the seller's certificate cushions the investor's face value from seasonal fluctuations and interest rate movements. This 26 per cent 'overcollateralisation' reverts to Spiegel Inc. following the maturity of the ABS. In traditional financing the overcollateralisation could be viewed as equity.

Figure 19
Cash flow of the Spiegel Charge Account Trust No. 1



Source: Mr. Barry Perhac of DBCC

The beauty of this structure is that Spiegel receives the best of both the financial and the tax worlds. Under the provisions of the Statement of Financial Accounting Standards, Spiegel is able to treat this sale as an 'off-balance sheet' transaction. Spiegel converted $150 million worth of risky receivables into cash at a relatively

low cost, dramatically improving its balance sheet complexion. Even though the credit card receivables were treated as a 'sale' for financial accounting purposes, Spiegel Inc. is able to treat the interest payments as a debt expense under tax accounting rules. This tax saving lowered Spiegel Inc.'s 'all-in' cost of capital. Moreover, this ABS structure allowed Spiegel Inc., an unrated company, to tap AAA rated funds at 73 basis points over comparable US Treasuries while enjoying secondary tax benefits.

4.2.2 Collateralised Automobile Receivable Securities (CARS)

Collateralised Automobile Receivable Securities (CARS) are asset-backed securities that are supported by amortising personal auto loans that are paid monthly with maturities ranging from two to seven years. Most loans are paid at fixed rates and are secured by liens on new cars or light trucks. Lenders use different methods for calculating interest and have different types of loans. The interest and outstanding balance calculations are based on one of the following three methods:

- internal rate of return or actuarial method,
- simple interest, and
- rule of 78.

It is important to know which method is used when structuring the security because different methods can affect the CARS payout.

Additionally, there are two main types of auto loans:

Direct loans: made by the lending institution, and

Indirect loans: originated by the auto dealer and sold to the lending institution.

CARS portfolios consist mainly of indirect loans. When these loans are made on a non-recourse basis they experience a higher default rate than do dealer-recourse loans. This is because the dealer absorbs the losses and is not necessarily representative of the borrower's credit quality. Therefore, one should consider the portfolio's composition when assessing risk, and the CARS prospectus should indicate the portfolio's weighting of each type of loan.

4.2.2.1 Fixed-rate CARS

In 1984 the failing US automobile industry introduced 'incentive-rate financing', which offered low or 0 per cent financing on new cars. These deep-discounted 'incentive-rate' loans allowed fixed-payment CARS to be issued. Through their wholly owned finance subsidiaries (also called captives), manufacturers offered below-market loans to entice buyers and to promote new car sales. This marketing method was well received by the US public, and the captives now dominate the market.

The fixed-payment CARS structure eliminates investors' concerns over prepayment. This type of structure resembles a corporate bond with a sinking fund and is not directly dependent on prepayments. The issuer is able to achieve this structure by utilising a guaranteed investment contract which absorbs the prepaid cash flow. The investment contract guarantees a predetermined yield for undistributed cash flow. This eliminates reinvestment risk by allowing issuers to invest their excessive cash flow, with a yield that will support the ABS debt service. To gain a better understanding of this structure we shall review one of Salomon Brothers' CARS issues in detail.

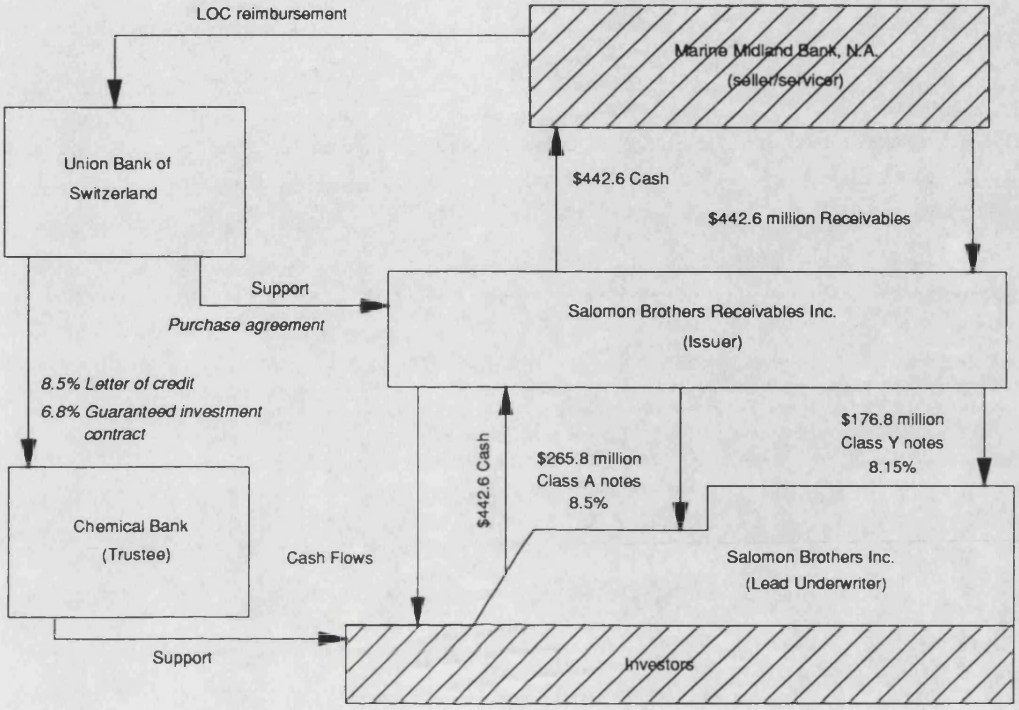
4.2.2.2 Salomon Brothers Receivables Inc., CARS, Series 1

Salomon Brothers Receivables Inc., Series 1 (SAL 1) is a AAA rated special purpose company whose assets consist of $442.6 million worth of collateralised auto receivables purchased from Marine Midland Bank. SAL 1 issued two notes (A & Y) which Salomon Brothers Inc. placed on 17 November 1987. This issue has a 'pay-through' structure — the same structure that is used when underwriting collateralised mortgage obligations (CMO).

4.2.2.2.1 Structure

SAL 1's legal structure and cash flow are shown in Figure 20. Marine Midland Bank, N.A. is a New York bank that purchased and bundled a group of instalment sale contracts from New York State car dealers and then sold them to SAL 1. This indirect, wholly owned subsidiary of Salomon Inc. serves as a limited-purpose, bankruptcy-remote legal entity, established specifically to issue asset-backed obligations.

Figure 20
Structure of Salomon Brothers Receivables Inc. CARS, Series 1



Sal 1's notes represent two tranches of senior debt that pay quarterly. Class Y has a coupon of 8.15 per cent with a guaranteed termination date of 15 November 1989, whilst Class A has a coupon of 8.50 per cent with a guaranteed termination of 15 November 1990. The guaranteed termination dates are attractive to investors because they eliminate maturity uncertainty. The logic for having two tranches is the same as that used when issuing CMO: varying maturities allow the issuer to dynamically manage cash flow uncertainty resulting from prepayments.

This transaction is supported by the following three credit enhancements, which were issued by the Union Bank of Switzerland (UBS):

- 8.5 per cent Letter of Credit (LOC),
- 6.85 per cent Interest Guaranteed Investment Contract (IGIC) and
- Purchase Agreement

The 8.5 per cent LOC serves to cushion cash flow from problems with the underlying receivables. If these receivables fall in arrears or default, impeding the issuer's ability to pay the note holders, the trustee — Chemical Bank — will draw on the LOC. This irrevocable letter of credit will support impaired cash flow to a maximum of $38 million (8.5 per cent of the ABS face value). This LOC cushion should support the receivables, even during harsh economic periods. Delinquencies for the Marine Midland Bank N.A. auto loan portfolio ranged from 2.38 per cent to 3.39 per cent between 1983 and 1987, with defaults only ranging from 0.53 per cent to 0.59 per cent.

The 6.85 per cent IGIC serves to protect cash flow from reinvestment risk. If interest rates dropped severely, this could affect the yield on the intermediate cash flow. For example, let us assume that all the receivables are prepaid in full the day after the issue is sold and on the same day interest rates drop to 3 per cent. Three months later when the quarterly payment becomes due on the note, the issuer would not have enough cash to cover the debt. The IGIC significantly reduces this risk because it acts as an interest rate floor.

The purchase agreement assures the note's guaranteed maturity. The underlying receivables are in the form of amortising consumer debt, which has prepayment uncertainty. These receivables can prepay at any time or wait the full term of their contracts. If the pool experiences a zero prepayment rate, then the issuer will not be able to retire the Class Y notes in 1989. UBS, through their repurchase agreement, will buy a substitute Y note in the amount equal to the unpaid balance of the Y notes. If the same problem arises for the Class A notes, then UBS will purchase all the remaining receivables. This will enable the issuer to meet its obligations to investors.

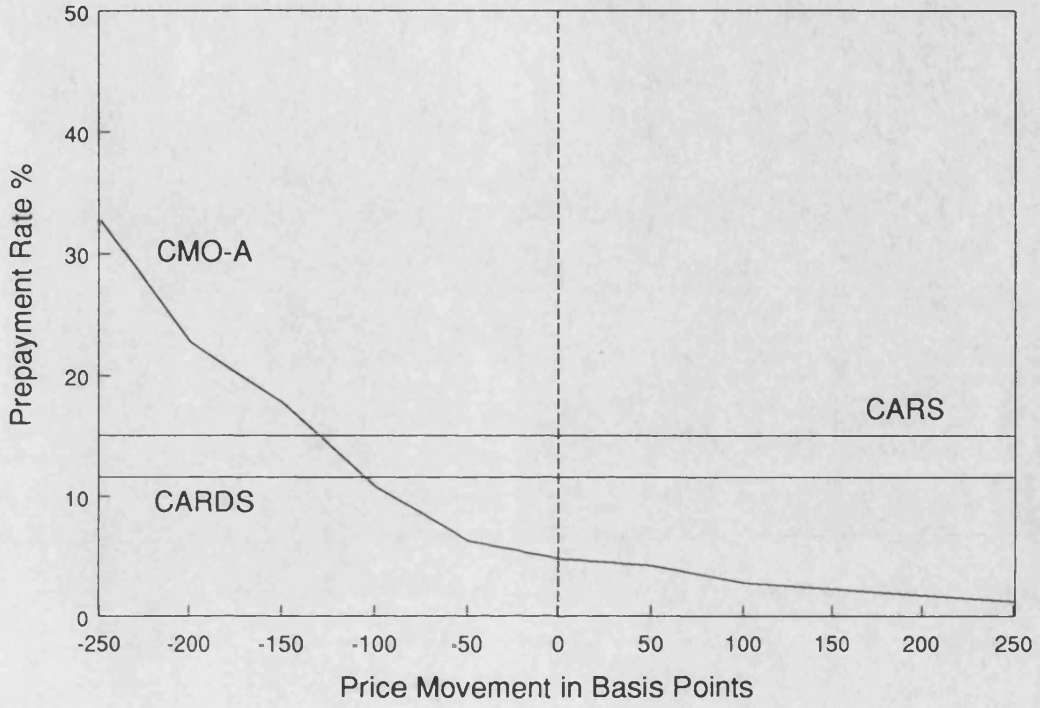
To summarise, Marine Midland Bank, N.A., which is rated below AA, was able to attain AAA rates via SAL 1. This transaction, which was structured similarly to a CMO, attracted investors because it paid quarterly over a maximum guaranteed life. With a combination of proper credit underpinning, SAL 1 was able to offer two AAA notes that resembled traditional corporate debt.

4.2.3 Prepayment: Asset-Backed vs. Mortgage-Backed Securities

Prepayment is the most important variable to consider when assessing a US mortgage-backed securities (MBS). MBS prepayment rates exhibit 'inverse convexity' with relation to interest rates; that is to say, prepayment rates increase as interest rates decrease. We shall explain this in detail in Section 7.3. However, CARDS and CARS do not suffer inverse convexity because of the nature of their underlying receivables. In Figure 21, we show the prepayment sensitivity in relation to movements in interest rates.

Figure 21

Prepayment Rates Sensitivity Based on Interest Rate Movements



The reason why CARS prepayments remain relatively flat is that prepayment on auto loans is contingent on transfer, cashing out, repossession, loss or death. Effectively, all US auto loans are made with a 'due-on-sale' clause, and when the asset is transferred or traded-in the loan must be repaid. This is the primary cause of prepayment. The next item that can cause a prepayment is cashing-out. Cashing-out is the voluntary repayment of a loan and rarely occurs. When a vehicle is repossessed, it is sold and the proceeds are used to retire the debt, while losses due to fire, theft or death of the creditor are covered by insurance. Prepayments caused by refinancing are usually not economically beneficial for the consumer because auto loan rates are higher on second-hand cars.

We also show in Figure 21 that the prepayment sensitivity to revolving credit (i.e. CARDS) is not significantly affected by swings in interest rates. Suppliers of revolving consumer credit adjust their rates when there are wide swings in the market. The different rates charged by credit card companies is marginal and does not offer any economic incentive for a consumer to prepay his debt with another credit card.

Investors are well aware of the CMO's interest rate sensitivity and are demanding approximately 30 basis points above CARDS and CARS issues to compensate for the additional volatility. A CMO A Tranche currently yields 110 basis points over US treasuries, while ABS enjoy the narrower margin of 80 basis points.

4.3 Asset-Backed Securitization - Global Developments

Global corporate treasurers, commercial banks and international fund managers are investing heavily in asset-backed securities. For example, in November 1988, European investors purchased 15 per cent of Citibank's $750 million card-backed issue, and in January 1989 they purchased over 25 per cent of Citibank's $1 billion card-backed ABS deal. As global investors are learning more about ABS, their investment activities are increasing. The pressure is on for non-dollar issuers and there are several issues being offered. Italy and the United Kingdom have already issued car-backed securities.

4.3.1 Asset-Backed Securitization in the United Kingdom

The United Kingdom's 1989 budget cleared away one of the major hurdles for asset-backed securities. Prior to the 1989 budget, sterling-denominated debt issues were limited to a five-year minimum maturity, which restricted securitization to long-term debt receivables. Mortgages were the only long-term homogeneous debt

instruments that had enough depth to permit the securitization. Now that short and intermediate maturities are allowed, sterling asset-backed securities are being issued. Even though the selling side is cleared, there are still some minor difficulties hindering the underwriting of sterling asset-backed securities (SABS). The existing consumer credit laws complicate the securitization process. For example, a consumer who buys a new car on a hire purchase agreement has the right to return his car to the finance company without penalty once he has paid half the contracted price. This complicates structuring an ABS for an investment grade rating. Theoretically, every debtor could return his car to the originator half-paid. The potential losses due to this possibility would appear to make securitization prohibitively expensive.

Another significant cost is stamp duty. Whenever there is a transfer of assets, the Government taxes the value of the transfer at a rate of 1 per cent. There are exemptions for small transfers, but when transacting in hundreds of millions of pounds, this tax becomes excessive.

The development of SABS will be limited given the current environment. A thin supply of homogeneous receivables, combined with the previously mentioned UK consumer protection regulations, limits market penetration. The transfer of receivables is not restricted by English or Scottish law, and this is beneficial to SABS market growth. The problem that faces SABS underwriters is not the transferring of assets but what is being transferred. English title law, which dates back centuries, is not conducive to the bundling and transferring of assets. Additionally, UK financial lending methods are splintered and not designed for a secondary market. To find a

large pool of homogeneous receivables with clear rights of recourse could be a difficult task. The legal restraints, tax costs and standardised financing methods will need to fall in line before sterling asset-backed securitization can develop into a sizable market.

Another problem with trying to securitize sterling receivables is that medium-term sterling investors prefer floating rate notes as opposed to fixed-rate. This could complicate the underwriting process because funding fixed-rate consumer debt with floating-rate loans can be dangerous if the margins are thin. If the floating rate 'cost of funds' exceeds the fixed-rate 'source of funds', cash flow dwindle and losses are incurred. In the case of credit cards, margins are wide enough to support any short-term swings in interest rates, and long-term movements could be offset by increasing the card rate. Additionally, auto loans could be made on a floating rate, eliminating the floating/fixed rate mismatch.

Given the efficiency and savings inherent in the securitization process, SABS should develop as the primary markets are standardised and Government restraints are removed. In 1987, sceptics of sterling mortgage-backed securities said that SMBS were a 'fluke' and would never survive in the UK financial environment. Today, those sceptics are silent. As securitization has established itself in the mortgage market, SABS should also find their niche.

4.3.2 Asset-Backed Securitization in France (*titrisation*)

French legislators, in December 1988, laid the ground work for *titrisation* (French for securitization). The French law allows underwriters to securitize many types of amortising debt. After studying the US asset-backed securities market, the French

government decided to adopt *titrisation* into its financial market in the hope that it would stimulate free market growth. The government's purpose for introducing *titrisation* was threefold:

- to support the housing finance industry,
- to lower the cost of consumer credit and
- to give banks an additional means of balance sheet management.

The French government, through an autonomous state agency, Caisse des Depôts et Consignations (CDC), is taking an active part in developing the securitization process. While other financial institutions were waiting for the French government to finalise the *titrisation* legislation, CDC, which is given certain legal privileges, had already issued a mortgage-backed security.

The French government rightly believes that *titrisation* is an efficient form of intermediation which can help lower the cost of consumer credit. They want to lower consumer credit cost, but they do not want to support credit abuse. Therefore, they are allowing only amortising credit to be securitised. This aids the financing of durable goods like cars but is designed to deter credit card mania.

Furthermore, *titrisation* offers French banks an effective tool for balance sheet management. French banks need effective ways to improve capital-to-asset ratios. Currently in France the capital requirement for banks is 5 per cent of assets, but they must have capital backing of 8 per cent by 1992 to be in line with the Bank of International Settlement. Securitization provides the banks with a cost-effective way of transferring assets without suffering significant loss.

4.4 Conclusion

This chapter served as a general introduction to non-mortgage securitized debt instruments — a market which deserves continued monitoring, for asset-backed securitization should continue to show remarkable growth during the 1990s. As capital markets and financing techniques become globalised, ABS will play a crucial role in corporate finance. Serving as a cost-efficient alternative to traditional debt, this method of financing will be adopted in the United Kingdom and the rest of the world. It will be fascinating to see how this method of financing is integrated into the various international capital markets.

CHAPTER 5
HISTORY AND DEVELOPMENT OF THE FUTURES MARKETS

A hedging methodology for the sterling mortgage-backed security (SMBS) is developed later in this thesis using currency swaps. This section will show that swaps are the most cost-efficient financial instrument used in hedging foreign exchange risk on long term multiperiod static cash flow. To understand the rationale for this argument, it is important to know the history and development of financial futures, which are the basic component of most financial hedging instruments.

FUTURES MARKET commodity or financial exchange where future contracts are traded[19]

FUTURES CONTRACT 'a commitment to deliver or receive a standardised quantity and quality of a commodity (or financial instrument) at a specified future date.'[20]

5.1 General Introduction

Futures trading is not unique to this century; its origins can be traced back to about 2000 BC, when merchants took goods on consignment for barter from the Bahrein Island to India. As civilisations developed and trade increased, there came a need for an effective system in which to exchange commodities. There emerged a need for money, laws, an established market for exchange and, eventually, the futures market. The first semblance of today's modern futures exchange began in seventeenth century Japan when merchants traded 'rice tickets' (warehouse receipts) on an organised exchange. In the eighteenth century the 'to arrive' contract, was widely traded in Europe

and was the immediate predecessor to the modern day futures contract. The nineteenth century marked the birth of today's current exchanges when, in 1848, the Chicago Board of Trade (CBOT), the world's oldest active commodity exchange, was established.

Before describing the historical development of commodities markets (synonymous with futures market), it is best to summarise the five basic methods of exchange:

BARTER	One commodity is exchanged for another without the use of money.
CASH	Commodities are exchanged simultaneously based on an accepted medium of exchange.
SPOT	A sample of a commodity is tendered for sell at 'the spot' rate of trade but not exchanged there.
FORWARD	Two parties agree on an exchange of a specific quality and quantity of a commodity for a specific amount to be delivered at a future date. Also known as the 'To Arrive' or 'Lettre de Faire' contract.
FUTURE	This form of trading is the only one that requires an established exchange with standardised contracts. The exchange sets the standard grades for the articles, contract lengths, and method of delivery.

5.2 Early Trade

The first transactions were based on the barter system. As civilisations became more complex and commerce increased there came the need for money — an accepted medium of exchange.

In 344 BC, shortly after the Gallic invasion of Rome, Lucius Furius built a temple to Juno Moneta (the Monitress). Attached to this temple was the first Roman mint, in which they coined moneta, hence our word money.

Money was first coined in Lydia[23] during the sixth or seventh century BC. These coins were basically a commodity (like silver) which was stamped to signify unit weight and standard quality. The Lydia coins were not widely accepted by their sceptical foreign neighbours, who preferred their personal mark over the mint's stamp. Silver talents[24] and shekels grew to be the accepted medium of exchange in the major empires of Palestine, Syria, and Greece. As time progressed, the prevailing ruling bodies established acceptable weights and standards, which were based on a counting of readily available, commonly uniform items such as barley-corns, carats,[25] or cowries. This primitive practice was used as late as the thirteenth century, when the English Government defined a penny sterling to be the weight of '32 wheat corns in the midst of the ear'.[21] Today money holds no intrinsic value but is accepted as legal tender for domestic transactions.

As villages grew into cities, there came the birth of the common market place. These markets became a nest of activity at the heart of most cities, providing a forum for ease of exchange using barter and cash transactions. The air would come to life as merchants haggled over value in much the same way that modern futures markets' floor traders use the 'open outcry system' to establish price.[26]

During the medieval age, trade grew and so did the need for a common meeting place for merchants. Trade fairs began sprouting up in the larger cities, which provided a

[23] According to *Brewers's Dictionary of Phrase and Fable* , Cassel, London 1959, p. 575 - Lydia was the ancient name of a district in the middle of Asia Minor which was an important centre of early civilisation and exerted much influence on Greece.
[24] Talents are an ancient unit of weight used in Palestine and Syria: 1 talent equaled 3,000 shekels, and in Greece a talent was equal to 6,000 Drachmas.
[25] Carat as derived from the Greek word meaning carob bean.
[26] The rules and regulations of the Chicago Board of Trade require that pit traders use an open outcry in buying and selling.

venue where merchants could trade in bulk. The long journeys over robber-ridden highways made it too cumbersome and dangerous for merchants to carry all their goods to market. The merchants would bring samples of their goods to the trade fairs, thus offering but a trivial bounty to the highwaymen.

The merchants would establish their price at the 'spot' of exchange and arrange for transfer of the commodity from their storage centres. Title and moneys would change hands at the time of delivery. Thus the origin of the "spot price", a term used in the futures market which in essence means today's price or current price.

Trade fairs were usually held annually, lasting for as long as a month. Due to this relatively short period for trade, and as commerce increased, there came the need for a permanent venue. In the sixteenth century, major trading centres were built in massive buildings which each housed a storage centre, a floor of exchange, and a clearing house.[27] Through the following centuries these exchanges splintered into specialised functions. Storage centres were built close to the harbours for ease of transportation. The trading floors and clearing houses took root in the central business districts of the major cities and grew into the world's current commodity and financial markets.

5.3 The First Futures Exchange

The first recorded case of organised futures trading occurred in Japan in the 1600s. During the Tokugawa era (1603-1868) wealthy feudal landlords were always in need

[27] A clearing house serves as an intermediary for market participants. The clearing house may standardise contracts, assume credit risk and provide accounting.

of cash to keep up their lavish households and impressive garrisons. The need for a constant cash flow from a seasonal income, combined with poor budgeting, created a vacuum which the futures market filled.

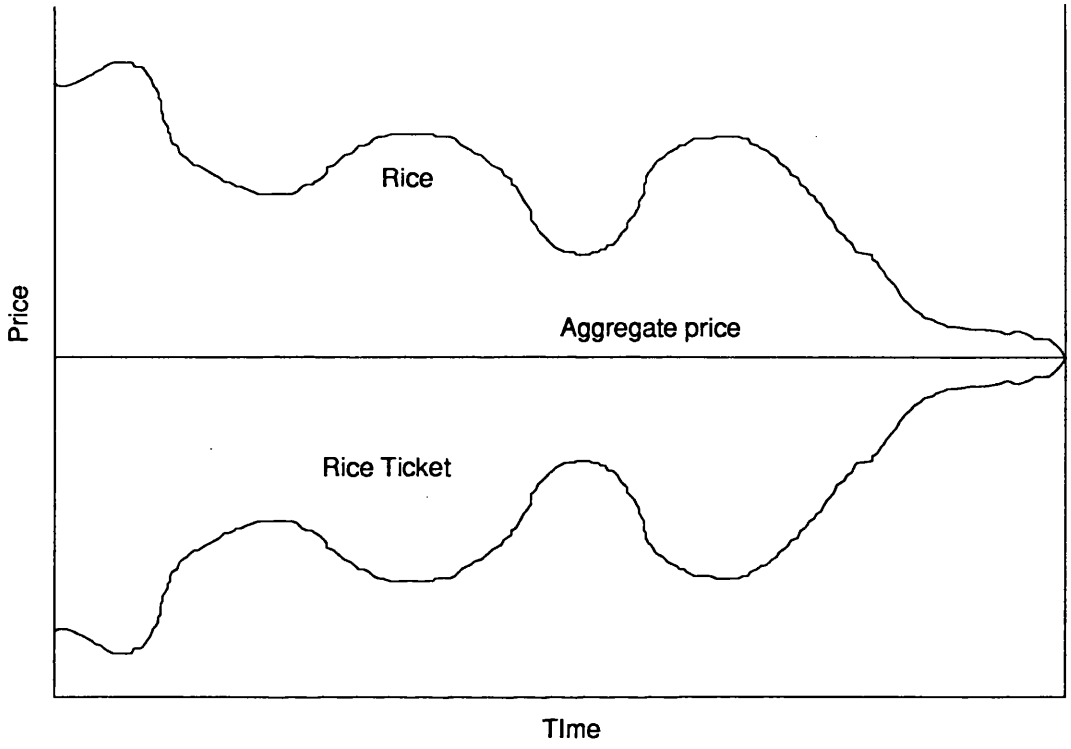
The Shogun, Tokugawa, decreed that his feudal lords were to stay in residence in the capital city of Edo (Tokyo) for at least six months a year, and when they were away their families were to stay as insurance against disloyalty. This allowed the Shogun to keep dominion over his Imperial Court. By decree the feudal lords would travel throughout Japan in lavish caravans heavily guarded by samurai while attending to affairs of state. In addition to paying travel expenses and supporting two major households, these men of honour were constantly required to fund municipal improvements such as building roads, reclaiming land, and repairing castles.

These feudal lords derived their income primarily from the rice and other crops that were grown on their lands and sold at market in Edo and Osaka. As with any agrarian product, prices fluctuated drastically due to seasonal supply and demand. It was usually feast or famine, and for the lords it was always a feast! The constant drain of cash and the seasonal income left these poor budgeters in need of cash. They first started to sell "rice tickets", which functioned as warehouse receipts, to rice merchants.

The merchants used these rice tickets to offset anticipated needs, thus hedging their supply line. Hedging is using an investment to offset the risk of another investment or future need by keeping the aggregate price, as shown on Figure 22, relatively flat, like a hedge row. The rice tickets became so commonly used that they developed into a means of currency. It is interesting to note that government officials were the first to

administer these rice tickets but the merchants eventually took full control of this market.

Figure 22
Hedging Rice Tickets



As the demand for cash continued while the warehouse supplies dwindled, the men of the court began to borrow from the merchants, using future warehouse receipts as collateral. These loans, while bearing a high rate of interest, were very advantageous to the merchants, enabling them to become wealthier than some of the lords they served.

In 1650 the first Japanese futures market was established in Osaka in the home of a shrewd and wealthy merchant named Yodoya. This was the hub of Japan's rice trade, where merchants met to exchange information and establish prices. The 'spot price'

for rice was known as 'The price at Yodoya's'. Forty-seven years later Yodoya moved the exchange to the Dojima district in Osaka, and the market was renamed as the Dojima Rice Market.

The Dojima Rice Market marked the establishment of the world's first futures market. In 1730, the Tokugawa Shogunate officially sanctioned this market, which was entirely formed and structured by the private merchants. Its activities and system of exchange were accepted unchanged and were protected by the supreme power of the land.

Tokugawa Shogunate officially designated it '*Cho-Ai-Mai-Kaisho*' (literally translated as 'rice-trade-on-book meeting place') and it was to be governed under the rules on the following page:

Table 11 RULES OF *CHO AI MAI KAISHO*
1. The contract term was limited to four months.
2. The year was divided approximately into three four-month periods.
3. At the end of each contract period the market was closed for a few days.
4. Trading was carried on in rice only.
5. All contracts in any four-month term were standardised.
6. The basic grade for any contract period was chosen by the traders by majority vote. There were four grades available.
7. No physical delivery of grain against outstanding contracts was permissible.
8. All differences in value had to be settled in cash.
9. All contracts had to be settled and accounts cleared on or before the last day of the trading period.
10. No contracts could be carried over into the new contract period.
11. All traders had to be cleared through a clearing-house.
12. Every trader was required to establish a line of credit with the clearing-house of his choice.
13. Any default in payments was borne by the clearing-house.
14. The clearing houses were non-profit operations, but a commission was charged for services rendered.
15. No new contracts could be made during the last three days of any trading period.

These rules are remarkably similar to those of modern commodity futures markets with one exception: the *Cho-Ai-Mai-Kaisho* futures contract had to be settled in cash. This rule segregated the futures market from the spot because contracts could not be settled in kind. As the Tokugawan period came to an end, the economy became unstable, which resulted in violent moves in rice prices. With the dichotomy between the futures market and the spot market, and with high price volatility, there was little, if any,

resemblance between spot and futures prices. In desperation contract lengths were shortened to two months in 1863, and then, in a final attempt to save the market, contract lengths were shortened to one month in 1869.

This final attempt was to little avail. The Meiji regime came to power that year and closed all futures trading because it regarded the futures trading as a form of gambling. The ruler considered only the speculative component of this market and failed to consider the hedging instruments it provided. However, this forced closure was short lived; within two years the government was forced to authorise futures trading so as to bring order to the rice markets. During the market's resurrection a new rule was introduced, which allowed all futures contracts to be settled in kind. On the settlement date the person who was 'short' (the person who sold the contract) could go to the market and purchase rice at the current price then deliver the rice to the person who was 'long' (the person who bought the contract). Allowing physical delivery of the commodity to settle the futures contract tied the cash market to the futures market, which served to stabilise prices even during unstable periods.

The world's futures markets continue to operate today basically under the same rules as they did two hundred years ago in Japan. The futures markets have grown considerably and have expanded to include a variety of contracts, ranging from pork bellies to pools of US government guaranteed mortgages.

5.4 European History

During the sixteenth century, Antwerp held the title as being the 'most renowned merchandising City that ever was in the World'.[22] It was in these markets that

unsanctioned futures and option trading began. Merchants would place wagers on items of a vast array of interest, from the possibility of ships returning to the sex of an unborn child. It was to these gambling merchants that we can attribute the origins of marine insurance, forward contracts, futures contracts and options.

Amsterdam became the financial hub of Northwest Europe after the political unrest in Antwerp during the 1570s. Trading in the 'to arrive' (i.e. still afloat) contract in grains became a common practice. The 'to arrive' contract was the immediate predecessor to the modern forward contract. It was a contract that simply stated that the grain would be purchased upon arrival at a predetermined price.

During the early seventeenth century options were offered on a variety of commodities, including herrings, grain, spices, whale-oil and salt. Gerard Malynes, a seventeenth century writer and trader, describes option trading this way:

> *And this bargaining is most proper for such and the like commodities, the price whereof doth quickly rise and fall, and are also commodious when a mans money is not so ready to buy much, and to make a great employment with little money, which happeneth upon some sudden advice many times unexpected, whereupon men are very hot either to buy or sell: which is much used in Flanders in buying of Herring, before they are catched, by "stellegelt', as they called it, that is by a summe of money agreed upon to be paid, if the partie doeth repent himselfe of the bargaine..."[23]*

Stellegelt was basically the practice of setting a prearranged price on the future delivery of a certain commodity. If the buyer chose not to fulfil his end of the bargain then he was to pay a set fee. This ex post facto option fee was the option price and in modern option markets is paid ex ante.

The United Kingdom's cotton industry formed the foundation on which modern futures markets were built. In 1841 the Cotton Brokers' Association was formed by ninety firms. Its mission was to assimilate information and develop a code of conduct. This group of merchants is considered to be the parent body of organised futures trading.

The 'to arrive' market, the immediate predecessor of the forward market, began to flourish in the 1840s when Samuel Cunard's Steam Packets began running regularly across the Atlantic. These steam powered, paddle wheel, wood boats offered fast, reliable transatlantic crossings. These three-mast single-funnel ships would carry information on crop reports and bulk samples from North America to the British cotton merchants six to seven weeks prior to the arrival of the goods. The 'to arrive' market grew as merchants were eager to pre-sell their goods to dealers and manufactures who wanted to hedge their supply needs.

5.5 Development of Financial Futures

According to Merton H. Miller, Milton Friedman is credited as the first person to conceptualise financial futures. In 1971, when Friedman was a member of the Department of Economics at the University of Chicago, he believed that the British pound was over-valued and wanted to 'short' the pound. However, none of the Chicago banks would accommodate his request. During a social occasion, he mentioned his dilemma to Leo Melamed, an employee of the Chicago Mercantile Exchange who had close ties with the university. Melamed pursued the concept and within a year the Chicago Mercantile Exchange formed the International Money Market (IMM), which offered the first currency futures contract. This fired the imagination of financial market participants and propagated the development of financial derivatives.

Soon after, on 20 October 1975, the first true financial futures were introduced by the Chicago Board of Trade — the Government National Mortgage Association-Collateralised Depository Receipts, (GNMA-CDR), or better known in street terms as the 'Ginnie Mae 8s.' This contract was revolutionary for it provided cash market users the opportunity to hedge their interest rate sensitivity. This contract was offered in response to the demands of mortgage-bankers who were in need of an instrument to hedge the interest rate risk exposure they carried on their mortgage pipelines. Mortgage bankers have to warehouse their mortgages until they have enough to bundle into a MBS. For example, one must have $1,000,000 before one can issue a GNMA. During the warehousing period, mortgage bankers are completely exposed to interest rate movements. The GNMA's futures offered them a method of hedging this risk.

The Ginnie Mae 8s are based on a stated deliverable GNMA with a $100,000 principal balance bearing an 8 per cent coupon or a suitable GNMA which would emulate the 8 per cent yield. The futures contracts require an initial margin of $2,000 and the delivery months are March, June, September and December. As within the futures market, settlements on GNMA 8s are normally made in cash, but may be settled in kind. Therefore, it is important to know the price of the cheapest to deliver contract because, as already mentioned, spot price must equal the delivery price when the contract matures, or else arbitrage opportunities would exist. For a detailed description and explanation see Johnston (1986).

5.6 Conclusion

Since the introduction of Ginnie Mae 8s there has been a proliferation of new financial instruments. To cite all of them would be beyond the scope of this thesis; nevertheless, the ones relative to this thesis will be reviewed in the next section. Even though the first financial futures has been primarily replaced by the T bill futures when hedging mortgages, it is important to note that demand by the mortgage market served to revolutionise the financial industry and will continue to serve as a breeding ground for financial innovation.

CHAPTER 6
FINANCIAL HEDGING INSTRUMENTS

As we mentioned in the previous chapter, GNMA 8s were created to help mortgage bankers manage the interest rate risk on mortgages in their pipeline[28]. Even though Treasury futures are mainly used today in lieu of GNMA 8s, the introduction of the GNMA 8s sparked the creation of a thriving financial futures market. Today, the financial markets offer an array of various financial risk management instruments that allows investors to expand their investment horizon.

As securitized products of various types proliferate and are integrated into international capital markets, interest from foreign investors arises. Because foreign exchange rate risk may cause unwanted additional risk to foreign market participants, a need for hedging emerges. This chapter defines foreign exchange risk in Section 6.1; reviews hedging instruments, markets and pricing in Section 6.2; and in the final section offers some foreign exchange rate hedging methodologies.

6.1 Currency Risk

> *"So much of barbarism, however, still remains in the transactions of most civilized nations, that almost all independent countries choose to assert their nationality by having, to their own inconvenience and that of their neighbours, a peculiar currency of their own." John Stuart Mill (1806-73).*

Just as were nineteenth century investors, modern investors in international capital markets are exposed to foreign exchange risk. Modern capital market theory defines

[28] Pipeline it the term used to describe mortgages that are being warehoused until a critical mass is formed to achieve securitization.

foreign exchange risk as 'the systematic risk associated with a foreign currency denominated return (or cost) stream and measured by the covariance between the rate of change of the exchange rate and the domestic market return'.[24]

From 1944 to March of 1973, international investors were not especially concerned with foreign exchange risk because major currencies were under a quasi-fixed exchange rate system. But after the demise of the Bretton Woods agreement (1944 to 1971), followed by the short-lived Smithsonian Accord (1971-1973), there emerged the current floating exchange rate system.

Today, whenever an investment is made in a major foreign currency, with an expected funds flow back to the domestic currency, an exchange risk exists. Foreign exchange (FX) rates are stochastic and can drastically affect the return on any given investment. To limit this risk, a vast array of hedging instruments has been developed. FX hedging is the technique of taking a position in an investment which will offset the FX risk in existing or expected foreign exchange commitment.

6.2 Types of Hedging Instruments

Increased volatility in the foreign exchange market has caused a rapid growth in the number and type of hedging instruments that are available to investors. This section will review the structure, markets, pricing, benefits and drawbacks of each instrument.

6.2.1 Forward Contracts

A currency forward contract is an agreement to deliver at a future date a specified sum of currency at an agreed exchange rate. This method guarantees the future exchange

rate and so eliminates exchange rate uncertainty. It is very effective for hedging a foreign investment with a guaranteed cash flow. In practice, most forward contracts have a maturity of five years or less.

The value of a forward contract at origination is zero, and the parties involved do not incur any cost until the settlement date. Forward contracts are formed in the interbank market. Trading is done via an informal network of telephones and telexes between banks, foreign exchange brokers and large corporations. This market has high entry barriers because of the size of the contracts, usually ranging from three to ten million dollars, and is illiquid because forward contracts are not tradeable.

The primary rationale for using forward contracts for hedging, as well as the valuation of forward contracts, is based on the interest rate parity theorem. This theorem (Eq. 6.1) states that interest rate differentials are equal to forward and spot exchange rate differentials. For example, in a world of frictionless currency exchange markets, the sterling rate of interest, adjusted for the interest rate differential, must be the same as the US dollar interest rate.

$$\frac{F_{\frac{d}{f}}}{S_{\frac{d}{f}}} = \left[\frac{1+R_d}{1+R_f}\right]^{\frac{(T-t)}{Y}} \tag{6.1}$$

From Equation 6.1 the pricing formula for a forward contract is derived.

$$F_{\frac{d}{f}} = S_{\frac{d}{f}} \times \frac{(1+R_d)^{\frac{(T-t)}{Y}}}{(1+R_f)^{\frac{(T-t)}{Y}}} \tag{6.2}$$

Where:

- $F_{\frac{d}{f}}$ is the forward exchange rate given in the domestic currency per unit of the foreign currency
- $S_{\frac{d}{f}}$ is the spot exchange rate given in the domestic currency per unit of the foreign currency
- R_d is the risk free rate for the domestic currency
- R_f is the risk free rate for the foreign currency
- T is the termination date
- t is purchase date
- Y is the total number of days in a year[29]

A forward contract price is always derived from the Interest Rate Parity Theorem because if this price diverged significantly from parity, arbitrage opportunities would exist.

To better understand the rationale of forward pricing, consider the price valuation for a US dollar forward contract for sterling with a trade date of 15 September 1989 and a delivery date of 15 September 1990. Assume that the UK one year Euro-sterling

[29] When evaluating Deutsche marks, French francs, Japanese yen or Swiss francs, use 360 days; when evaluating British pounds, Australian dollars and Canadian dollars, use 365 days.

rate is 14 per cent, the one year Euro-dollar rate is 9 per cent and that the spot value of the pound is $1.584. After applying Equation 6.2 the forward price of pounds would be $1.515.

If the forward price were less than (greater than) $1.515 then one could make riskless profits by borrowing (lending) pounds at spot and buying (selling) pounds forward. For example, let us assume the forward rate is $1.700 instead of $1.515. One could borrow $8,173,375 at 9 per cent and exchange for pounds at spot which will equal £5,159,959 ($8,173,375 X .631) and invest in sterling for a year at 14 per cent. During this transaction one would simultaneously sell forward $10,000,000 at a rate of $1.700, which would result in a $1,091,022 arbitrage profit.

The transaction would be as follows:

On 15 September 1989	
(a) borrow $8,173,375 and exchange for	£5,159,959
(b) sell $10,000,000 forward	
On 15 September 1990	
(a) receive £5,882,353 and settle forward contract	$10,000,000
(b) Pay loan plus interest	-$8,908,978
Leaving a net risk-free profit of	$1,091,022

The essence of the Interest Rate Parity Theorem is the establishment of a relationship between the premium (or discount) on a forward contract for foreign exchange based on the differential in interest rates on securities that are identical in all respects except for the issuing currency.

Historically, the forward price will vary around the traditional interest rate parity equilibrium point. Jacob (1975) describes a neutral band around this equilibrium point and proves that due to various transaction costs, arbitrage profits do not exist. This explains why the basis[30] will fluctuate when the FX market is at equilibrium.

6.2.2 Futures

Currency futures contracts began trading on the International Monetary Market (IMM), a division of the Chicago Mercantile Exchange (CME), on 16 May 1972. Table 12 gives specifications of the IMM currency futures contracts. The creation of this exchange marked the beginning of the financial futures market. This market has grown rapidly with trading taking place worldwide through various central exchanges. For a listing of all markets including types of contracts traded see the FUTURES supplement '1989 International Guide to Futures/Options Markets'.

Table 12

Currency Futures Contracts Specifications

	Australian Dollar (AD)	British Pound (BP)	Canadian Dollar (CD)	Deutsche Market (DM)	French Franc (FF)	Japanese Yen (JY)	Swiss Franc (SF)	European Currency Unit (EC)
Trading Unit in (,000)	AD100,	DP25,	CD100,	DM125,	FR250,	JY12,500,	SF125,	EC125,
Quotations	US$ per A$	US$ per UK£	US$ per C$	US$ per mark	US$ per FF	US$ per ¥	US$ per SF	US$ per ECU
Min. Price Change	0.01%	0.05%	0.01%	0.01%	0.05%	0.0001%	0.01%	0.01%
Value of One Point	$10.00	$12.50	$10.00	$12.50	$12.50	$12.50	$12.50	$12.50
Price Limit	None							
Months Traded	March, June, September and December							
Last Day of Trading	Two business days before the third Wednesday of the delivery month							
Delivery	The third Wednesday of the delivery month							

Source: Chicago Mercantile Exchange

[30] Basis is the difference between the forward price and the spot price. For an detailed explanation of basis, see Section 6.2.2.1.

Futures contracts are initially priced in the same way as forward contracts. However, as explained in Chapter 5, Section 5.1.2, they are traded on a formal exchange with standardised contracts. The exchange requires each participant to deposit a percentage of the value of the contract in a margin account which is held by the broker. This margin account may vary in value every trading day when the contracts are 'marked-to-market'. This means that on every trading day the accounts are re-balanced as to price. Given that there is a price movement, the gaining party's margin account will be credited whilst the losing party's margin account will be debited. Table 13 illustrates the cash flow of a futures trade.

Table 13
Cash Flow of Marked-to-market

Date	Item	Futures price	price change	profit /-loss	account balance
Mon. 5/11	Buys one December £ future Post initial margin with brokerage firm	$43,750.00			2,187.50
Tues. 6/11	Marked-to-market	$45,000.00	100	1,250.00	3,437.50
Wed. 7/11	Marked-to-market	$44,062.50	-75	937.50	2,500.00
Thurs. 8/11	Marked-to-market Margin call of $329 to bring balance to 5%	$43,437.50	-50	625.00	1,875.00 2,204.00
Fri. 9/11	Marked-to-market	$44,687.50	100	1,250.00	3,454.00
Mon. 12/11	Sell 1 December £ futures to close	$44,687.50			

In our illustration, on the fifth of November an investor buys one December £ future priced at $1.75 per pound sterling. A sterling futures contract represents £25,000; therefore the price of the contract is $43,750. When he buys the futures contract he is required to deposits $2,187 (5% of $43,750) with his brokerage firm to establish his margin account. The following day, the December futures moves up 100 points and his margin account is credited with $1,250. However, the next day his position drops 75 points. After the drop he retains over 5 per cent of the futures price in his

margin account. Unfortunately, the following day, Thursday 8/11, his position drops another 75 points and he receives a call from his broker informing him that he must deposit money into his margin account to bring the margin balance to equal 5 per cent of the futures price. This is referred to as a 'margin call.' If the investor does not deposit the $329 into his margin account the broker is forced to close the investor position. In this transaction, the broker would sell one December £ contract, which would close the position.

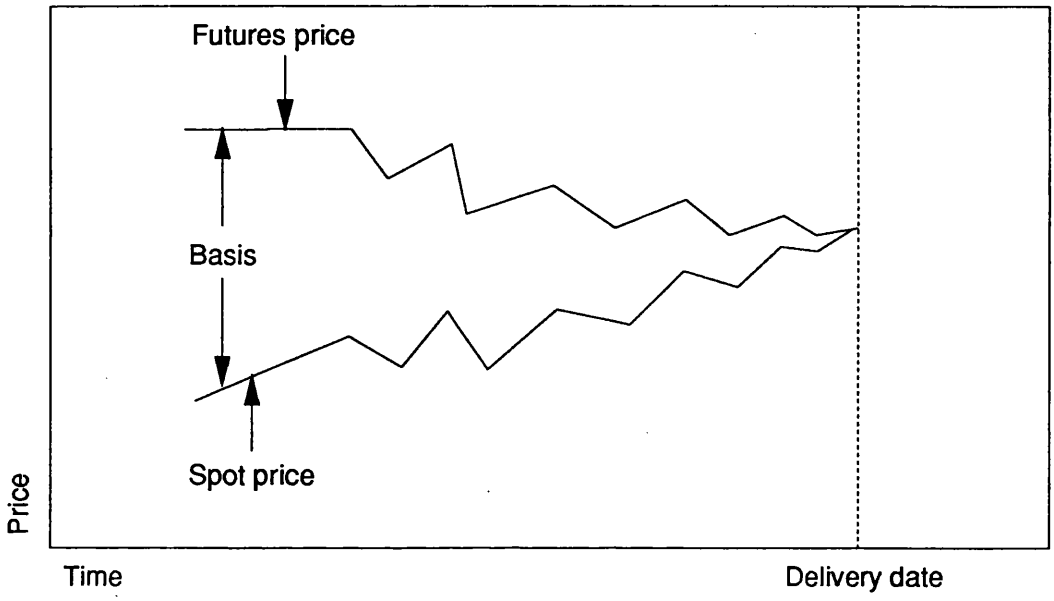
Fortunately, the investor made the margin call and earned 100 points the following day. He closed his position by selling a December £ futures. In this example, our investors earned $625 on a total investment of $2,518.50 or a 1,825 per cent annual return.

6.2.2.1 Basis

The change in price during the above transaction is referred to as the movement in basis. Basis is the futures price minus the spot price. As Figure 23 shows, the basis tends to zero as the futures delivery date approaches. However, the basis, or gap, between the spot and futures does not converge at a constant rate. The fluctuation around the equilibrium point is referred to as basis risk. On the delivery date the basis is always equal to zero because on that date the futures price and spot price are equal.

Figure 23

THE CONVERGENCE OF SPOT AND FUTURES PRICES



6.2.3 Forwards vs. Futures

Practitioners usually regard the forward and futures markets as synonymous. Either market can be used to hedge foreign exchange risk and it is assumed that both serve the same economic function. Seemingly, the only perceptible differences are administrative; forward contracts are settled at maturity, whereas futures contracts can be viewed as being settled daily. Black's (1976) seminal article explains in detail the different payment schedules. He deduces that the two markets are equivalent; that is, forward prices are equal to future prices when interests rates on constant.

In practice, however, this is not true. In reality interest rates fluctuate, affecting the price of futures contracts when compared to the price of forward contracts. Cox, Ingersoll, and Ross (1981) prove that when interest rates are stochastic, there is a fundamental difference between the pricing of forward and futures contracts.

Even though forward and futures contracts are initially priced using the same theory, they serve different functions. Because of transaction costs, they are not perfect substitutes. The forward market tailors large contracts, usually ranging from three million to ten million dollars, whereas the futures market has a set of small "ready-made" contracts. These differences should become evident from Table 14, which compares and contrasts the futures and forward markets.

Table 14

COMPARISON OF THE FUTURES MARKET TO THE FORWARD MARKET

Futures Market	Forward Market
1. Trading is conducted in a competitive arena by "open outcry" of bids, offers and amounts.	1. Trading is done by telephone or telex, with banks generally dealing directly with other banks, foreign exchange brokers or corporations.
2. Participants are either buyers or sellers of a contract at a single, specified price at any given time.	2. Participants quote a bid (buy) and asked (sell) price.
3. Non-member participants deal through exchange members who represent them on the trading floor.	3. Participants deal on a principal-to-principal basis, either directly or through brokers.
4. Market participants usually are unknown to one another , except when a firm is trading its own account through its own brokers on the trading floor.	4. Participants in each transaction always know the other trading party.
5. Participants include banks, corporations, financial institutions, individual investors and speculators.	5. Participants are banks dealing with each other, and other major commercial entities. Access is limited for individuals and small firms.
6. Trading prices are disseminated continuously by the exchange.	6. Indicated bids and offers are available throughout the interbank market.
7. The exchange's clearing house acts as the opposite side of cleared transaction and so credit risk monitoring is reduced.	7. Each counter party with whom a dealer does business must be examined individually as to credit quality. This offers a wide range of credit capabilities of participants.
8. Margins are required of all participants.	8. Margins are not required by banks dealing with other banks, although for smaller, non-bank customers, margins may be required.
9. Settlements are made daily via the exchange's clearing house. Gains on position values may be withdrawn and losses are collected daily.	9. Gains and losses are realised on settlement date.
10. Usually less than one percent of all traded contracts result in actual delivery.	10. The majority of trades result in delivery.
11. The market is very liquid.	11. Forward positions are hard to offset or transfer. The market is illiquid.
12. All contracts are standardised.	12. All contracts terms are negotiated.
13. Prices are usually quoted in US dollars per foreign currency unit.	13. Prices are quoted in domestic currency unit per foreign unit except for sterling and some Commonwealth currencies.
14. A single commission is charged and is negotiated between the broker and customer.	14. No commissions are charged if the transaction is made directly with another bank or customer. A commission is charged if transacted through a foreign exchange broker.

6.2.4 Currency Options

When dealing with hedging foreign exchange rate risk, there are instances where cash flow is not certain. For example, the bulk of Jaguar's automobile production is sold in the United States for US dollars. Therefore, Jaguar's treasurer wants to hedge his US$ exposure, because if the dollar depreciates relative to the pound, so will Jaguar's earnings. The treasurer could use futures to lock in the exchange rate. However, he is uncertain as to the number of automobiles that will sell and as to the timing of the sales. In this case, using Jaguar's sales forecast, the treasurer could sell dollar futures equal to what he believes to be the minimal dollar cash flow and buy US$ currency options to hedge the difference between the minimum sales and expected sales. This strategy is robust because it does not obligate the treasurer to exchange the 'uncertain' dollar cash flow but gives him the right to exchange US dollars for sterling at his discretion. To better understand currency options, this section will explain how these options are structured, priced and traded.

A currency option gives the owner the right to exchange one currency for another at a preset quantity, exchange rate and date or dates (depending on the type of option). A 'call option' gives the owner the right to buy a predetermined quantity of one currency for another; a 'put option' entitles the owner to sell a set quantity at an agreed price. Since currency options were first introduced on the Philadelphia Exchange in December 1982, they have shown remarkable growth and expansion throughout international markets.

There are two types of options: American and European. The American option may be exercised from inception till maturity; the European option may only be exercised at maturity.

Theoretical option pricing gained practitioners' recognition when Black and Scholes published their seminal paper in 1973. This paper derives the price of a European call option on a stock. Based on this pricing theory and Merton (1973), numerous currency option pricing models have been developed. The next section reviews the development of currency option pricing theory and presents a pricing model.

6.2.4.1 Pricing

Feiger and Jacquillat (1979) were the first to suggest the opening of a market for options on foreign exchange. They developed a pricing model based on a variant of Merton's option pricing model when interest rates are uncertain. By first pricing a currency option bond,[31] they attempted to derive a foreign currency option price. They showed that the two-currency option bond is equivalent to a single-currency bond plus an FX option. However, they failed to find a simple closed-form solution.[32]

Grabbe (1983)[25] was able to develop a rational pricing model with a closed-form solution that derived an exact pricing equation for European currency options when interest rates are stochastic. Following Merton's (1973) approach, and expanding on his methodology by introducing an additional stochastic bond, Grabbe derived the following closed form solution for the European currency call option:

[31] A currency option bond allows the holder to choose between two currencies in which coupons and principal are paid according to a predetermined exchange rate.
[32] A closed-form solution is a standard mathematical expression whose values can easly be obtained from a set of published tables.

$$c(t) = B(t,T)[F(t,T)N(d_1) - XN(d_2)] \tag{6.3}$$

Where:

$$d_1 = \frac{\ln(F/X) + \frac{\sigma^2}{2}T}{\sigma\sqrt{T}}$$

$$d_2 = \frac{\ln(F/X) - \frac{\sigma^2}{2}T}{\sigma\sqrt{T}}$$

and

$$\sigma^2 = \int_0^T \frac{1}{T}\sigma_F^2(t+T-\mu,\mu)d\mu,$$

Where:

$\sigma_F^2(t,T)$ -is the instantaneous variance of $dF(t,T)/F$, where dF is the stochastic differential of F.

t -is the current date

T -is the time until expiration

$c(t)$ -is the domestic currency price at time t of a European call option written on one unit of foreign exchange.

$B(t,T)$ -is the domestic currency price of a pure discount bond which pays one unit of domestic currency at $t+T$.

$F(t,T)$ -is the forward domestic currency price of a unit of foreign exchange, for a contract made at time t and which matures at time $t+T$

X -is the domestic currency exercise price of an option on foreign currency.

The following is an example of how this equation is used to determine the price of a European currency call option.

Assume that we want to price a three-month call option on US dollars. The current continuous risk-free rates in the UK and the US are 14 per cent and 8 per cent respectively. The current exchange rate is £0.625 per US$; we shall assume a 14.9 per cent standard deviation and an exercise price of £0.65. Therefore our terms will become:

Current rate	$S_{£/\$} = 0.625$
Forward rate	$F_{£/\$} = 0.634445$
Exercise price	$X = 0.65$
Risk-free Domestic	$r_{£} = 0.14$
Risk-free Foreign	$r_{\$} = 0.08$
Time	$T = 0.25$
Discounted bond	$B(t,T) = e^{-r_{£}T}$
Standard deviation	$\sigma = 0.149$

By entering this data into Equation 6.3, we derive the option price of £ 0.0511. Thus, it will cost the investor 5.11p to have the right to purchase $1 at a price of £0.65 three months from now.

Option prices will vary from their theoretical price even in efficient markets where no arbitrage profits exist. These differences are almost certainly due to the fairly strong assumptions used in the development of the pricing model. One of these assumptions is that foreign exchange rates can be modelled as an Itô processes. This essentially assumes that there exists some transformation of the foreign exchange rates which can then be modelled directly as a Wiener process, which looks like a

normal distribution. Exchange rates are not normally distributed. Empirical evidence suggests that exchange rates are best described as non-normal members of the Pareto-Levy[33] class of probability distribution (Westerfield[26] and Vinso & Rogalski[27]).

An additional source of potential error in the theoretical price is that volatility may change. Implied volatilities are used when pricing options, but market anticipation may change, thus causing option prices to increase (decrease) if volatility increases (decreases).

6.2.4.2 Markets

The major currency option markets are in the Chicago Mercantile Exchange International Monetary Market Division and the Philadelphia Stock Exchange/Philadelphia Board of Trade, which are responsible for trading approximately 99 per cent of all currency options. Table 15 lists all exchanges on which options are traded and includes contract specifications.

[33] The work of Levy in connection with stable distributions showed that the Pareto distribution can be derived from a version of the central limit theorem in which the individual random variables do not have finite variance.

Table 15

CURRENCY OPTION CONTRACTS SPECIFICATIONS

Contract	Contract months	Trading hours (local time)	Contract size	Minimum price fluctuation	Daily limit
Chicago Mercantile Exchange International Monetary Market Division					
Deutsche Mark	Jan/Mar/Apr/June/July/Sept/ Oct/Dec and spot month	7:20-2:00	125,000 DM	$0.0001/DM = $12.50	50 pt.*
Canadian Dollar	"	7:20-2:00	100,000 CD	$0.0001/CD = $10	100 pt.*
Swiss Franc	"	7:20-2:00	125,000 SF	$0.0001/SF = $12.50	150 pt.*
British Pound	"	7:20-2:00	62,500 BP	$0.0002/BP = $12.50	400 pt.*
Japanese Yen	"	7:20-2:00	12,500,000 JY	$0.000001/JY = $12.50	150 pt.*
Australia Dollar	"	7:20-2:00	100,000 AD	$0.0001/AD = $10	150 pt.*
* EDT, Sun.-Thur.;6:00-10:00 p.m. EST.					
Philadelphia Stock Exchange Philadelphia Board of Trade					
British Pound	Mar/June/Sept/Dec plus two near months	4:30 a.m.-2:30 p.m., 7-11 p.m.*	31,250 BP	$0.0001/BP = $3.125	—
Canadian Dollar	"	4:30 a.m.-2:30 p.m.,	50,000 CD	$0.0001/CD = $5.00	—
Deutsche Mark	"	4:30 a.m.-2:30 p.m., 7-11 p.m.*	62,500	$0.0001/DM = $6.25	—
Swiss Franc	"	4:30 a.m.-2:30 p.m., 7-11 p.m.*	62,500 SF	$0.0001/SF = $6.25	—
French Franc	"	4:30 a.m.-2:30 p.m.,	25,000	$0.00002/FF = $5.00	—
Japanese Yen	"	4:30 a.m.-2:30 p.m., 7-11 p.m.*	6,250,000 JY	$0.000001/JY = $6.25	—
Australian Dollar	"	4:30 a.m.-2:30 p.m., 7-11 p.m.*	500,000 AD	$0.0001/AD = $5.00	—
European Currency Unit	"	4:30 a.m.-2:30 p.m.	62,500 ECU	$0.0001/ECU = $6.25	—
* Opening limit between 7:20-7:35 a.m.; no limit after 7:35 a.m.					

Table 15 *(continued)*
CURRENCY FUTURE CONTRACTS SPECIFICATIONS

Contract	Contract months	Trading hours (local time)	Contract size	Minimum price fluctuation	Daily limit
Sydney Futures Exchange Ltd					
Australian Dollar	Mar/June/Sept/Dec out to six months ahead	8:30 a.m-4:30 p.m.	A$100,000	US$0.0001/AD = US $10	—
Bolsa de Mercadorias de Sao Paulo (Brazil) (Sao Paulo Commodities Exchange)					
US Dollar	all months	10:15 a.m.-4:00 p.m.	US$5,000	Cz$0.001/US$1	—
Bolsa Mercantil & de Futuros (Brazil)					
US Dollar	all months	10:30 a.m.-3:45 p.m.	US$5,000	Cz$0.01/US$1	—
New Zealand Future Exchange					
Kiwi Dollar	Spot plus next three months, then quarterly	8:15 a.m.-4:45 p.m.	NZ$100,000	0.01	—
Singapore International Monetary Exchange					
Eurodollar	Mar/June/Sept/Dec and spot month	8:30 a.m.-5:20 p.m.	$1,000,000	0.01 pt. = $25	—
Deutsche Mark	"	8:20 a.m.-5:10 p.m.	125,000 DM	$0.0001/DM = $12.50	—
London International Financial Futures Exchange Ltd					
British Pound	Mar/June/Sept/Dec and three nearby months	8:32 a.m.-4:02 p.m.	£25,000	0.01¢/£ = US$2.50	—
US$-Mark currency	"	8:34 p.m.-4:40 a.m.	US$50,000 traded against DM	$0.0001 DM/US$1	—
London Traded Options Market					
US Dollar	Mar/June/Sept/Dec plus two nearest months	9:00 a.m.-4:05 p.m.	£12,500	0.05¢	—
US$-Mark	"	9:00 a.m.-4:05 p.m.	62,500 DM	0.01¢	—

Source: Futures supplement '1989 International Guide to Futures/Options Markets'

6.2.5 Synthetic Currency Contracts

Via financial engineering, investment bankers have developed numerous synthetic contracts from options for their clients who are restricted, either by their articles of

association or by regulation, from direct participation in the options market. These products are attractive to clients because they offer the benefits of options while staying within their corporate or regulatory guidelines. This section provides some examples of these contracts.

6.2.5.1 Range Forward Contract

The range forward contract, introduced by Salomon Brothers, specifies a range of exchange rates in which currency may be exchanged. This exchange range offers investors the benefit of profiting when the currency moves to the upper end of the range whilst offering a floor to the down side. If the spot exchange is within the boundary range, the contract will be settled at that rate.

Salomon Brothers protect themselves from risk by using a hedging technique called the 'zero cost option.' By taking opposing positions in currency options, they are able to offer the range forward contract to their customer without charging an up front fee.

6.2.5.2 Break Forward Contract

Midland Bank developed the break forward contract, which allows customers to break the contract if the spot rate at maturity is more favourable than the pre-specified rate or 'break rate.' By setting the break rate higher than the market forward rate, the underwriter is compensated for allowing the customer the option of breaking the contract.

The underwriter protects himself form risk exposure by using the same technique used in the range forward contract. Therefore, he is able to offer this contract without charging any front-end fees.

6.2.5.3 Scouts

In a shared currency option under tender (Scout) the cost of the option contract is distributed among a group of clients that are bidding on the same contract. This currency option contract allows foreign bidders on the same contract to share the sunken cost of hedging by spreading the cost amidst all the bidders.

6.2.5.4 Participating Forward Contracts

Salomon Brothers devised the participating forward contract, which sets a lower boundary or floor on the exchange rate but offers a percentage participation in appreciation. This floor rate is usually lower than the standard forward contract rate. Treasurers benefit by limiting FX losses while not restricting gains; moreover, it requires no initiation fees.

6.2.6 Currency Swaps

A currency swap is a contract between two parties whereby they exchange a series of cash flows denominated in one currency for one denominated in another. They were created to provide hedgers with a simple low-cost method of managing foreign exchange rate risk on certain multiple-period cash flows over longer time horizons than those provided by contracts offered on the futures market. A swap can be viewed as a bundle of forward contracts that can extend over a long period, normally to a

maximum of ten-years. Currency swaps were publicly introduced by the World Bank and IBM in August 1981. Since their introduction, the swap market has shown an amazing growth, with over $110 billion outstanding at the end of 1988.

6.2.6.1 Development of Swaps

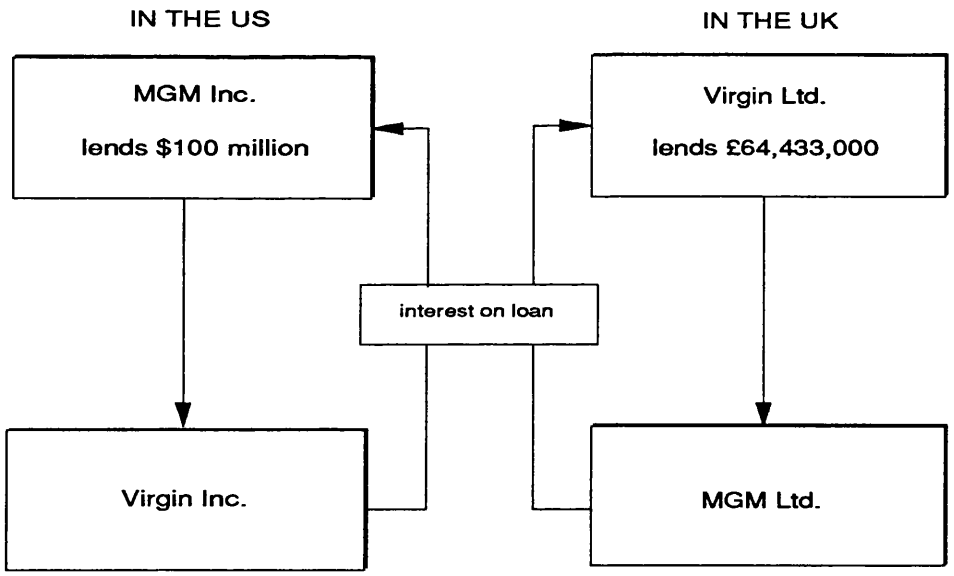
In this section, we describe the evolution of the currency swap market, providing examples of the three stages of development—parallel loans, back-to-back loans and swaps. Additionally, we shall explain the environmental forces that spurred the creation of the swap.

The origins of the swap can be traced to parallel loans. A parallel loan is one whereby a home company lends funds to a foreign company's subsidiary located in the home country, in exchange for the foreign company providing a loan for the home company's subsidiary located in the foreign company's country. The parallel loan technique was first used in the mid 1970's, spurred by the change from a fixed to a floating currency exchange market and UK exchange control legislation. During this period, UK multinational firms needed capital for their foreign subsidiaries but were restricted by currency controls. The UK government, in an attempt to protect foreign exchange reserves, charged a tax on all non-domestic sterling investment. This tax barrier spurred City financiers, such as Kleinwort Benson and Hill Samuel, to discover ways in which to circumvent this expense by arranging parallel loans.

For example, suppose that Virgin Films Inc, the American subsidiary of the British company Virgin Films Ltd, is producing its new film in Hollywood over the next year with a budget of $100 million. Also assume that the American company, MGM

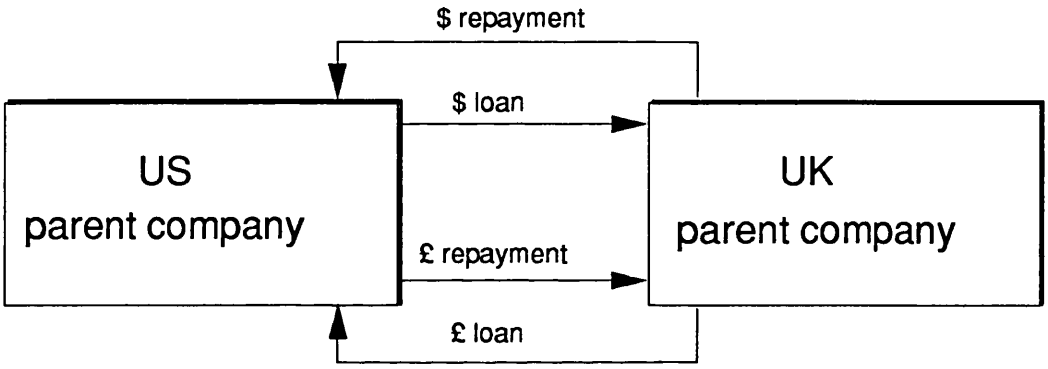
Inc, has a British subsidiary, MGM Ltd, which is planning to shoot its new production in London. MGM Ltd has budgeted £64,433,000 over the year for production. Assuming that the spot exchange rate is $1.552/£, these two firms could eliminate exchange rate risk by entering into parallel loans. MGM would borrow $100 million from Bank of America while Virgin Films would borrow £64,433,000 from National Westminster. Then they would each transfer the principal to the other company's subsidiary. The relevant subsidiary makes interest payments to the lending firm, and upon loan maturity, the subsidiary returns the original principal. Figure 24 illustrates this transaction.

Figure 24
Parallel Loan Structure
Virgin & MGM



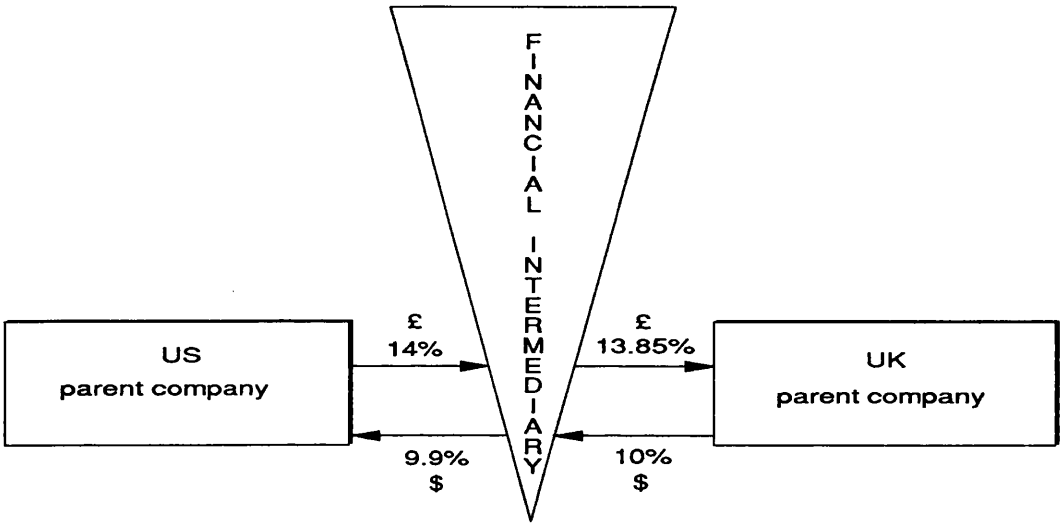
During the 1970's, back-to-back loans were also introduced, which are a simpler variation of the parallel loans. As shown in Figure 25, these loans are similar in all respects to parallel loans, except that the parent companies are the only transacting parties.

Figure 25
Back-to-Back Loan Structure



In the 1980's financial institutions discovered they could lower transaction costs by serving as intermediaries in a structure similar to back-to-back loans. They introduced the fixed-rate currency swap, which is depicted in Figure 26 on the following page.

Figure 26
Swap Structure



The three main reasons why currency swaps eventually replaced back-to-back loans are cost, risk and regulation. Back-to-back loans are very expensive to originate. Every back-to-back loan is unique, requiring voluminous amounts of legal documentation, usually involving two different legal environments and insurance policies to protect against default risk. These front-end costs are high compared to those of a fairly standardised swap transaction. In the above example the aggregate transaction cost is only twenty-five basis points.

Another reason why swaps have replaced back-to-back loans is that in the event that one of the parties defaults (because of bankruptcy or for some other reason) on a back-to-back loan, the counter party may suffer losses because of delayed payments. Alternatively, in a swap the principal is contracting with an intermediary who usually has a high credit rating, and is therefore not exposed to the counterparty's default

risk. Finally, under financial reporting regulations, back-to-back loans must be reported on-balance sheet, whereas swaps are considered off-balance sheet items. Off-balance sheet transactions are preferred by corporations because reporting transactions on-balance sheet inflates the balance sheet, affecting important ratios, such as return on assets and return on equity.

6.2.6.2 Pricing

Swaps are economically beneficial to both the contracting parties because of the comparative cost advantage each party has in issuing debt in their domestic market. For a detailed explanation of the rationale of the swap market, see Dubois-Pelerin (1988) or Smith (1986).

Swap contracts for major currencies are actively traded throughout international financial markets via a network of telephones and telexes. Consequently, prices are easily obtained through swap dealers or through financial information services, such as Reuters. In this section, we will first present the theoretical pricing formula for a swap. Then, to bridge the gap between theory and practice, an example is given of how a swap dealer may go about pricing a transaction.

Before the swap pricing formula is presented, we must assume that capital markets are perfect. Copeland & Weston set the following conditions for a perfect market:

- Markets are frictionless; i.e., there are no transaction costs or taxes, all assets are perfectly divisible and marketable, and there are no constraining regulations.
- There is perfect competition in product and securities markets. In product markets this means that all producers supply goods and services at minimum average cost, and in securities markets it means that all participants are price takers.

- Markets are informationally efficient: i.e., information is costless, and it is received simultaneously by all individuals.
- All individuals are rational expected utility maximisers, i.e. risk averse.

To value a swap, we replicate the cash flow of the swap by using a series of forward contracts, because a swap is defined as a bundle of forward contracts. Therefore, by definition, the swap and the portfolio of forward contracts must have the same value at inception, which must be zero. If the swap is priced differently from the portfolio of forwards, arbitrage opportunities would exist. Given that we know how to price a forward contract (see Eq. 6.2), we can determine the theoretical value of the swap. As shown in Equation 6.4, subtracting the sum of the present values of the domestic cash flow from the present value of the foreign cash flow exchanged at the spot exchange rate, the value of the swap must equal zero, the same value a forward contract has at inception.

$$V = B_1 - B_2 \tag{6.4}$$

$$B_1 = \sum_{i=0}^{i} \beta_i e^{-R_i t_i}$$

$$B_1 = S \sum_{i=0}^{i} F_i e^{-r_i t_i}$$

where

V = is the value of the swap, which is zero
R_i = Domestic interest rate at time i
β_i = Domestic cash flow at time i
S = Spot exchange rate at time 0
F_i = Foreign cash flow at time i
r = Foreign interest rate at time i

To gain a better understanding of this pricing model, let us consider the following transaction:

Virgin Films Ltd has decided that it needs $10 million over the next five years to fund a US venture and is willing to pay a 12 per cent fixed-rate of interest per annum. Because Virgin Films Ltd is not well-known in the dollar capital markets, it has decided to issue a sterling bond and swap the proceeds. Since a swap can be viewed as a portfolio of forward contracts, the intermediary would produce a table similar to Table 16 to evaluate the cash flow before he tenders an offer to Virgin.

Table 16

Theoretical Cash Flow of a Swap for Virgin Films Ltd

Year	US$ swap cash flow	Implied forward	$ Interest rate	£ Interest rate	£ Swap cash flow
0	10,000,000	1.653 *	12.00%	15.50%	6,049,607
1	(1,200,000)	1.603	12.00%	15.00%	(748,639)
2	(1,200,000)	1.561	11.50%	14.00%	(768,692)
3	(1,200,000)	1.527	11.00%	13.50%	(785,927)
4	(1,200,000)	1.493	10.75%	13.00%	(803,628)
5	(11,200,000)	1.463	10.00%	13.00%	(7,652,909)
NPV	(10,000,000)				(6,049,607)
IRR	12.00%				14.83%

** Current rate is given*

Checking the figures in this table by entering the data into Equation 6.4, we find that the value of our swap is zero. Even though this theoretical price is correct, it does not include items that cause market friction, such as transaction cost, liquidity risk and divisibility. In practice the intermediary must consider these costs. As one can

see, the pound cash flow of this swap is staggered, which causes the swap dealer problems in developing a tender for Virgin Films Ltd It is unlikely that Virgin would be able to issue a fixed-rate sterling debt paying staggered payments. Therefore, the professional swap dealer must solve this problem by adjusting the cash flow. He can use Equation 6.5 to produce a payment stream similar to that of a standard five-year coupon bond as shown in Table 17.

$$C = P - \frac{\frac{P}{(1+r)^N}}{\sum_{n=1}^{N} \frac{1}{(1+r)^n}} \tag{6.5}$$

Where:
r = the internal rate of return
C = coupon payment
P = principal

Table 17

Level Cash Flow of Swap for Virgin Films Ltd

Year	US$ swap cash flow	£ Swap cash flow
0	10,000,000	6,049,607
1	(1,200,000)	(897,062)
2	(1,200,000)	(897,062)
3	(1,200,000)	(897,062)
4	(1,200,000)	(897,062)
5	(11,200,000)	(6,946,669)
NPV	(10,000,000)	(6,049,607)
IRR	12.00%	14.83%

By viewing the sterling cash flow in Table 17, the intermediary may compute the minimum cash flow needed from Virgin Films' swap. After deriving the base cost,

the swap dealer will incorporate his commission and risk premium into the coupon payments, or he may choose to charge a premium. This premium should be the summation of his commission and risk premium discounted at a risk adjusted rate.

6.2.7 Interest Rate Swaps

An interest rate swap is a bilateral contract where one party agrees to exchange a fixed stream of cash flow for an index-linked variable stream of cash flow. Interest rate swaps have shown a remarkable growth. Bias toward borrowers in the fixed and variable interest rate lending markets is the force driving this growth. Each party is able to use its comparative advantage in its particular market, fixed-rate or variable rate, by issuing debt at a lower cost than it could in the opposing market. Bicksler & Chen (1986); Smith, Smithson & Wakeman (1986) and Hammond (1987) explain in detail how interest rate swaps are used by capital market participants who take advantage of the anomalies that exist in different credit markets. The following example will explain the structure of an interest rate swap as well as its economic benefits.

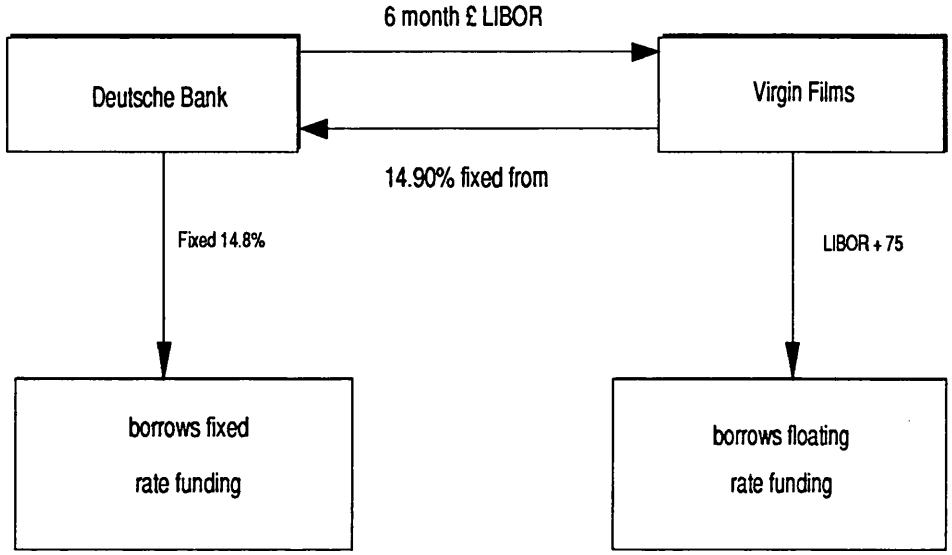
Virgin Films PLC is ready to embark on another project that will require it to obtain an additional £5 million. Virgin Films PLC decides to issue debt to fund the new project. Because Virgin Films PLC holds a low credit rating (BBB), it should issue debt in the floating rate market. Poorly rated companies are at a relative disadvantage when issuing fixed-rate debt rather than variable rate debt, because investors view fixed-rate debt as riskier, which tends to magnify the cost for poorly rated companies. Investors in fixed-rate instruments are more sensitive to credit quality than investors in floating rate instruments.

However, the project is on a limited budget and the company does not want to be exposed to the potential risk of increasing interest costs. To eliminate this problem they enter into a swap with Deutsche Bank, a AAA rated company. Deutsche Bank uses its comparative advantage in the fixed-rate market but prefers the variable rate of interest because it matches its variable source of funds, short-term deposits. This scenario is shown in the following analysis:

Current Market	Deutsche Bank	Virgin Films	Comparative Advantage
Credit rating	AAA	BBB	
Direct fixed	14.8%	16%	1.2%
Cost of floating	LIBOR + 1/4%	LIBOR + 3/4%	.5%

To illustrate the swap:

Figure 27
Interest Rate Swap Structure



Net Costs	Deutsche Bank	Virgin Films
OUTFLOWS		
fixed	14.80%	14.9%
floating	LIBOR	LIBOR + .75
INFLOWS		
fixed	14.9%	
floating		LIBOR
TOTAL COSTS	LIBOR - .10	15.65%
less non-swap costs	LIBOR + .25	16.00%
SAVINGS FROM SWAP	.35	.35

The analysis of this transaction clearly shows that each firm was not only able to obtain the type of debt it desired (fixed or floating) but was able to reduce its total cost by 70 basis points. In this example the parties shared equally in the savings, but in practice

the party with the higher credit rating would demand a greater portion of the savings.

Like the currency swaps market industry, the interest rate swap industry has adopted standard structures as well as involving intermediaries. Intermediaries serve to promote market efficiency by transmitting information, providing liquidity, guaranteeing payments and promoting standardisation.

International investors also use a combination of currency and interest rate swaps to hedge risks. By using swaps, investors are able to transcend their traditional markets and begin to invest in a broader range of products. For example, US investors could eliminating currency risk via the swap market when invest in sterling mortgage-backed securities.

6.2.7.1 Pricing

Interest rate swaps are simple to price. The price of an interest rate swap is equal to the sum of

1. present values of all the fixed-rate cash flow,
2. rate difference (stated floating rate less index used[34]) and
3. transaction costs.

Equation 6.6 is the pricing formula used to value an interest rate swap.

$$P = \sum_{i=1}^{n} \frac{C_i + (V - R) + T}{(1+r)^i} \qquad \text{(Eq. 6.6)}$$

[34] LIBOR is a commonly used index but it is open to negotiation.

Where:

P = price of the swap
C_i = coupon payment from fixed-rate bond
V = contracted rate of the floating side
R = index rate (eg LIBOR)
T = transaction cost consisting primarily of commissions earned by the intermediary.
r = discount rate

6.3 Conclusion

This chapter presented a thorough investigation of the hedging instruments used by international investors. We showed that swaps offer the most efficient method for hedging discrete, multiperiod, long-dated cash flow. Additionally, swaps may be structured in a variety of ways to meet investors' needs. However, no matter how complicated these structures may appear, they can always be broken down into the essential elements that were presented in this chapter.

In Chapter 9 of this thesis, we present a UK-based multicurrency collateralised mortgage obligation (MCMO). We create this instrument to explain how securitization could evolve on a global scale. An integral part of our structure will be an amortising currency swap, which is used to hedge the foreign exchange rate risk on a specific tranche of the MCMO. Before we discuss the structure of the MCMO, it is important to appreciate the problems that can arise when one is trying to hedge a mortgage-backed security. The next chapter will examine the most difficult element to hedge in MBS — mortgage prepayment.

CHAPTER 7
PROBLEMS IN HEDGING MORTGAGE-BACKED SECURITIES

Earlier in this thesis, we mentioned that mortgage-backed securities (MBS) have a unique embedded call feature that is caused by prepayment. If it were not for this embedded call, the MBS would resemble a traditional corporate debt issue. As explained in the previous chapter, standard debt instruments can be easily hedged against foreign exchange risk by using currency swaps. However, this prepayment uncertainty does exist and presents a major obstacle when it comes to hedging and valuing the MBS. It should be stressed that the UK mortgage market is being used solely for illustrative purposes. The hedging methodology presented in this thesis can be applied to any form of securitized debt, regardless of country of origin.

Prepayment models were first built by researchers who were trying to value MBS. The value of an MBS, or any investment, may be viewed as the sum of the present value (PV) of its future cash flows. Therefore, because PV is time dependent, the value of an MBS is contingent on the timing of its cash flow. An MBS cash flow consists of two components: the regularly scheduled mortgage payments, which are predetermined by contractual agreement; and the unscheduled, irregular prepayments and arrears. A prepayment occurs when the mortgagor repays his mortgage prior to the contracted date. He may do this for numerous reasons which will be discussed later in this chapter. Prepayment models are developed to minimize this uncertainty by estimating the timing and size of the prepayments.

A published functional prepayment model for UK mortgages does not exist. The only published study was a survey conducted for the Building Societies Association.

According to this survey of 1,000 mortgagors, the average life of a UK mortgage is 6.8 years. This research is of little use because the sample size is dated and is not relevant to mortgages that are securitized.

However, American researchers have published a large number of academic papers investigating the pricing of mortgage-backed securities, which include prepayment models. Since the model presented in this thesis is based on American research, Section 7.1 will review the development of the current methodology used in constructing US prepayment models. Section 7.2 explains how prepayment rates are quantified. In Section 7.3, we compare and contrast the causes of British mortgage prepayment with those of the US. Based on this comparison, the prepayment elements found in the US mortgage that are similar to those found the UK mortgage will be used in discussing the structure of a UK prepayment model. Section 7.4 will conclude this chapter.

7.1 US Mortgage Prepayment Modelling

Currently, in the United States of America most residential mortgages are securitized. This market is in excess of $850 billion, and has had considerable interest focused on the problem of MBS valuation. Most US mortgage-backed securities are supported by a portfolio of fixed-rate, thirty-year, amortising mortgages. The pool of mortgages may be viewed as a long-dated amortising bond with a series of calls. According to Fabozzi (1985), this call feature, or prepayment, is triggered by

- economic,
- seasonal and
- aging influences.

7.1.1 Economic

US mortgagors have the right to prepay their mortgage throughout its life without penalty. Therefore, when interest rates drop there exists a rational economic incentive for the mortgagor to replace his existing high rate mortgage with a lower rate mortgage. US mortgage prepayment research has dedicated a great deal of attention to interest rate sensitive prepayment modelling. See Chung, Tang & Fong; Dunn & McConnell (1981); Fabozzi 1987; Kau, Keenan, Muller & Epperson (1988); Hendershott (1985); and Johnston (1986). This thesis does not consider the interest rate element of prepayment because most UK mortgages are variable rate. However, UK mortgagors are economically motivated to prepay their mortgage when interest rates are high, whereas American mortgagors are motivated by low interest rates. This will be explained in detail in Section 7.3 British vs. US Mortgage Prepayments.

7.1.2 Seasonal Movements

US mortgage prepayments are affected by the time of year. Seasonal changes particularly affect building activity: most homes are built and sold during the summer. Another factor is family utility: families prefer to move during the summer while the children are out of school and the climate is mild. Additionally, more couples are married during the summer. Carron (1986) shows that prepayments accelerate during April and May, remaining high through the summer until they drop during August and September, and reaching a lull between November and February.

7.1.3 Mortgage Aging

Blaine (1987) and Green and Shoven (1986) show that US mortgagors rarely prepay during the first two and a half years. This is intuitively obvious, because demographic considerations that cause prepayment (e.g. job transfer, trading up, divorce and default) are not likely to happen during this time frame. Rational people will not generally purchase a home if their short-term domestic or professional situation is volatile.

7.2 Quantifying Prepayment

When MBS were first introduced in the 1970s, the investment industry modelled prepayment as a '12-year prepaid-life'. This method assumes that the MBS receives no principal payment for the first twelve years, then on the twelfth year the principal balance is paid in full. The rationale for this model was based on early research conducted by the Federal Housing Authority (FHA), which found that the average FHA mortgage is prepaid in about twelve years. This crude method of prepayment modelling was a poor representation of actual cash flow, so the US Department of Housing and Urban Development started publishing annual survival rates for FHA mortgages in a document appropriately called 'The FHA Experience'.

FHA Experience

The FHA periodically publishes its mortgage prepayments, which is often used as a bench-mark for investors. Past prepayments are not representative of future prepayments. Many investors wrongly assume that if a past historical prepaid rate of a pool was, let's say, 200% of the FHA Experience, the pool would continue to prepay at that rate. Fabozzi (1987) shows that this naive assumption is unfounded through empirical tests.

Constant Prepayment Rate

To reflect the actual prepayment rate of a MBS, the constant prepayment rate (CPR) was developed. CPR is an index that is considered to be more sensitive to prepayment than the FHA Experience. It expresses current prepayment as a proportion of the outstanding balance of the principal from the prior year. The results are typically stated as a percentage. Measurements of prepayment are expressed in terms of single monthly mortality (SMM) and CPR, where

SMM simply reflects the percentage of outstanding principal balance prepaid each month and

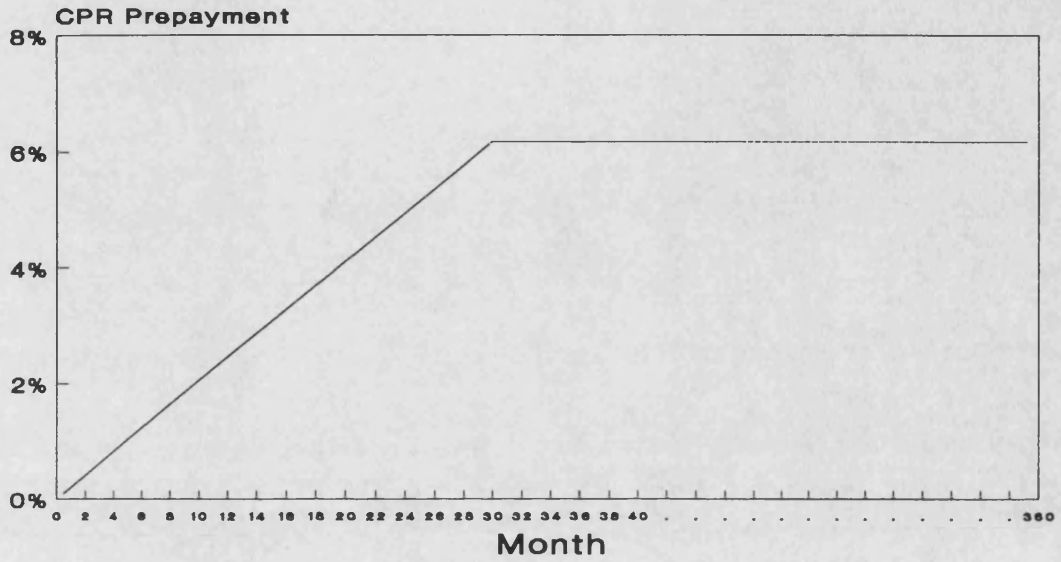
CPR is the annualised equivalent of SMM.

$$\text{CPR} = 100 \times \left\{ 1 - \left[1 - \frac{SMM}{100} \right]^{12} \right\}$$

Public Securities Association

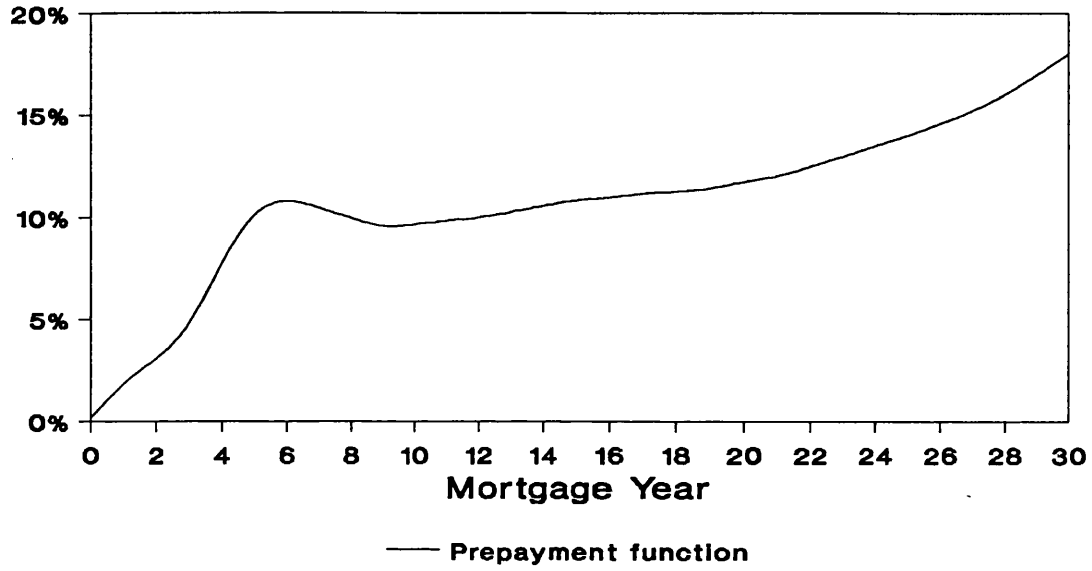
The Public Securities Association (PSA) introduced the current industrial standard in July 1985. It is based on a combination of the previous methods. This prepayment index assumes that the SMM is 0 per cent at origination, increasing by 0.2 per cent monthly until it reaches a maximum of 6 per cent CPR in the thirtieth month and remains constant thereafter. This is graphically represented in Figure 28.

Figure 28
PSA Prepayment



Even though the PSA model is commonly used because of its simplicity, empirical evidence shows that it does not accurately describe prepayment. Green and Shoven (1986) sampled 3,938 mortgages issued by a large California savings and loan association over the period of 1947 to 1976. This study included mortgages of every possible age. They made inferences on mortgages of a particular age, which allowed them to gauge the probability of prepayment at a given age. Green and Shoven (1986) used a method of analysis called the 'baseline hazard function'. The following graph shows the annual repayments that resulted because of aging.

Figure 29
The Pure Aging Effect: Annualised Percentage Prepay Rates



The model of Green and Shoven (1986) is limited in that it is static. It is inelastic in that it only views the habits of a limited geographical locale during a certain economic environment. To compensate for this inelasticity, Schwartz and Torous (1988) developed a model that is robust in that it allows the modeller to incorporate forecasts. It allows flexibility by permitting inferences to be made on the prepayment of mortgages that differ from observed maturities.

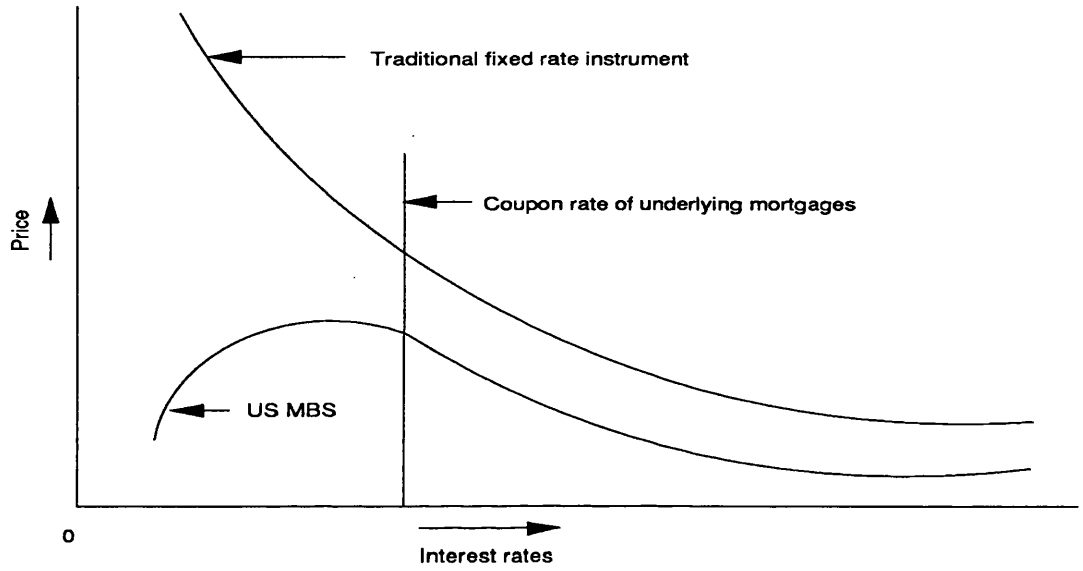
To date, the model developed by Schwartz and Torous (1988) has not been tested, and its efficiency will depend on the accuracy of the economic variables. However, we will show in Chapter 9 how the Schwartz and Torous model could serve as a base on which to build a UK prepayment model. The following section will contrast the UK mortgage market to that of the United States.

7.3 British vs. US Mortgage Prepayments

When adapting United States prepayment models for United Kingdom analysis, one must be sensitive to the differences between the mortgage markets in these countries. Economic effects on mortgage prepayment differ vastly between the US and the UK. US methodology may be used to develop a UK model, but the weighting of economic variables must be derived independently. These economic differences will be explained in this section.

The primary difference between UK mortgages and US mortgages is in the sensitivity prepayments have to interest rate movements. As already mentioned, most US mortgages pay a fixed-rate of interest as opposed to most UK mortgages, which pay a variable interest rate. US MBS are different from other fixed-rate instruments in that they experience what investors call 'Inverse Convexity'. This refers to the MBS price movement in relation to interest rates. When interest rates fall, fixed-rate instruments rise in value. However, MBS do not enjoy the same amount of appreciation because mortgage holders will call their mortgages when rates drop. Investors are then forced to reinvest at the lower current rate because prepayment accelerates when interest rates drop. The concept of 'inverse convexity' may best be understood through Figure 30. As interest rates drop below the rates on the underlying mortgage pool, mortgagors start remortgaging at the lower rate, which increases prepayments.

Figure 30
Inverse Convexity



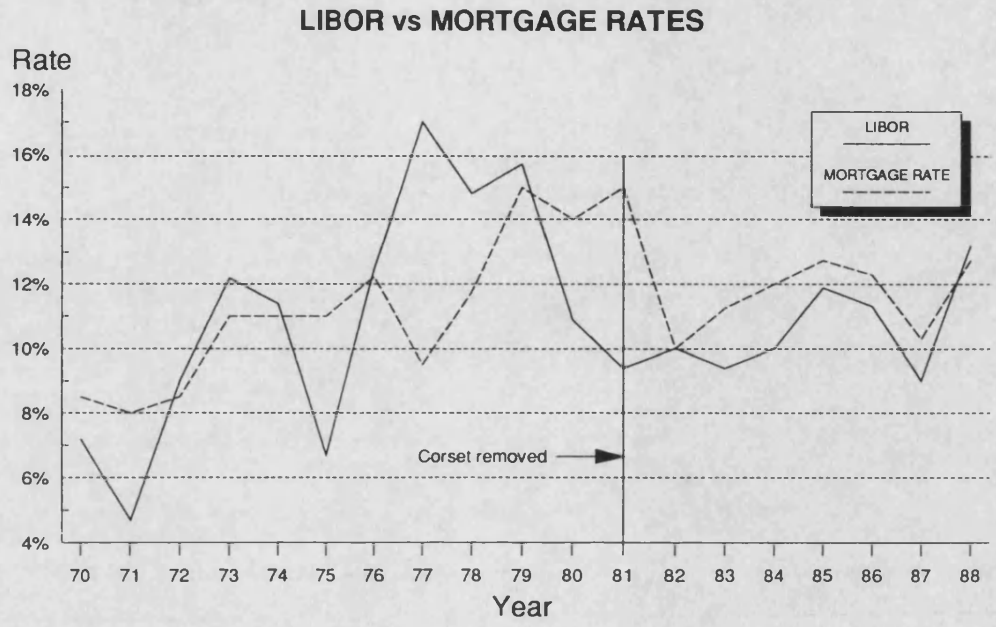
UK mortgage-backed securities do not suffer from this price sensitivity, because sterling mortgage-backed securities (SMBS) are issued on the floating-rate market. The interest rate is reset every three months at a set margin over the London Interbank Offer Rate (LIBOR). Therefore, the instrument trades at, or close to, par. However, the average life of a SMBS is affected by interest rate movements. Where in the US the prepayment is inversely related to interest rate movements, the current UK prepayment experience is positively correlated to interest rate movements. During the autumn of 1989, when the base rate in the UK rose to 15 per cent, National Home Loans reported that 60 per cent of their business was remortgaging. The rationale for remortgaging is that most

mortgagors are on a fixed-income, while their mortgage rates are variable. Therefore, mortgagors opt for a low-start or lower-cost fixed-rate mortgage, which helps to ease cash flow problems.

Historically in the UK economic influences such as capital market interest rate movements did not affect mortgage prepayment. The mortgage market used retail funds and was controlled by a cartel, the building societies association. There existed a dichotomy between the retail and wholesale markets, which served to insulate the mortgage market from the volatile interest rates movements in the capital markets. Additionally, the cartel would set mortgage rates causing the mortgage lending rate to be the same throughout the market. This offered no economic incentive for the mortgagor to remortgage because the mortgage products and rates were identical. The primary motive to prepay came when one moved house.

However, since the demise of the cartel and the advent of securitization, mortgage base rates have shown a positive correlation with capital market rates. As we show in Figure 31, the UK mortgage rates now have a positive correlation with capital market interest rates.

Figure 31



Source: Bank of England

Since the cartel was dismantled in 1981, a host of new mortgage lenders have entered the market, introducing a range of new products, such as the fixed-rate, low-start and foreign currency mortgages. Mortgagors' prepayment decisions are now sensitive to movements in LIBOR, because they may improve their economic position by remortgaging. Because this has been a recent development, efficient prepayment data do not yet exist for empirical research. Therefore, when modelling the effects of interest rate movements, one must make inferences regarding prepayment sensitivity to interest rate movements.

Prepayments caused by seasonal movement in the UK are similar to those in the US. According to the building societies association statistics, prepayments exhibit seasonal variation because people are more likely to move house in summer than winter.

Therefore, prepayments are low in January, February and December and then tend to peak in late summer. Additionally, advances on mortgages are higher during the summer than the winter.

7.4 Conclusion

Because of the rapid changes in the UK mortgage market and the lack of detailed prepayment data, foreign investors are not able to economically invest in sterling mortgage-backed securities without being exposed to foreign exchange rate risk. We have shown in this chapter that prepayment risk is the most difficult to manage because it is impossible to accurately predict the prepayment of a mortgage. In the next chapter we review a hedging methodology that is suggested by a leading investment banking firm that is known for its expertise in mortgage-backed securities. Our analysis shows that their system fails in providing an efficient hedge.

CHAPTER 8
SALOMON'S HEDGE

8.1 Introduction

In the previous chapter we discussed how prepayment causes difficulties in predicting the cash flow of mortgage-backed securities (MBS). This prepayment uncertainty exacerbates the foreign exchange rate risk faced by foreign investors in MBS. In Chapter 9 we introduce a multicurrency collateralised mortgage obligation (MCMO), which allows foreign investors to purchase interest in sterling mortgage-backed securities without being exposed to foreign exchange rate risk. To clarify how the MCMO contributes to the development of securitization, this chapter reviews a leading practitioner's recommendation for hedging foreign exchange rate risk on sterling mortgage-backed securities. We shall analyze Salomon Brothers Inc.'s (SBI) hedging strategy as described in 'An Introduction to Sterling Mortgage-Backed Floating-Rate Notes', and we shall show through empirical tests that the Salomon's strategy is weak when hedging for the long-term.

The remaining sections of this chapter are organized as follows: a general overview of sterling mortgage-backed securities is given in Section 8.2; the section explains the instrument's structure and its inherent risks. Section 8.3 reviews the claims made by the SBI hedging strategy and explains the theoretical basis of the strategy. Section 8.4 presents our test model, test data and test results. Section 8.5 concludes this chapter by commenting on the outcome of the tests.

8.2 Sterling Mortgage-Backed Securities

Sterling mortgage-backed securities (SMBSs) are notes issued from a thinly capitalised public limited company (PLC) whose assets consist of a pool of endowment-linked residential mortgages. To appreciate how low the capital ratio is for a SMBS, we show the capital structure of one of National Home Loan's SMBS in Table 18.

The SMBS resembles a floating rate note with a series of embedded call options (i.e., prepayment). Prepayment gives rise to a call option. The mortgagor exchanges his promised payment stream for a lump sum of money to purchase the "house". However, at any time the mortgagor can call the payment stream (i.e. his loan) by prepaying the principal balance of the loan. Thus exercising his call option. The variable rate and put provision create two sources of uncertainty, which present an interesting problem for anyone trying to hedge the SMBS against foreign exchange (FX) risk.

Table 18 Capitalisation of the NHL Third Funding Corporation PLC	
Share Capital	
Authorised	£
Shares of £1 each	50,000.00
Issued	
2 shares of £1 each (Fully paid)	2.00
49,998 shares of £1 each (25p paid)	12,499.50
Loan Capital	
£100,000,000 Mortgage-backed Series A Notes Due 2014	100,000,000.00
£10,500,000 Mortgage-backed Series B Notes Due 2014	10,500,000.00
Total Loan Capital	110,500,000.00
Total Capitalisation	110,512,501.50
Capital ratio	.0113%

8.2.1 Prepayment of Principal

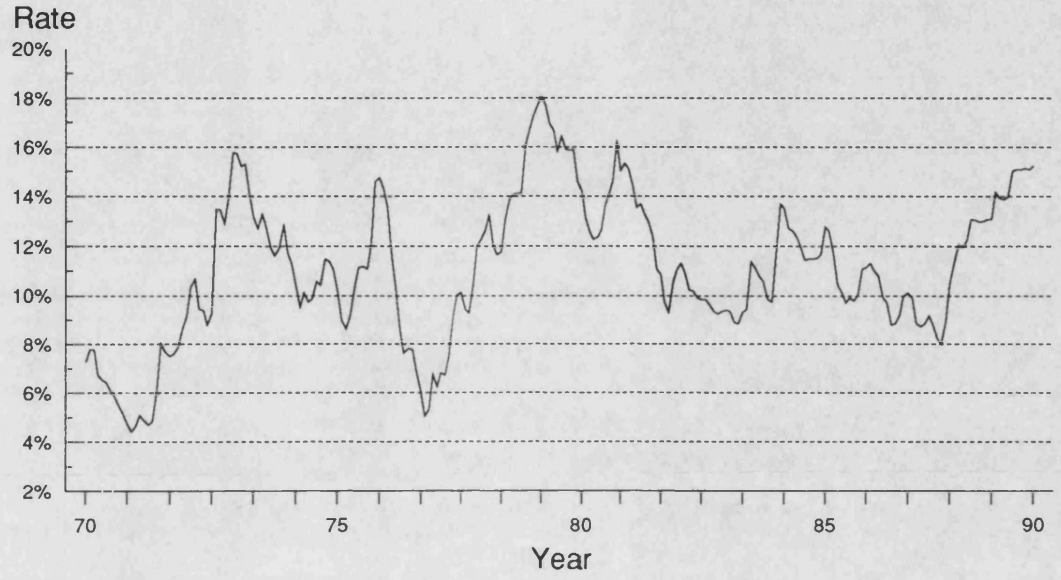
As discussed in Chapter 7, the primary source of uncertainty of cash flow in a MBS is mortgage prepayment. The mortgagor has the right to prepay his mortgage at any time during the life of the loan without suffering penalty. This prepayment of principal by the mortgagors causes the MBS to resemble a callable bond with a series of embedded American call options. The mortgages within the MBS are called over the life of the MBS.

Because SMBS have been only recently introduced, prepayment trends do not exist for these mortgage pools. However, it is often naively assumed that these instruments will have a five-year average life.

8.2.2 Uncertainty of Income Stream

The second source of uncertainty is the income stream. All sterling mortgage-backed securities are indexed to the three month London Interbank Offer Rate (LIBOR) plus a small percentage ranging from 0.2 per cent to 0.5 per cent. LIBOR is stochastic and has ranged between 4.41 per cent to 18.07 per cent over the past twenty years, as shown in Figure 32 on the following page.

Figure 32
Movement of LIBOR
from 1970-1990



8.3 The Salomon Brother's Hedge

Salomon Brothers Inc.'s publication by Dr. Youngblood, 'An Introduction to Sterling Mortgage-Backed Floating-Rate Notes', recommends an hedging strategy for sterling mortgage-backed securities that is intended to eliminate foreign exchange rate risk exposure. This publication claims that 'US dollar investors can gain access to sterling mortgage-backed FRN (floating rate notes) without incurring significant currency exposure.'[28] This section shows that this strategy is weak and is economically inefficient when hedging foreign exchange risk over multiple periods.

An investor is advised to exchange dollars at the spot rate equal to the amount he will invest in the SMBS, and to simultaneously sell sterling three months forward equal to

the principal value of the SMBS and the interest payment he will receive from the SMBS in the next quarter. Upon reaching the next quarter, the investor is advised to sell the SMBS. The proceeds are used to cover the balance due on the forward contract that was sold in the previous period, which was not covered by the sterling interest and prepayment cash flow. He is then advised to buy back the SMBS and to sell sterling three months forward in an amount equal to the remaining principal and the future interest payment, thus rolling over the forward contract. We illustrate this strategy in Table 19.

Table 19

SALOMON'S HEDGE

Quarter	Transaction
0	Exchange US$ for UK£ is equal to principal investment. Buy SMBS Sell UK£ forward to next quarter = to principal + interest payment.
1	Sell SMBS Settle Forward contract Exchange US$ for UK is equal to remaining SMBS principal balance Buy SMBS Sell UK£ forward is equal remaining principal + interest payment.
.	.
.	.
N	Sell or receive final payment from SMBS on payment date. Settle forward contract and receive US$.

The Salomon's hedging methodology is based on the Forward Parity Theorem, which is weak when tested empirically.

8.3.1 Forward Parity Theorem

The Forward Parity Theorem[29] (Equation 8.1), an extension of the interest rate parity theorem, simply states that the forward rate will equal the future spot rate.

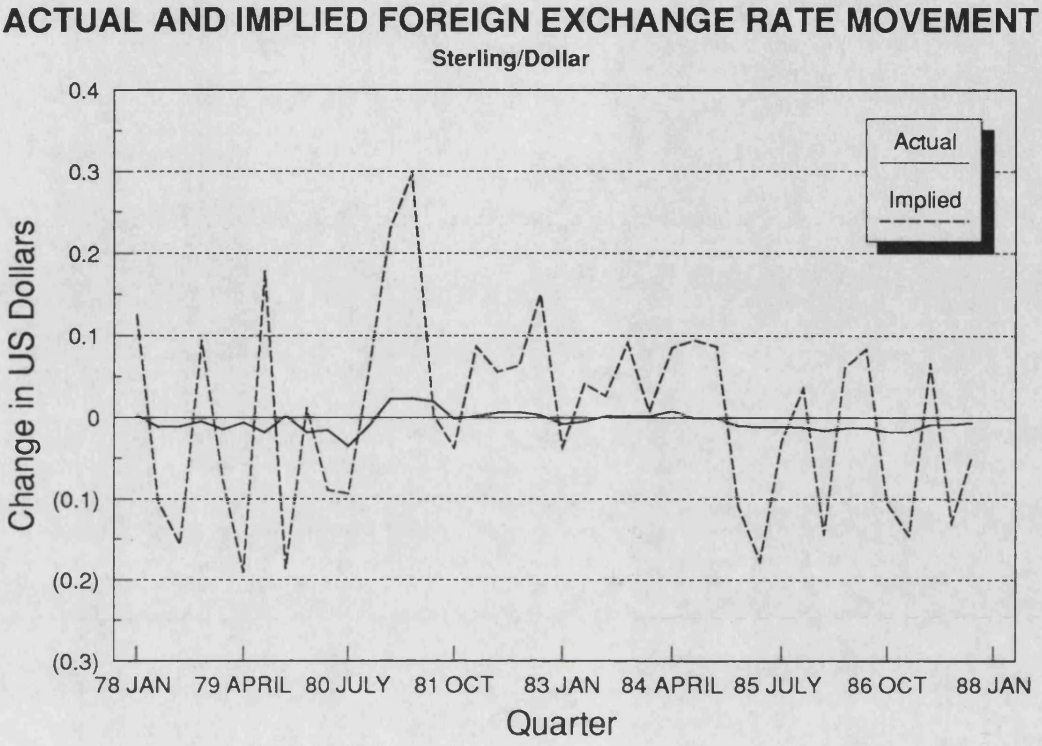
$$X_{fo} = X_1 \qquad \text{(Eq. 8.1)}$$

where

X_{fo} = the current forward exchange rate
X_1 = the future spot exchange rate

The forward parity theorem has been criticised by many academics and fails when tested. Dr. Kaveh Alamoutinia (1981) applied rigorous testing to the parity conditions and found that forward rates are poor predictors of future spot rates. He found that in the short run, inflation rate differentials are weakly related to exchange rate movement: there was no evidence that forward rates would predict future spot rates. This is better illustrated by the following graph, Figure 33, which compares the expected future spot rate determined by the forward rate and actual exchange rate of US$ and sterling.

Figure 33



Our test will further show why one should not rely on the rolling over of forward contracts as a hedging methodology for multiperiod hedging.

8.4 The Test Model

8.4.1 Structure

In this section we shall test the effectiveness of Salomon's hedging strategy. We shall track a million pound investment in a SMBS over the following three time frames, using the corresponding prepayment assumptions:

TIME FRAME	PREPAYMENT PER QUARTER
June 1978 to September 1988	£250,000
September 1982 to January 1988	£500,000
January 1986 to September 1988	£250,000

Using these three time frames, we compare the Salomon's hedge to a no hedging strategy and a perfect hedging[35] strategy to test the effectiveness of the SBI hedge. The total cash flow will be stated in terms of net present value (NPV), using the current US$ LIBOR rate as the discount rate. The present value of the cash flow is rolled back to the previous quarter until it reaches the security's origination data. We use the actual LIBOR rate from the quarter over which we are discounting.

[35] A perfect hedge is one whereby an investor would not have incurred any change in wealth due to foreign exchange movements. This analysis would require the forward rate hypothesis to hold true — i.e., that forward rates are perfect predictors of future spot rates.

8.4.2 The Models

In this section we derive the models used to test the proficiency of the SBI hedge. In formulating the no hedge model, the SBI hedge and the perfect hedge, we shall use the following notation:

N = total number of quarters

n = current quarter

i_n = London Interbank Offer Rate (Sterling) at instant of time n

I_n = London Interbank Offer Rate (US dollar) at instant of time n

P = purchase price in sterling

S_n = spot exchange rate (US$ per £) at time n

F_{n-1} = three month forward rate (US$ per £) negotiated at time $n-1$ for delivery at time n.

D_{n-1} = three month forward rate (US$ per £) derived from the interest rate differentials at time $n-1$

C = Commission rate for trading the SMBS

For all three equations PV_n is defined by

$$PV_n = \left[\prod_{f=1}^{n} \left(1 + \frac{I_{f-1}}{4} \right) \right]^{-1}$$

8.4.2.1 NO HEDGE

We derive our no hedge equation by first determining the principal value of the SMBS at time $n-1$. Each period we repay $\frac{1}{N}-th$ part of the principal, i.e. $\frac{P}{N}$. Therefore, at $(n-1)$ payments of principal have been made, the outstanding balance is

$$P-\frac{n-1}{N}P=P\frac{(N-n+1)}{N} \qquad \text{Eq. (8.1)}$$

Note: This is the position at time n only before the $n-th$ payment is made

Next we compute the interest we receive from the SMBS. We multiply the principal value by LIBOR at time n-1. Notice, we divide LIBOR by four to give us the quarterly return The point is at time $n-1$, i_{n-1} is set in the market. The interest is received at time n.

$$\left(P\frac{N-n+1}{N}\right)\frac{i_{n-1}}{4} \qquad \text{Eq. (8.2)}$$

Equation 8.3 gives us our total sterling cash flow for the period by adding the interest payment to the principal repayment. We assume that the principal repayment is static. (However, as we discussed in Section 7.1, mortgage prepayments are not static and are difficult to predict with any accuracy.)

$$\left(P\frac{N-n+1}{N}\right)\frac{i_{n-1}}{4}+\frac{P}{N} \qquad \text{Eq. (8.3)}$$

Equation 8.4 produces the US dollar cash flow by exchanging the sterling cash flow into to US dollars at the current spot rate.

$$\left(\left(P\frac{N-n+1}{N}\right)\frac{i_{n-1}}{4}+\frac{P}{N}\right)S_n \qquad \text{Eq. (8.4)}$$

Equation 8.5 discounts the dollar cash flow using US$ LIBOR from the previous quarter as the discount rate.

$$PV_n\left(\left(P\frac{N-n+1}{N}\right)\frac{i_{n-1}}{4}+\frac{P}{N}\right)S_n \qquad \text{Eq. (8.5)}$$

Equation 8.6 sums the discounted cash flow over the time period. This gives us our No Hedge equation.

$$\sum_{n=1}^{N}\left[PV_n\left(\left(P\frac{N-n+1}{N}\right)\frac{i_{n-1}}{4}+\frac{P}{N}\right)S_n\right] \qquad \text{Eq. (8.6)}$$

8.4.2.2 SBI HEDGE

To derive the SBI hedge we must alter the exchange rate we used in Equation 8.4. Instead of exchanging our cash flow at the current spot rate, we exchange it at the forward rate that was negotiated in the previous quarter.

$$\left(\left(P\frac{N-n+1}{N}\right)\frac{i_{n-1}}{4}+\frac{P}{N}\right)F_{n-1} \qquad \text{Eq. (8.7)}$$

Next, we must account for the change in cash flow caused by rolling over the remaining principal balance of the SMBS. We take the principal balance of the SMBS

and multiply it by the difference between the spot and our prenegotiated forward rate. We receive US$ at the forward rate and exchange them at the spot rate in an amount equal to the repurchase price, i.e. the principal balance.

$$\left(\left(P\frac{N-n+1}{N}\right)\frac{i_{n-1}}{4}+\frac{P}{N}\right)F_{n-1}+P\frac{N-n}{N}(F_{n-1}-S_n) \qquad \text{Eq. (8.8)}$$

Transactions cost also affect our cash flow when we roll over our investment. We must pay a commission when we sell the SMBS to settle our forward commitment and when we repurchase it for the next holding period. Therefore, costing us two commissions.

$$\left(\left(P\frac{N-n+1}{N}\right)\frac{i_{n-1}}{4}+\frac{P}{N}\right)F_{n-1}+P\frac{N-n}{N}(F_{n-1}-S_n)-2C\left(P\frac{N-n}{N}\right) \qquad \text{Eq. (8.9)}$$

By discounting and summing Equation 8.10, we derive the SBI hedge, Equation (8.10).

$$\sum_{n=1}^{N}\left[PV_n\left\{\left(\left(P\frac{N-n+1}{N}\right)\frac{i_{n-1}}{4}+\frac{P}{N}\right)F_{n-1}+P\frac{N-n}{N}(F_{n-1}-S_n)-2C\left(P\frac{N-n}{N}\right)\right\}\right] \qquad \text{Eq. (8.10)}$$

8.4.2.3 PERFECT HEDGE

We construct the perfect hedge by taking the cash flow of our SMBS and exchange it at the forward rate created by the interest rate differential. We assume the Forward Parity Hypothesis (see Section 8.3.1) holds true and the spot price of the next period will equal the forward price from the previous period. Therefore, we create an

hypothetical exchange rate data series based on this assumption to construct the perfect hedge. We use our new forward rate to determine the $US cash flow in Eq. 8.11.

$$\left(\left(P\frac{N-n+1}{N}\right)\frac{i_{n-1}}{4}+\frac{P}{N}\right)D_{n-1} \qquad \text{Eq. (8.11)}$$

We also roll over our principal value in this hedge, but we do not experience any change in cash flow, because our forward rate and spot rate are always equal. Therefore, we only include the transaction cost.

$$\left(\left(P\frac{N-n+1}{N}\right)\frac{i_{n-1}}{4}+\frac{P}{N}\right)D_{n-1}-2C\left(P\frac{N-n}{N}\right) \qquad \text{Eq. (8.12)}$$

Equation 8.13 is the perfect hedge. We sum the discounted cash flow to determine the net effect of our perfect hedge.

$$\sum_{n=1}^{N}\left[PV_n\left\{\left(\left(P\frac{N-n+1}{N}\right)\frac{i_{n-1}}{4}+\frac{P}{N}\right)D_{n-1}-2C\left(P\frac{N-n}{N}\right)\right\}\right] \qquad \text{Eq. (8.13)}$$

These models are structured to resemble the 'real world' but we must make some assumptions to simplify an already difficult test. The first assumption is the fixed transaction costs. Traders normally charge between 1/8% and 1/2%; therefore, we use the intermediate price of 1/4%. The second assumption is that SMBS yield LIBOR. These instruments trade at LIBOR plus a small margin ranging from 15 to

25 basis points. Making a slight increase over the index will not significantly affect the results of this test because the aggregate value of the SMBS is rolled over and a small fraction of one percent is insignificant. Therefore, the premium is omitted.

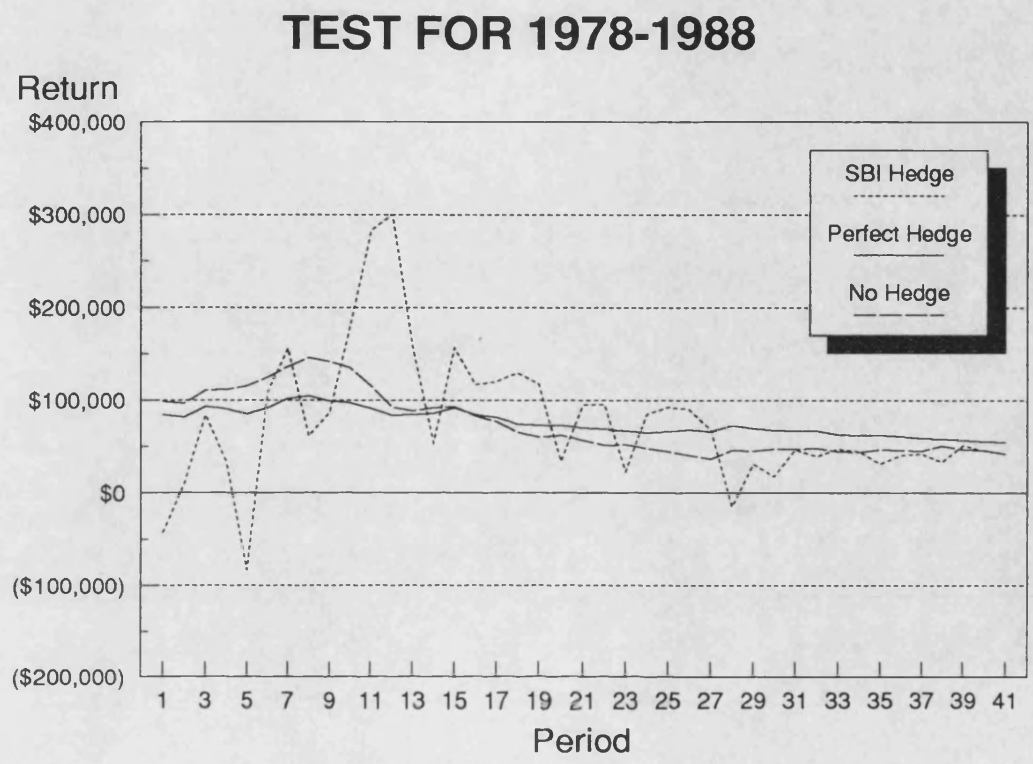
8.4.3 Empirical Results

The results of our test are presented in the following three sections. The interest rates, foreign exchange rates and results of our test are listed in Appendix B.

8.4.3.1 Test from 1978-1988

For our first test we determine the affects the hedging methodologies would have on a SMBS with a ten year life. Our research started in 1988, therefore we will assume all our SMBS mature in 1988. For this test we assume we purchase a SMBS for £1,000,000 and hold it for ten years. Additionally, we assume a 2.5 per cent rate of prepayment per quarter. If we did not hedge our investment we would have received a total cash flow of $1,935,926 in 1978 net present value terms. If we had implemented the SBI hedge in January 1978 and held the SMBS full term for ten years, we would have a NPV of $1,848,637. A perfect hedged position would have generated a NPV of $1,870,112. The cash flow from these hedges are illustrated in the following figure.

Figure 34



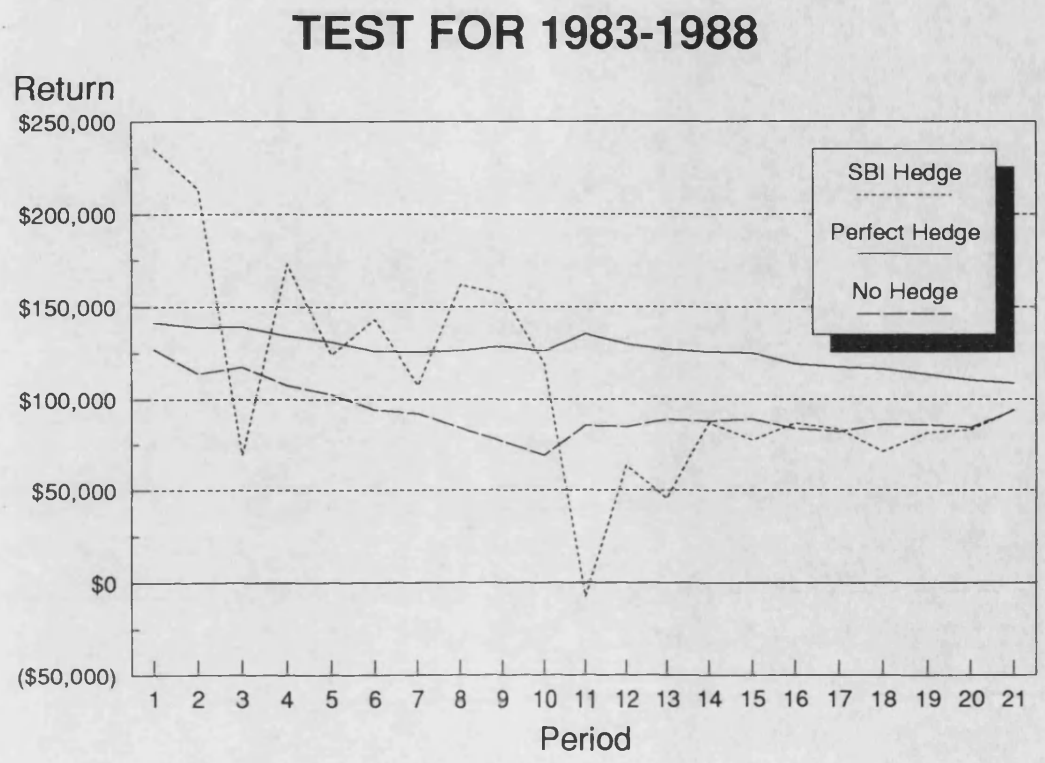
This graph compares the dollar cash flow from the no hedge strategy, the SBI hedge strategy and a perfect hedge strategy. Notice how volatile the SBI hedge is compared to the other two models. This test shows that the SBI hedge actually increased the volatility of the position as opposed to lowering the cash flow volatility. The opposite of its intent.

8.4.3.2 Test from 1983-1988

In this test we purchase a SMBS for £1,000,000 and hold it for five years. As we explained in Chapter 7, SMBS prepay at different speeds. This simulation tests the effects the hedges would have on a SMBS with a fast prepayment. We double the

prepayment speed by assuming a 5 per cent prepayment rate per quarter, which reduces the life by half. If we did not hedge this investment we would have received $1,579,979 in 1978 net present value terms. If we had implemented SBI hedge in January 1978 and held the SMBS full term for five years, the NPV of the cash flow would have been $1,897,505. A perfectly hedged position would have returned a NPV of $2,149,949.

Figure 35



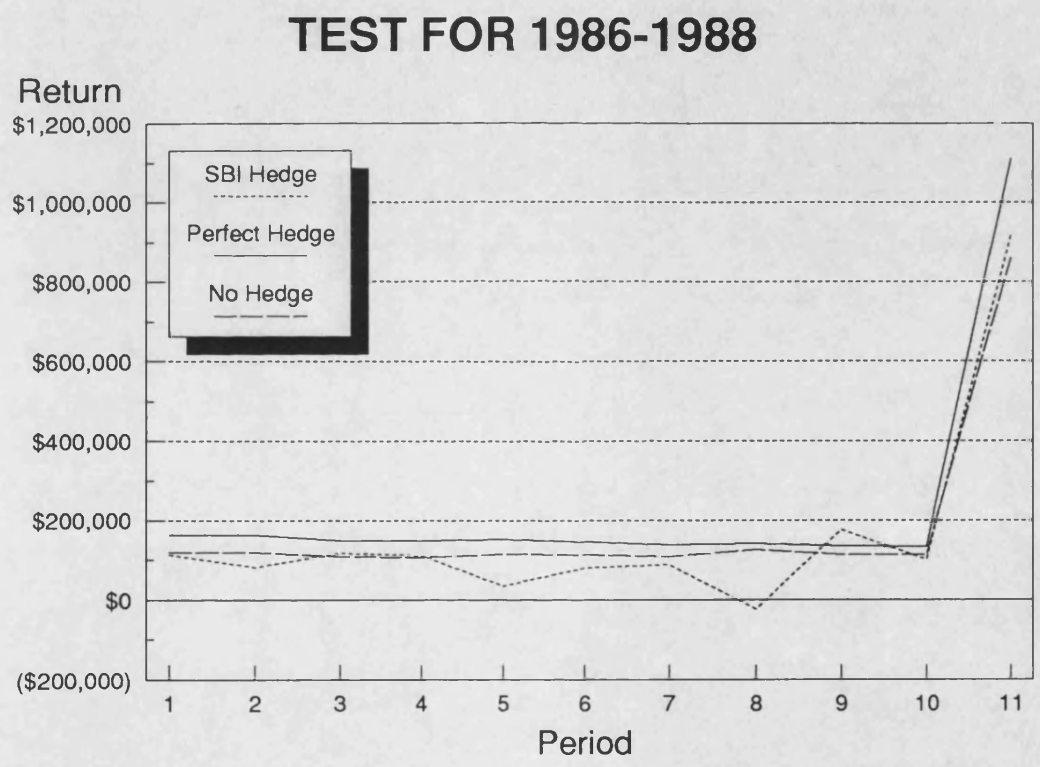
This graph compares the effects foreign exchange rate movements had on the cash flow of the no hedge strategy, the SBI hedge strategy and the perfect hedge strategy on a £1 million SMBS held from January 1983 to January 1988. Notice again in this model, the SBI model generates the most volatile cash flow.

8.4.3.3 Test from 1986-1988

In this test we purchase a SMBS for £1,000,000 and sell it eleven quarters later. Since SMBS are actively traded, we want to test the effects of the hedges when trading out of our position versus holding the investment full term. We use our standard prepayment speed of two and a half percent. On 2 September 1988 we cash out our

position. Using the rolling hedge in our SBI and perfect models, we settle our forward contacts in September 1988 including the settlement as a part of the cash flow. If we did not hedge this investment, we would have received $1,703,028 in 1986 net present value terms. If we had used the SBI hedge in January 1986, we would have received $1,517,140 in net present value. A perfectly hedged position would have generated a NPV of $2,204,187.

Figure 36



The above graph compares the effect foreign exchange rate movements had on the three hedging strategies used when investing in a £1,000,000 SMBS held for two years from January 1986 to September 1988. Again the SBI hedge creates the most volatile cash flow.

8.4.4 Post 1988

The world has experienced some radical changes since 1988. East and West Germany were reunited followed by the fall of communism in Eastern Europe. Exchange rates are experiencing more volatility because of these dramatic changes. These changes are affecting the pound and US dollar exchange rates, especially during the period when the UK removed its currency from the exchange rate mechanism in 1992. The forward markets could not have anticipated these events and it would have dramatically affected the results of our tests. For instance, during the 1992 decline of the pound relative to the US dollar, the forward exchange rate for the dollar relative to the pound would have increased because of the interest rate differential. Nonetheless, it would not have been enough to compensate for the radical move we saw in sterling during the third quarter of 1992.

Additionally, another event has taken place since our testing period. Property prices plummeted and mortgage foreclosures increased generating substantial losses for the mortgage industry. Even though none of the SMBS experienced any default or delay in paying their commitments, they were affected by these events, forcing prices down and therefore driving up yields. The SBI model assumed a par price when we rolled the SMBS, but now we would have to account for the price fluctuation in any post 1988 trials. The yield spread above LIBOR for SMBS increased from 15 basis points

to 75 basis points due to the increased UK mortgage default rate. When the SMBS was rolled over we would experence a capital loss, which would lower the NPV of the SBI hedge. Again, this would have increased the volatility of the rolling hedge methodology, further weakening this approach to hedging SMBS.

8.5 Conclusion

In this chapter we undertook a sensitivity analysis of hedging SMBS using threee alternative strategies. In each case the Salomon Brothers strategy proved to be totally inferior to the others. Therefore, we have shown that the Salomon Brothers Inc. hedging strategy is not an effective method for hedging sterling mortgage-backed securities over long periods. In fact, this strategy does the opposite of its intent by increasing the volatility of the cash flow in all three tests.

The SBI hedge was ineffective because the foundation on which it is built is unsound. A hedging strategy that involves rolling over forward contracts will not offset FX movement, because forward rates in practice do not equal future spot rates. As currency markets become more volatile, the predictability of the forward rate becomes even less useful. Therefore, the Salomon Brother's Inc. hedge should not be used because, as we have shown in this chapter, an investors risk is increased (i.e. more volatility) while his net return decreases. However, the hedging methodology presented in the next chapter provides an economical, sound and robust approach to minimising foreign exchange rate risk for foreign investors who want to invest in sterling mortgages.

CHAPTER 9

THE UK MULTICURRENCY COLLATERALISED MORTGAGE OBLIGATION

9.1 Introduction

In this chapter we propose the development of a UK multicurrency collateralised mortgage obligation (MCMO). We shall describe the construction of an instrument which explicitly is designed to remove foreign exchange rate risk for foreign investors. This is achieved by creating a CMO with a foreign currency (FX) tranche. We explain how to structure this instrument based on a UK prepayment model. Using the results from our model, a PAC tranche size is identified and swapped into a foreign currency.

Currently, this instrument does not exist. However, as the global market develops, it should only be a matter of time before we see the introduction of an instrument similar to the one introduced in this chapter. SMBS have saturated the sterling FRN market and avenues to new capital sources are needed. Our new financial instrument, the MCMO, opens avenues to all foreign capital markets by eliminating foreign exchange rate risk in a cost effective manner.

This chapter is presented in five sections. The first section provides an overview of the chapter. Section 9.2 demonstrates the need for the MCMO. Section 9.3 discusses the development of a UK prepayment model, which is crucial to the structure of the MCMO. Section 9.4 presents the structure for a MCMO, and the final section, Section 9.5, summarises the chapter.

9.2 The Need for a UK Multicurrency Mortgage-backed Security

We mentioned earlier that the UK has the fastest growing MBS market in the world. Sterling mortgage-backed securities (SMBS) account for approximately 50 per cent of the total sterling floating rate note (FRN) market. Given the rapid growth in the supply of SMBS, the FRN market is approaching saturation and SMBS need new avenues for placement. These are being found in other markets, such as the $350 million Mortgage Asset Euro-Securities (MAES) program that was introduced by Canadian Imperial Bank of Commerce (CIBC) in March of 1990.

CIBC formed MAES, a special-purpose company, to buy CIBC's mortgages. MAES issued US$ Euro-commercial paper in order to fund the purchase. Commercial paper (CP) is high quality short term debt (less than 365 days), which trades in a liquid market. MAES did not issue sterling CP because The Bank of England requires a large capital base before a company can issue sterling CP. The cost of capital makes a sterling CP structure cost prohibitive. Additionally, the US$ CP market is larger and more liquid. The MAES structure uses sterling/US$ forward contracts to hedge against foreign exchange rate risk. Note the hedge is effective because it is for a single, short-term period. The CP matures at the same time the forward contact comes due. CIBC is not the only lender starting to access the US$ market. National Home Loans is issuing US$ domestic CP backed by UK mortgages.

The US market can easily absorb new US$ issues because its mortgage-backed securities market is over $1,000,000,000,000 in size, thus offering more liquidity than the £9,000,000,000 UK mortgage-backed market. Additionally, there are other large capital markets, like Japan, that have a keen interest in the UK mortgage market, which is

exhibited by foreign investments in floating rate notes issued by UK building societies. Hedging foreign exchange risk on FRNs issued by building societies is simple because of their finite maturity and fixed principal repayment. Currency swaps can easily be used to offset any currency risk. However, as was shown in the previous chapter, hedging foreign exchange rate risk on SMBS is not a simple task. However, if one were to develop a long-dated dollar or yen denominated instrument supported by UK sterling mortgages, it would be easy to sell the instrument in the US and Japanese capital markets because of their greater liquidity.

9.3 Prepayment of Principal

As we explained in Chapter 7, prepayment of principal from MBS resembles a series of embedded call options. The mortgagor has the right to prepay his mortgage at any time during the life of the loan without suffering penalty. According to Youngblood (1987), United Kingdom prepayment rates are usually determined by demographic conditions, whereas prepayment rates in the United States are highly sensitive to interest rate movements. Most mortgages are variable interest rate instruments in the UK, not fixed as in most US mortgages, so they offer no economic incentive for the mortgagor to prepay his loan when rates drop. The primary incentive to prepay arises when one moves house.

However, it is interesting to note that with the sudden rise in interest rates during 1990 and 1991, lenders introduced low-start mortgages, which caused many UK mortgagors to remortgage their loans in order to lower their monthly mortgage payment. Therefore, in the future a rational expectation would be for UK mortgage prepayments to rise

relative to interest rates. While in the US, mortgage prepayments remain inversely related to interest rate movements. This presents a fundamental difference between the UK and US mortgage market.

Prepayment trends for SMBS do not exist because of their recent introduction. To address prepayment uncertainty, an actuarial table could be drawn from building society data. An effective table could be drawn from building societies' loans that are similar to those in the mortgage pool. The amount, loan-to-value ratio, mortgage age, mortgagor's age and property location would all have to be considered. Unfortunately, this approach would not produce a practical model because the UK mortgage industry has experienced fundamental changes in the past ten years, as we explained in Chapter 3, Section 3.3.1.1. Therefore, one must look to another source of data. The following section presents a mortgage prepayment methodology that is used for structuring the MCMO.

9.3.1 UK Prepayment Model

Developing a functional prepayment model is beyond the scope of this dissertation. However, leading researchers' prepayment modelling methods are examined, and using their modelling approaches, we shall produce a mortgage prepayment model that can use UK data. Unfortunately these data do not exist but are currently being collected by the National Opinion Poll (NOP). The data base should be complied and ready for use by the end of 1993. The following section explains the foundation for our prepayment model.

9.3.1.1 Mortgage Prepayment Research

Green and Shoven (1986) modelled mortgage prepayments using information gathered on 3,938 residential fixed-rate mortgages issued since 1962 by two California savings and loans (equivalent to UK building societies). They reviewed the prepayment history on these mortgages from 1975 to 1982 to determine the effect mortgage aging has on prepayment in relation to 'lock-in' (the ratio of the difference between the book value and market value of the mortgage divided by an estimate of the current house value). They modelled these prepayments using the proportional hazards model[36] that was developed by Kalbfleisch and Prentice (1980). Green and Shoven's research served as a foundation for future research but is not applicable to UK mortgages because the 'lock-in' ratio does not affect the UK mortgagor's prepayment decision. UK mortgages are not assumable, therefore they are non-tradeable and do not affect the value of a property. This is in contrast to assumable US fixed-rate mortgages, which add value to property when mortgage market rates are greater than the pre-existing assumable mortgage rate.

However, Quigley (1987) expanded on Green and Shoven's (1986) model by introducing household mobility factors as influencing prepayment. Additionally, he found that mobility is not independent of homeowner's length of residency; thereby disproving a critical assumption used in the proportional hazards model. He cites

[36] See Appendix C for a further discussion of the proportional hazards model.

Dynarski (1985) in arguing that household's attachment to its neighbourhood increases over time. To compensate for this weakness, he uses a nonproportional hazards model[37] as developed by Cox (1972).

Using data from the Panel Survey of Income Dynamics, Quigley determines that household income, age, size, changes in size, and changes in head of household affected the mortgagor's propensity to move, thus triggering a mortgage prepayment. He reports that

1. increase in household size increases mobility,
2. the age of the household head is inversely correlated with mobility,
3. the education of the head of household is positively correlated with mobility and
4. there is weak evidence that home owner mobility rate varies by race.

Giliberto and Thibodeau (1989) expand on Quigley's research by analyzing micro- and macro-economic variables that motivate prepayment when the mortgagor does not move house. The micro-economic data base was collected by the MIT/Harvard Joint Center for the housing research consumer mail panel (see Appendix E for a copy of survey). This database, which was compiled in 1986, consists of a national stratified random sample of 4,000 households.

[37] See Appendix D for a further discussion of the nonproportional hazards model.

This survey collected the following information:

Mortgage information
1. Origination date
2. Loan amount
3. Contract rate
4. Monthly payment
5. Whether monthly payment included hazard insurance or property taxes (rates)
6. Type of mortgage interest rate (fixed or variable)
7. Whether the interest rate was below-market
8. Type of loan (conventional, FHA or VA)

Household characteristics
1. Household size
2. Age and education of head of household
3. Marital status
4. 1983 and 1986 household income
5. Had the household moved since 1983
6. Other extensive demographic data

Giliberto and Thibodeau (1989) tested the influence the following variables have on mortgage prepayment when the mortgagor does not move house:

1. Lock-in
2. Household income
3. Interest rate volatility
4. Household size
5. Marital status
6. Age of head of household
7. Geographic location

They found that all of these variables, except marital status, have an impact on prepayment. Their findings are intuitively logical, considering that many couples choose to share a home before getting married. As long as the mortgagors remain in the home, prepayment is not affected by marital status.

At the time of writing, Giliberto and Thibodeau's (1989) paper is the most recently published research on mortgage prepayment using survey data. When interviewed during the Allied Social Science Associations conference in December 1989, Dr. Michael Giliberto said that he saw no reason why his model could not be adapted for use in the United Kingdom.

9.3.1.2 NOP's Survey

Our hypothetical mortgage prepayment model can produce a practical working model once NOP has completed its survey. The National Opinion Poll has agreed to collect the data by modifying their survey to include the pertinent variables as identified by our research. NOP's current survey, reference number 5702 (see Appendix F), includes most of the data needed to derive a UK mortgage prepayment model. However, some key statistics are missing, and the following modifications are being made in NOP's survey:

1. Specific month and year the mortgagor last moved house
2. Question 78 is being changed from categories to specific year and quarter
3. Question 84 is being expanded to include the year and quarter the changes were made
4. Regions are broken down by postal code

Once these data are collected, a multivariable discriminate analysis will be applied to the mirco- and marco-economic data to determine the influence each variable has on prepayment. The intercept of this model will give the expected life of the mortgage and a weighting can be assigned to each critical economic variable, establishing the basis for a working model. However, for this dissertation we shall use the results obtained by Giliberto and Thibodeau in developing our prepayment model.

9.3.1.3 The Mortgage Prepayment Model

The prepayment model is used to structure the MCMO, thus broadening the investor base for sterling mortgage-backed securities by a providing a tranche issued in a foreign currency. We are using a simple model to demonstrate the application and it is not intended to serve as a functional application. We realize that using the results from the Giliberto and Thibodeau work on US prepayment to identify UK prepayment is unrealistic. We just use their numbers instead of making up random estimates. We in no way want to imply that the results from our model are applicable to the UK mortgage prepayment speed. We only use these data to show how to formulate and structure a multicurrency mortgage obligation.

Table 21 is a variation of Giliberto and Thibodeau's Table 1. We are using their estimates, but we have omitted LOCKIN, LOGY, VOLATILE and DHHSIZE. The first three variables were omitted because they relate to fixed-rate mortgages. DHHSIZE was omitted in order to simplify the model. We anglophiled the REGION variables in the model by placing the UK regions in parenthesis. A functional model would consist of more detailed variables such as household size, defined regions, tenure, age of the head of household, level of education, marital status and income. We provide a listing of these variables in Appendix G for those researchers who may wish to apply our model once the data collection is complete.

Table 21

	Estimate	Std Error
Intercept	12.99	2.94
REGION		
New England (Greater London)	-3.06	1.10
East North Central (South West)	-2.65	0.95
West North Central (South East)	-2.96	1.03
South Atlantic (Midlands)	-2.04	1.00
East South Central (North East)	-1.86	1.50
West South Central (North West)	-1.17	1.20
Mountain (Wales)	-1.04	1.48
Pacific (Scotland)	-2.48	0.98
AGE		
30-39 years	-2.13	0.21
40-49 years	-2.11	0.21
50-59 years	0.23	0.02
> 59 years	2.37	0.24
MARRIED	-0.68	2.17

Using the above intercept and coefficients we ran a simulation of 10,000 trials on a pool of the fifty mortgages shown in Table 22, each being worth £100,000. Because the regression model is at best only a linear approximation to a very complex relationship, we decided to undertake a sensitivity analysis via simulation and to try to reflect the type of real constraints on the variables. As a consequence, we assumed that the intercept arose from a log normal distribution and the other factors from normal distributions. Table 22 shows the characteristics of the mortgage pool and demonstrates one trial in our simulation. Using a Monte Carlo simulation, we randomly generated new estimates for each trial which produced the histogram in Figure 34.

Table 22

The Mortgage Prepayment Model

	Number of Mortgages	Estimate	Std Err	Total
Intercept	50	12.99	2.94	649.50
REGION				
Greater London (New England)	16	-3.06	1.10	(48.96)
South West (East North Central)	4	-2.65	0.95	(10.60)
South East (West North Central)	6	-2.96	1.03	(17.76)
Midlands (South Atlantic)	9	-2.04	1.00	(18.36)
North East (East South Central)	5	-1.86	1.50	(9.30)
North West (West South Central)	4	-1.17	1.20	(4.68)
Wales (Mountain)	1	-1.04	1.48	(1.04)
Scotland (Pacific)	5	-2.48	0.98	(12.40)
AGE				
30-39 years	10	-2.13	0.21	(21.30)
40-49 years	15	-2.11	0.21	(31.65)
50-59 years	16	0.23	0.02	3.68
> 59 years	9	2.37	0.24	21.33
MARRIED	28	-0.68	2.17	(19.04)
Average Life of Mortgage Pool (sum of the total column divided by 50)				9.59

For our assumed tranche structure, our simulation produced the results presented in Appendix H. The histogram of the Average Life of the Mortgage pool is shown in Figure 34. The histogram provides the expected prepayment speed fro the MCMO. The mean life is 9.58 years with a standard deviation of 3.17 years. This provides us with the basis of the framework in which to divide the prepayments into different tranches. This task is non-trivial and is beyond the scope of this thesis, however, we shall outline the main ingredients of the exercise which must be undertaken. This should demonstrate the complexity of the problem.

The key feature of the "static" tranche, or PAC, is that is it should be structured in such a way that the probability of any one of its associated covenants being breached is extremely small. Essentially, there must be sufficient cash at each coupon date for no default to take place. It does not matter whether the cash arises from prior pre-payments or prepayments made just as a coupon is due. What is important is that there should be an appropriate reserve so that, except for the most unlikely of events, the covenants will be satisfied.

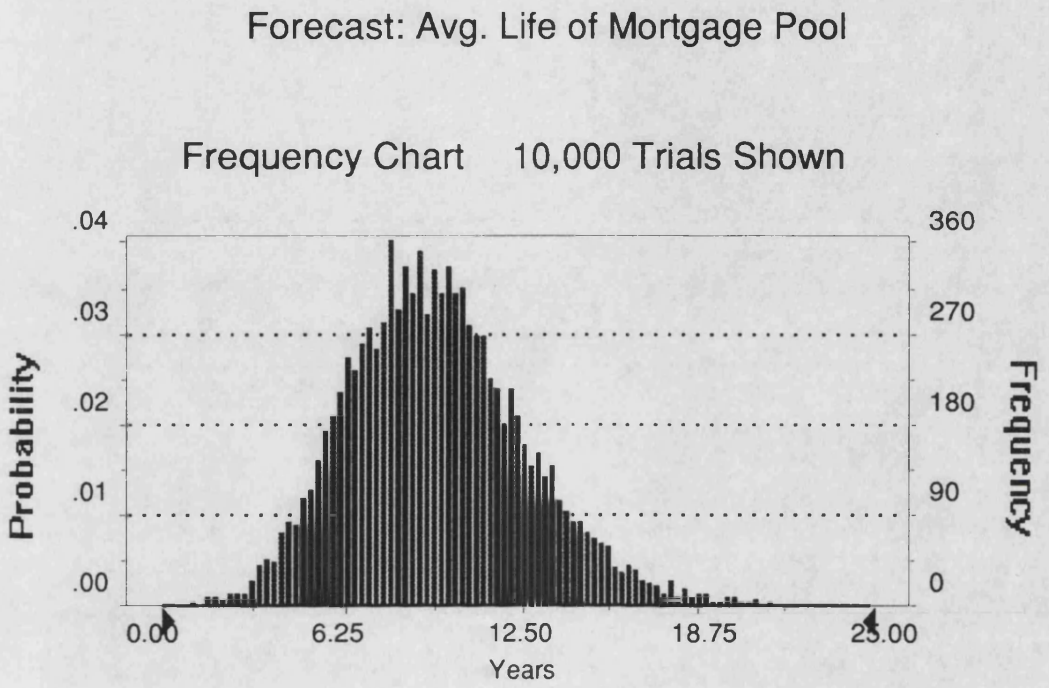
Broadly, the determination of this reserve requires determining the probability of various out comes which will lead to a default and the subsequent relationship between initial, intermediate and final coupon date. Clearly, this results in a significant exercise in conditional probability analysis as the various permutations and combinations leading to default must be determined. A key element of the calculation is the average life, which we have estimated via our simulations.

In passing, it should be noted that it may be that the required mathematical problem might be simplified if one considered the problem as a binary one as in the traditional hazard function literature. One could assume that the satisfaction of a coupon corresponded to success and the non-satisfaction to failure. It is then likely that the combinatorial problem is then one related to the Binomial Distribution and that one might be able to 'lift' results from that field. To implement this idea, we would make the assumption that the probability of success equals the expected prepayment speed.

We conclude this section by noting that there does not appear (1993) to be knowledge expounded in the public domain on this problem. Further, our simulations indicate

that the standard deviation, for our expository tranche, is very large. The 95% confidence interval for the expected prepayment speed is approximately (3.24, 15.92). In practice, this would seem to be too large to safely initiate the proposed static tranche. The view of the writer of this dissertation is that investment bankers might be willing to accept a much higher risk of default, and consequentially a small confidence interval. Noting that the 62.27% confidence interval (mean +/- one standard deviation) is (6.41,12.75), then commencing within year six would be acceptable for this tranche.

Figure 34



9.4 The Multicurrency Collateralised Mortgage Obligation

We now describe the structure of our multicurrency collateralised mortgage obligation (MCMO) in this section. The MCMO will combine many of the financial structuring techniques presented in this dissertation. Throughout this dissertation we identified all the elements used to build this instrument. We bring all these elements together in this section to develop an instrument that will aid in the globalization of capital markets. We create this instrument by structuring a UK collateralised mortgage obligation (CMO) (see Section 2.3.3), with a planned amortizing class (PAC) (see Section 2.3.3.3) and swapping the sterling cash flow from the PAC into a foreign currency (see Section 6.2.6). Through these combinations, we create a multicurrency mortgage-backed security.

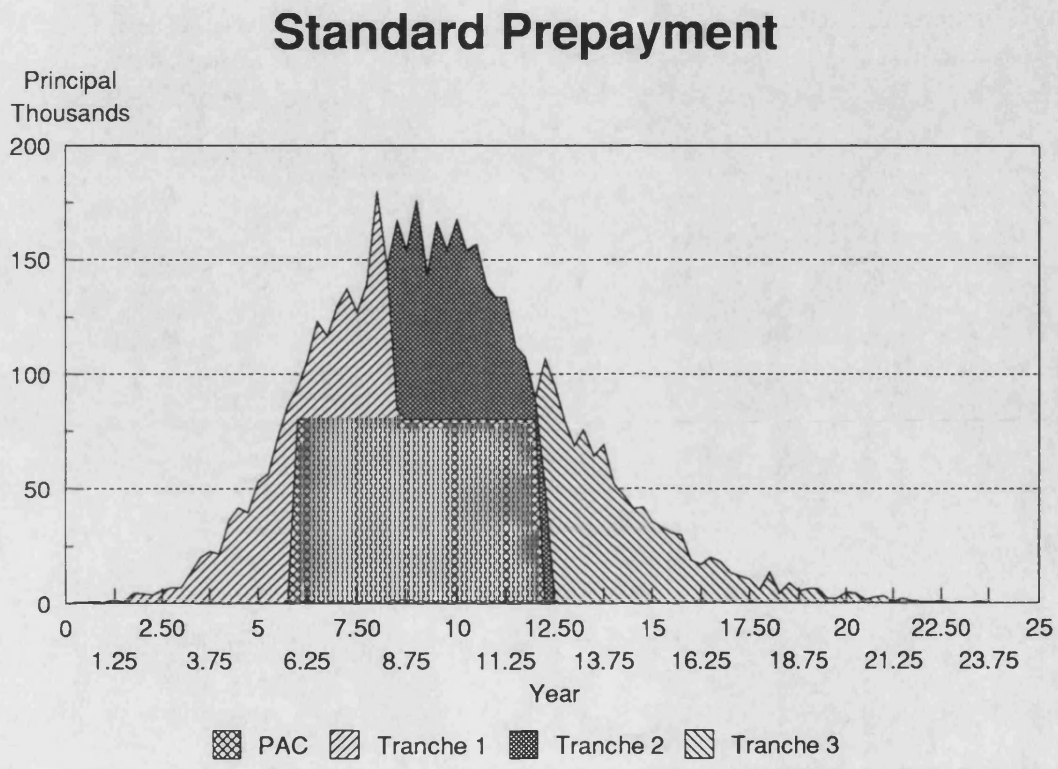
As we explained in Section 2.3.3, CMOs were developed to manage prepayment risk, and PACs evolved to better manage prepayment risk, which is inherent in mortgage-backed securities. However, before we can establish the size of the PAC (i.e., the value of the PAC) we have to have a sound prepayment model on which to base our predictions. Earlier in this chapter, Section 9.3, we explained why it is not practical to use US mortgage prepayment history when evaluating UK mortgage prepayment. To do so can be disastrous, as was proved by Bear, Stearns & Company when it failed to place its UK fixed-rate MBS that assumed US prepayment history.[30] However, we do provide a theoretically sound prepayment model based on US research that will be viable once the UK data are collected.

Our MCMO is structured with four tranches. The first three are a fast-pay, a medium-pay, and a slow-pay tranche denominated in sterling; the fourth tranche is the foreign currency tranche. The foreign currency tranche must have a stable principal cash flow to enable it to be swapped into another currency. The size of the PAC is established through the boundaries generated by our prepayment model.

As a means of easing our exposition, we describe our procedure through the following example. Based on our prepayment model, we issue a £5,000,000 MCMO with three £1,000,000 sterling tranches and one £2,000,000 PAC that we swap into US dollars or any other currency that may be deemed desirable at the time. The mortgage pool consists of the same fifty mortgages we used to generate the frequency chart in Figure 34. As we explained in Section 8.2, securitized mortgages are endowment-linked. The

principal is paid when the mortgage is paid off. We illustrate the standard principal repayment from the three sterling tranches and the PAC in Figure 35, using the expected prepayment speed derived from our prepayment model.

Figure 35

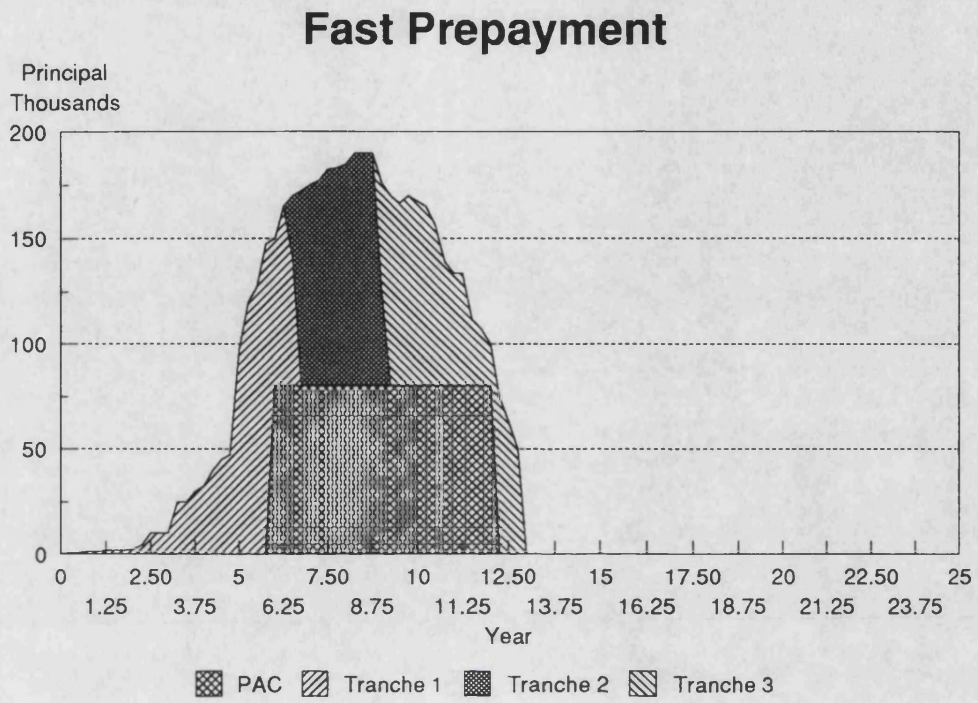


Our illustration shows how the first tranche pays through the eighth year. Also within the same time frame, the PAC begins to pay in the first quarter of the six year through to the first quarter of the twelfth year. The second tranche starts paying in the eighth year after the first tranche has matured. Then the last tranche pays from the twelfth year until the last payment is received. The data used to generate this graph and the flowing graphs are in Appendix I.

As long as there are enough prepayments to meet the principal debt service of the PAC, the integrity of the MCMO remains intact. However, if the prepayments are too rapid or too slow, there will not be enough cash to honour the currency swap and the PAC would default on its swap obligation. There are special insurance providers that will insure the risk of such a default if the credit rating agencies require it. For our MCMO, we assume that the rating agencies would give us the rating without the insurance.

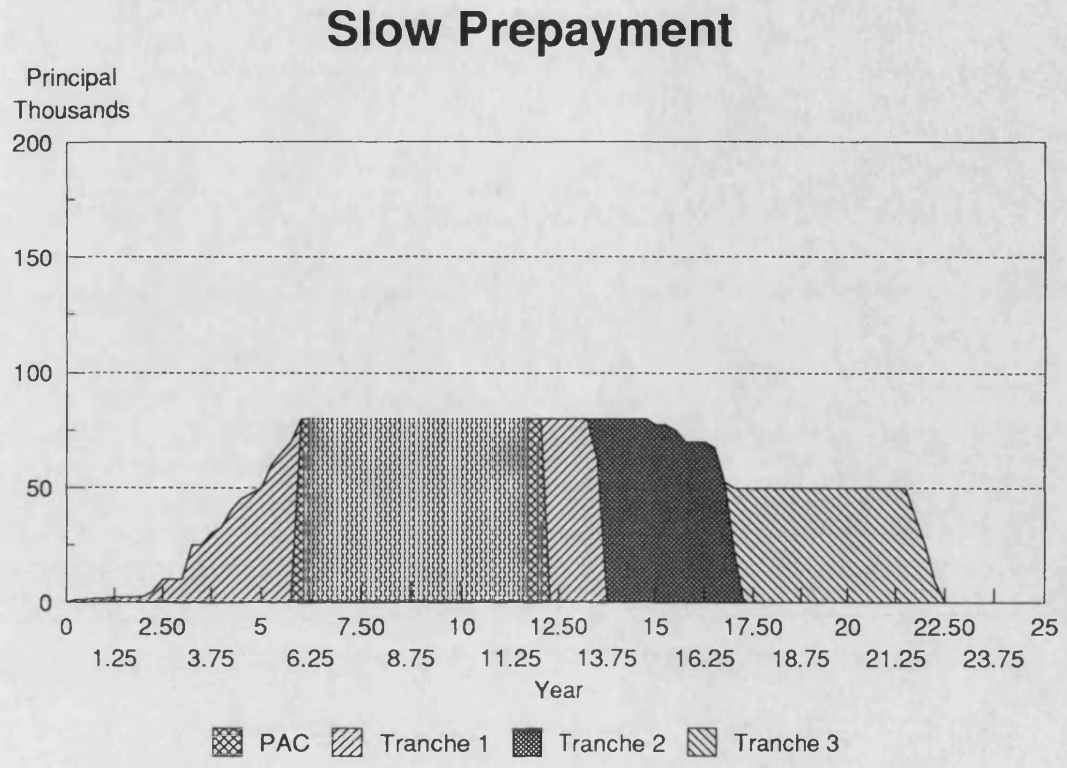
In the US, the prepayment speed at which the integrity of the PAC is intact is called the PAC band. Normally it is stated as a percentage of PSA i.e. 75% to 150% PSA (see Chapter 7, Section 2 for a definition of this index). (To establish a standardized prepayment index for the UK is beyond the scope of this dissertation, and we shall leave this task to future researchers.) Nevertheless, to demonstrate the robustness of our structure, we conduct a sensitivity analysis. We increased the speed of the prepayments until the upper boundary of our PAC was touched and illustrate the cash flow in Figure 36. The standard prepayment rate during the PAC time period, year six through twelve, is 2.76% principal payment per quarter. We increase the prepayment speed by 16.64% to a rate of 3.22% per quarter. Even with this increase, the PAC is able to meet its swap obligation. We illustrate this increased prepayment speed in Figure 36.

Figure 36



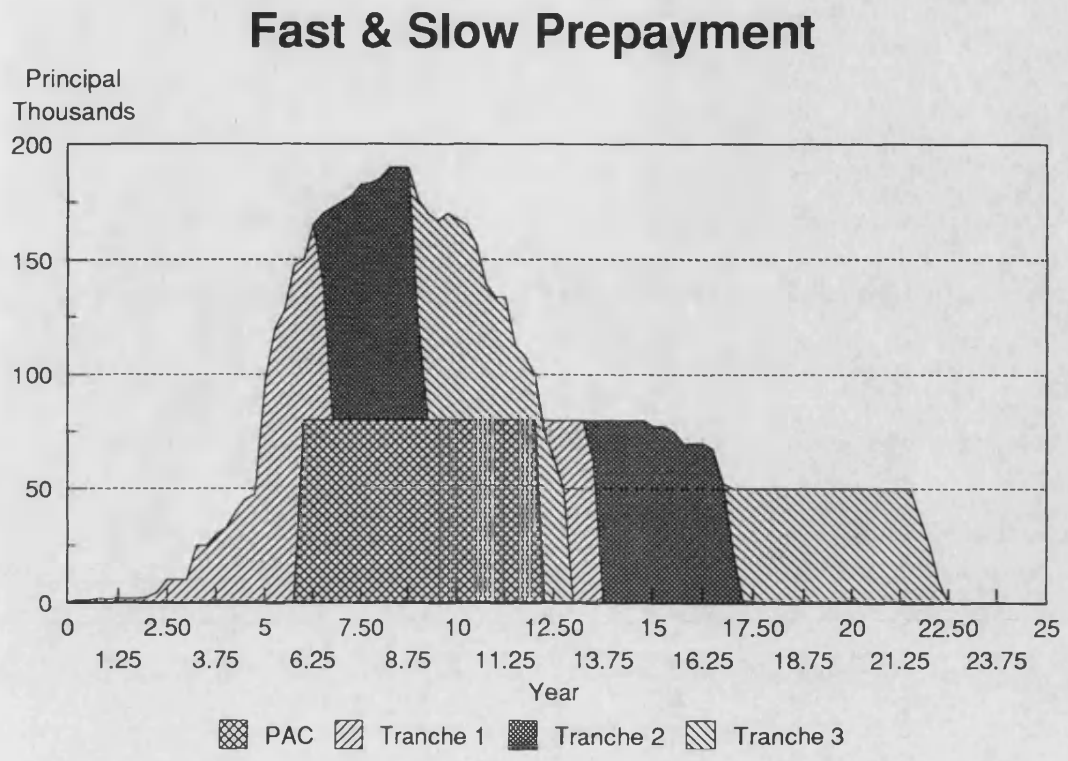
To determine the lower band of our PAC or the lower end of our sensitivity analysis, we reduce the quarterly prepayment speed by 42%, down to 1.6% per quarter. At this prepayment speed, only the PAC would receive principal repayments. If the prepayment dropped below this level, the PAC would default on the swap obligation. This gives us our minimum prepayment speed as shown in Figure 37.

Figure 37



By superimposing the maximum prepayment boundary over the minimum prepayment boundary, one visually sees the robustness of this structure in Figure 38. We show that the quarterly prepayment speed can fluctuate by over 58% without affect the integrity of the PAC. This demonstrates the effectiveness of our structure.

Figure 38



It is our belief that our MCMO offers a sound basis for practical development. Given that there are approximately £200 billion worth of mortgages outstanding in the United Kingdom, this structure will allow secondary market underwriters to tap international markets, thus broadening the investor base. Through this instrument, non-sterling investors are able to take a long dated position in UK mortgages without exposing themselves to currency exchange rate risk.

9.4.1 Uncertainty of Income Stream

The second source of uncertainty is the income stream. All sterling mortgage-backed securities are indexed to the three-month London Interbank Offer Rate (LIBOR) plus

a percentage ranging from 0.20 per cent to 0.50 per cent pre 1988. However, as we mentioned in Section 8.4.4, these interest rate spreads are increasing due to the mortgage market problems. However, if we wanted to create a medium-term fixed-rate instrument, we could easily enter into an interest rate swap as opposed to a currency swap with the PAC. Our fixed-rate sterling tranche could serve as a high quality fixed-rate sterling instrument.

9.4.2 Multicurrency ABS

The hedging methodology presented in this chapter is not just limited to mortgage-backed securities. As we explained in Chapter 4, there are many types of receivables that are securitizable, and they could also benefit from issuing multicurrency issues. In fact, many ABS have relatively small prepayment uncertainty. This then would allow for a large percentage of the issue to be swapped so as to take advantage of the most appropriate funding (e.g., variable rate, fixed-rate or currency.)

9.5 Conclusion

In this chapter we offer some insight into the future developments in securitization. We showed how securitization can be used to tap non-domestic sources of capital, which can add to the development of the global market. By introducing a specially constructed tranche, we can undertake an FX swap which achieves this objective. The success of this methodology will depend on the effectiveness of the prepayment model, which may be ready for application by 1994. Even if this model does not prove to be an effective predictor of prepayment speed, we believe that securitization, as a form of financial intermediation, will grow as technologies and the global community continue to evolve.

CHAPTER 10

SUMMARY & CONCLUSION

The essence of this dissertation is to present a new financial product that will further help to build the global financial market. We show a financial instrument can be structured to allow foreign investors to participate in the UK mortgage market without being exposed to foreign currency exchange rate risk. Our work is a single example of how securitization can be used as a conduit to channel funds between countries. We are confident that this financial process can help the global market to become more efficient.

Our objective for this work is to demonstrate how securitization can be used efficiently to source capital beyond domestic markets. By bringing together two derivative securities — a PAC and a swap, we eliminate currency risk for foreign investors. The PAC substantially reduces prepayment uncertainty, which is inherent in all MBS. The PAC provides a stable cash flow that is swapped into a foreign currency and sold to foreign investors. The foreign currency tranche opens a channel for investment in mortgages between countries.

We explained in Chapter 2 how securitization plays a similar role in the United States when MBS serve as a conduit to pierce fundamental barriers that restrict interstate capital investment. The growth of the US MBS market was fueled in the 1980s by the expanding home growth in the south and west which was funded by the wealthy north-east. We just expand this process by extending it beyond national boundaries through the elimination of currency risk.

Securitization of mortgages is a funding tool that is used in many countries in addition to the US. We discuss these non-US markets in Chapter 3 to show that the foundations are already laid for these established MBS markets to start cross-pollinating. Additionally, as we explain in Chapter 4, securitization is a robust form of financial intermediation that is applicable to a host of receivables. The only fundamental restriction for foreign investors is the foreign exchange (FX) rate risk.

We discuss the evolution of the derivatives markets to establish a thorough understanding of how and why hedging instruments are used. It is important to understand how these instruments evolved so one can appreciate the efficiency they bring to the current global market. The history presented in Chapter 5 and the application of modern hedging instruments discussed in Chapter 6, should give a foundation on which to understand the core concept of the thesis. Also, we hope that with this understanding of derivative financial products, the reader can share our excitement in the potential for the compound derivative instrument created in Chapter 9. This compound derivative manages FX rate risk and prepayment risk. To the best of our knowledge, no one has ever efficiently managed these risks simultaneously.

Most investors are not comfortable exposing their investments to FX rate risk. Therefore, they tend to limit their investment universe to instruments denominated in their home currency. They do not have the expertise or systems to manage FX risk, and it is not economically feasible for them to obtain the management ability. However, there are some large institutional investors that are willing to expose their investments to FX risk

or are able to manage it. These investors require a higher return on their capital to compensate for the risk or hedging cost, which raises the cost of funds that flow between countries.

Many international investment banking institutions have attempted to solve this hedging problem with respect to MBS. In Chapter 8 we test the effectiveness of the Salomon Brothers hedging methodology. They claim their hedging method will eliminate FX risk. However, we prove through empirical tests that this method fails to protect foreign investors from exchange rate risk over multiple periods. In fact, over some periods, it enhanced the risk. The Salomon model is effective for a single period investment which allows the foreign investor to invest for only three months. Its weak point is when the investors rollover their position. Transaction costs plus the discrepancy between the forward rate, which the investor receives, and the current spot rate the investor pays prohibits investors from using the Salomon model for any time period extending more than three months. Foreign investors require a hedging methodology that is effective over intermediate and long term periods.

Chapter 9 provides a major contribution to the developing global capital market by providing an efficient instrument for multinational transactions. We show how the data might be collected to derive a prepayment model, which is used to construct a robust cost efficient multicurrency financial instrument. The multicurrency collateralized mortgage-backed obligation (MCMO) provides a FX tranche that opens the sterling mortgage market to foreign investors without exposing them to FX risk. This methodology is not limited to the UK or to mortgages, but can be used as a a conduit to channel funds across national boundaries.

Furthermore, in Chapter 9 we described how a UK prepayment model can be developed. This model would be useful to not only those who securitize their mortgages, but to the whole housing financial market. Our model can be used better to predict prepayment, which should lower the uncertainty of future cash flow. As this uncertainty decreases, so should the mortgage cost. As we explained in Chapter 3, intermediaries are paid for taking risks, and if the risk decreases so should the cost.

Our thesis creates a way to lower funding cost by broadening the investor base. Securities backed by foreign assets, that pay in home currency, would be attractive to investors. The technique of securitizating assets then swapping the cash flow into different currencies will help to propagate the global financial market. This technique of structuring a swap imbedded in a asset/mortgage-backed security will serve as a conduit to channel funds between countries. As the cash flow increases through this conduit, the capital cost will drop as a result of reduced friction (i.e. cost) of global financial intermediation.

Much has happened since 1988 that only further supports our thesis. The UK property market collapsed and mortgage default rates reached record levels. Nevertheless, not a single investor experienced a delay in payment from their sterling MBS. This supports the robustness of the securitization process as a form of efficient financial intermediation. This is the second time securitization has proved itself as a sound system for funding mortgages. The US also suffered from a collapsing real estate market that crippled the savings and loan industry in that country. Still, the mortgage-backed securities market continues to thrive requiring no bail outs from the government.

Just as developed economies are benefiting from securitization, so can newly developing countries. Since the fall of communism, Eastern European countries are in need of capital to rebuild their economies. These countries cannot fund their capital needs internally. Therefore, these countries are prime candidates for securitization. Since capital markets are just starting to evolve in these countries, the securitization process is even simpler to introduce than it was when applied in the UK. In the UK, securitization had to compete with an established system and forms of regulation that were not conducive to the securitization process. As we discussed in Chapter 3, existing systems and legal structures had to be changed to allow securitization. In Eastern Europe, the laws, technology and systems could be introduced from the start, thus providing an efficient conduit for capital from foreign investors.

Our process can be applied to any national market in a relatively short period of time. Survey data bases can be compiled usually within two years. Our work shows that a relatively efficient prepayment model can be produced from that survey data. Based on the prepayment model, we can further refine the efficiency of our mortgage or asset backed security by creating a PAC tranche from the pool of receivables. This defined and static cash flow is then swapped for the investors currency of choice.

Our work raises many questions that are not answered in the thesis. Using the variables in Appendix G, we suggest that the NOP data be evaluated and applied to our model to determine the UK mortgage prepayment rate. Once a functional model is built, it can then be used as an index for prepayment speed. The market is in need of a yardstick,

similar to the US PSA prepayment rate. Not only would our model help to develop such an index, but as we demonstrated, it could be used to build the MCMO, a financial product that can attract foreign investors who are concerned about the pound.

Another element that is crucial to the development of securitization is homogeneity. If the UK Government or a professional agency standardized UK mortgages, the market could grow more quickly as it did in the US. Currently, only large mortgage originators are securitizing their own mortgages. If a standard were developed and accepted, then small building societies and mortgage bankers could originate and sell their mortgages on the open market. Standardization would eliminate the flexibility that mortgage lenders have if they wanted to sell the mortgage on the open market. However, this would not limit the mortgage lender. He could continue to originate and hold mortgages that did not meet the standards set for the securitizable mortgages.

There are some gaps in our work because of the large number of financial concepts and instruments we discussed. We hope that we provided enough information for the reader to grasp the various elements we used to structure the MCMO, and to see that securitization, as a form of financial intermediation, canserve a primary function in the development of the global market.

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APPENDIX A

TABLES OF MBS

SUMMARY OF STERLING MORTGAGE-BACKED FLOATING-RATE NOTES ISSUED

Issuer	Issue Date	Maturity Date	Amount in £ (millions)	LIBOR Reset Margin (bp)[1]	Type[2]
Citibank	2/85	February 2010	£50	37.5 3 month	End
NHL First Funding	1/3/87	September 2013	50	20 3 month	End
TMC Mortgage Sec. No. 1	31/3/87	September 2014	200	25 3 month	End
HMC Mortgage Notes 1	16/7/87	June 2017	150	25/50 3 month	End
TMC Mortgage Sec. No. 2	26/8/87	November 2014	100	37.5/50 3 month	End
NHL Second Funding	8/10/87	November 2014	111	27.5/50 3 month	End
TMC Mortgage Sec. No. 3	30/10/87	April 2015	100	37.5/50 3 month	End
TMC Mortgage Sec. No. 4	30/11/87	May 2015	100	37.5/50 3 month	End
NHL Third Funding	30/11/87	November 2014	100	25/50 3 month	End
DOMUS	4/12/88	December 2014	100	35/50 3 month	End
HMC II	23/2/88	February 2015	150	35/50 3 month	End
MFC I	31/3/88	March 2015	175	42.5/50 3 month	End
TMC Mortgage Sec. No. 5	7/4/88	September 2015	125	35/50 3 month	End
TMC Mortgage Sec. No. 6	29/4/88	October 2015	100	32.5/50 3 month	End
RPS #1	18/5/88	May 2018	200	35/50 3 month	End
TMC Mortgage Sec. No. 7	15/6/88	November 2015	100	32.5/50 3 month	End
HMC III	12/7/88	July 2015	150	32.5/50 3 month	End

1 Basis points (1/100 of 1%)
2 Endowment type mortgage

STERLING MORTGAGE-BACKED FLOATING-RATE NOTES (continued)

Issuer	Issue Date	Maturity Date	Amount in £ (millions)	LIBOR Reset Margin	Type
TMC Mortgage Sec. No. 8	18/7/88	December 2018	100	32.5/50 3 month	End
MAES	25/7/88	July 2018	200	32.5/50 3 month	End
RPS II	27/7/88	July 2018	200	32.5/50 3 month	End
MFC II	31/8/88	August 2023	115	32.5/50 3 month	End
Exclusive Finance No. 1	5/9/88	November 2015	135	30/50 3 month	End
TMC Mortgage Sec. No. 9	20/9/88	February 2019	200	32.5/50 3 month	End
TMC Mortgage Sec. No. 10	18/10/88	March 2019	200	30/50 3 month	End
MFC III	21/10/88	October 2023	120	30/50 3 month	End
NHL Fourth Funding	31/10/88	October 2015	100	27.5/50 3 month	End
First Mortgage Securities I	14/11/88	October 2023	200	30/50 3 month	End
TMC Mortgage Sec. No. 11	20/12/88	March 2020	500	Special CMO	End

Source: Moody's Investor Services

APPENDIX B

EMPIRICAL TEST RESULTS

ASSUMPTIONS	
US$ investment	1,823,000
POUNDS	1,000,000
COMMISSION	0.25%
PERIODS	40

TABLE OF RESULTS

Period June 78- Sept. 88	Total	PV
SLB	3,115,051	1,848,637
Perfect	3,099,214	1,870,112
No Hedge	3,019,497	1,935,926

Period Sept. 82-Jan 88	Total	PV
SLB	2,269,033	1,897,505
Perfect	2,645,104	2,149,949
No Hedge	1,936,005	1,579,979

Period Jan. 86 - Sept 88	Total	PV
SLB	1,792,576	1,517,140
Perfect	2,576,991	2,204,187
No Hedge	1,995,971	1,703,028

June 78 through Sept. 88

NO.	DATE	£ Libor	US$ Libor	Forward Rate	£/$ rate	Rolling Forwards	Salomon Hedge	PV of SLB Hedge	Perfect Hedge	PV of Perfect Hedge	No hedge	PV of No Hedge
0	02/06/78	9.688%	10.500%	1.8194	1.8230	1.8230		1,848,637		1,870,112		1,935,926
1	01/09/78	9.375%	11.938%	1.9374	1.9495	1.8194	-42,245	1,939,409	84,611	1,834,591	98,452	1,888,293
2	05/01/79	12.563%	16.750%	1.9997	2.0200	1.8081	9,398	1,987,890	81,707	1,807,636	96,660	1,847,986
3	02/03/79	12.375%	17.438%	1.9975	2.0220	1.7899	84,343	1,986,789	93,464	1,789,867	110,878	1,814,492
4	01/06/79	11.719%	18.625%	2.0403	2.0745	1.7682	33,217	2,040,184	90,243	1,777,650	111,229	1,782,364
5	07/09/79	14.031%	18.563%	2.2256	2.2500	1.7390	-83,143	2,218,323	84,892	1,775,531	115,576	1,749,779
6	04/01/80	17.000%	13.750%	2.2551	2.2375	1.7202	109,562	2,211,705	91,491	1,766,435	124,614	1,706,366
7	07/03/80	18.063%	14.438%	2.2480	2.2285	1.7337	155,579	2,132,154	101,786	1,725,371	136,217	1,628,805
8	06/06/80	16.875%	14.813%	2.3526	2.3410	1.7489	61,478	2,147,633	104,812	1,682,834	145,736	1,541,858
9	05/09/80	16.375%	11.500%	2.4421	2.4135	1.7576	87,113	2,140,050	99,320	1,645,831	141,793	1,457,162
10	02/01/81	14.750%	9.000%	2.4150	2.3815	1.7784	180,163	2,021,413	97,070	1,596,079	135,094	1,363,961
11	06/03/81	12.625%	9.125%	2.2128	2.1940	1.8034	283,687	1,783,207	91,273	1,540,718	115,528	1,279,123
12	05/06/81	13.063%	9.750%	1.9446	1.9290	1.8188	301,030	1,522,857	83,528	1,492,338	92,366	1,215,937
13	04/09/81	13.719%	10.125%	1.8591	1.8430	1.8335	158,206	1,401,771	84,314	1,444,399	88,205	1,157,370
14	01/01/82	15.844%	9.938%	1.9365	1.9090	1.8496	53,803	1,383,450	85,746	1,395,214	91,919	1,094,747
15	05/03/82	13.531%	10.188%	1.8535	1.8385	1.8762	156,335	1,261,485	92,025	1,337,852	93,297	1,028,648
16	04/06/82	12.938%	11.313%	1.8031	1.7960	1.8915	116,954	1,176,659	84,218	1,287,708	82,872	971,974
17	03/09/82	10.875%	12.000%	1.7233	1.7280	1.8990	120,311	1,089,625	81,391	1,242,735	76,734	922,729
18	07/01/83	10.656%	8.376%	1.6195	1.6105	1.8938	129,239	993,074	74,139	1,205,878	65,439	884,972
19	04/03/83	11.156%	9.813%	1.5175	1.5125	1.9044	117,701	896,167	72,827	1,158,301	59,974	843,528
20	03/06/83	10.313%	7.625%	1.5753	1.5650	1.9106	33,823	884,328	73,181	1,113,535	62,041	802,180
21	02/09/83	9.875%	8.188%	1.5017	1.4955	1.9232	95,166	806,019	70,435	1,064,326	56,665	760,806
22	06/01/84	9.375%	8.000%	1.4117	1.4070	1.9312	95,446	727,071	68,614	1,017,498	51,674	724,705
23	02/03/84	9.000%	7.688%	1.4757	1.4710	1.9377	22,811	718,802	66,692	971,156	52,289	686,909
24	01/06/84	9.938%	7.125%	1.3951	1.3855	1.9439	85,037	647,579	65,125	924,696	47,886	652,224
25	07/09/84	10.938%	6.000%	1.2890	1.2735	1.9574	92,393	566,722	66,449	874,718	44,493	619,349
26	04/01/85	10.313%	6.188%	1.1662	1.1545	1.9812	90,700	484,523	68,032	819,808	40,701	587,939
27	01/03/85	14.000%	6.375%	1.0926	1.0725	2.0013	68,452	423,566	66,403	766,086	36,490	560,543
28	07/06/85	12.406%	7.250%	1.2841	1.2680	2.0388	-14,431	444,748	72,601	705,695	46,124	523,354
29	06/09/85	11.688%	7.563%	1.3389	1.3255	2.0647	31,214	421,595	69,390	649,095	45,471	487,369
30	03/01/86	11.844%	7.188%	1.4555	1.4390	2.0856	17,898	411,668	67,584	593,783	47,538	449,045
31	07/03/86	12.032%	6.813%	1.4727	1.4540	2.1094	46,300	372,765	67,162	537,290	47,113	410,001
32	06/06/86	9.626%	7.625%	1.5124	1.5050	2.1365	39,251	339,863	66,808	479,633	47,810	369,173
33	05/09/86	9.938%	8.376%	1.5017	1.4960	2.1470	47,018	299,323	63,069	425,707	44,600	331,611
34	02/01/87	11.031%	9.251%	1.4970	1.4905	2.1552	44,943	260,648	62,437	372,184	43,743	294,812
35	06/03/87	10.344%	10.001%	1.5913	1.5900	2.1645	31,303	235,373	62,380	318,411	46,327	255,302
36	05/06/87	8.876%	9.313%	1.6293	1.6310	2.1664	40,398	200,859	60,599	265,772	46,047	215,638
37	04/09/87	10.251%	8.938%	1.6593	1.6540	2.1640	42,053	163,482	58,465	213,495	45,020	175,638
38	01/01/88	8.876%	8.313%	1.8811	1.8785	2.1710	33,400	133,735	58,135	160,130	50,573	128,990
39	04/03/88	9.157%	8.375%	1.7774	1.7740	2.1740	51,604	84,910	56,574	106,884	46,318	85,352
40	03/06/88	8.782%	8.250%	1.7973	1.7950	2.1781	45,390	41,298	55,638	53,484	45,902	41,237
41	02/09/88	12.500%	8.000%	1.7021	1.6835	2.1810	42,150		54,587		42,088	
							3,115,051	1,848,637	3,099,214	1,870,112	3,019,497	1,935,926

Sept. 82 through Jan. 88

PERIODS= 20

NO.	DATE	£ Libor	US$ Libor	Rate	£/$ rate	Forwards	SLB Hedge		Perfect Hedge		No hedge	
0	03/09/82	10.875%	12.000%	1.7233	1.7280	1.8990		1,897,505		2,149,949		1,579,979
1	07/01/83	10.656%	8.376%	1.6195	1.6105	1.8938	235,283	1,719,147	141,305	2,073,142	126,810	1,500,568
2	04/03/83	11.156%	9.813%	1.5175	1.5125	1.9044	213,632	1,541,512	138,793	1,977,758	113,904	1,418,084
3	03/06/83	10.313%	7.625%	1.5753	1.5650	1.9106	69,179	1,510,148	139,118	1,887,157	117,534	1,335,337
4	02/09/83	9.875%	8.188%	1.5017	1.4955	1.9232	173,017	1,365,918	134,183	1,788,948	107,547	1,253,244
5	02/03/84	9.000%	7.688%	1.4757	1.4710	1.9312	123,879	1,269,998	130,826	1,694,740	102,602	1,176,295
6	06/01/84	9.375%	8.000%	1.4117	1.4070	1.9374	143,180	1,151,226	125,940	1,601,371	94,093	1,104,808
7	01/06/84	9.938%	7.125%	1.3951	1.3855	1.9439	107,431	1,066,820	125,715	1,507,683	92,006	1,034,899
8	07/09/84	10.938%	6.000%	1.2890	1.2735	1.9574	162,101	923,722	126,353	1,408,186	84,241	969,092
9	04/01/85	10.313%	6.188%	1.1662	1.1545	1.9812	156,689	780,889	128,687	1,300,622	76,666	906,963
10	01/03/85	14.000%	6.375%	1.0926	1.0725	2.0013	119,085	673,883	125,818	1,194,924	68,833	852,160
11	07/06/85	12.406%	7.250%	1.2841	1.2680	2.0388	-7,542	692,165	135,247	1,078,721	85,590	780,151
12	06/09/85	11.688%	7.563%	1.3389	1.3255	2.0647	63,421	641,289	129,925	968,348	84,775	709,517
13	03/01/86	11.844%	7.188%	1.4555	1.4390	2.0856	45,690	607,724	126,778	859,878	88,768	634,163
14	07/03/86	12.032%	6.813%	1.4727	1.4540	2.1094	86,668	531,976	125,706	749,623	87,768	557,789
15	06/06/86	9.626%	7.625%	1.5124	1.5050	2.1365	77,460	463,577	124,727	637,663	88,831	478,459
16	05/09/86	9.938%	8.376%	1.5017	1.4960	2.1470	86,870	385,544	119,139	530,680	83,800	403,780
17	02/01/87	11.031%	9.251%	1.4970	1.4905	2.1552	83,356	310,261	117,592	424,200	81,931	330,303
18	06/03/87	10.344%	10.001%	1.5913	1.5900	2.1645	71,115	246,320	116,556	317,454	86,077	251,865
19	05/06/87	8.876%	9.313%	1.6293	1.6310	2.1664	81,323	171,155	113,545	211,845	85,768	172,394
20	04/09/87	10.251%	8.938%	1.6593	1.6540	2.1640	83,145	91,994	110,478	106,299	84,535	91,872
21	01/01/88	8.876%	8.313%	1.8811	1.8785	2.1710	94,050		108,675		93,925	
							2,269,033	1,897,505	2,645,104	2,149,949	1,936,005	1,579,979

January 86 through Sept. 88

NO.	DATE	£ Libor	US$ Libor	Forward Rate	£/$ rate	Rolling Forwards	SLB Hedge		Perfect Hedge		No hedge	
0	03/01/86	11.844%	7.188%	1.4555	1.4390	2.0789		1,517,140		2,204,187		1,703,028
1	07/03/86	12.032%	6.813%	1.4727	1.4540	2.1026	112,375	1,432,026	162,515	2,081,279	118,252	1,615,377
2	06/06/86	9.626%	7.625%	1.5124	1.5050	2.1296	81,977	1,374,439	162,709	1,954,017	118,255	1,524,634
3	05/09/86	9.938%	8.376%	1.5017	1.4960	2.1401	117,927	1,282,712	148,976	1,842,289	107,199	1,446,498
4	02/01/87	11.031%	9.251%	1.4970	1.4905	2.1482	111,651	1,197,920	148,652	1,732,212	106,000	1,370,786
5	06/03/87	10.344%	10.001%	1.5913	1.5900	2.1576	34,241	1,191,383	151,607	1,620,665	114,579	1,287,907
6	05/06/87	8.876%	9.313%	1.6293	1.6310	2.1594	79,038	1,142,131	146,227	1,514,957	113,183	1,206,923
7	04/09/87	10.251%	8.938%	1.6593	1.6540	2.1571	87,312	1,081,409	137,984	1,412,242	108,390	1,126,632
8	01/01/88	8.876%	8.313%	1.8811	1.8785	2.1640	-24,034	1,129,606	141,123	1,302,675	125,215	1,026,590
9	04/03/88	9.157%	8.375%	1.7774	1.7740	2.1670	175,123	977,958	134,325	1,195,420	112,318	935,606
10	03/06/88	8.782%	8.250%	1.7973	1.7950	2.1712	99,820	898,614	133,268	1,087,182	112,349	842,846
11	02/09/88	12.500%	8.000%	1.7021	1.6835	2.1740	917,148		1,109,605		860,230	
							1,792,576	1,517,140	2,576,991	2,204,187	1,995,971	1,703,028

APPENDIX C

THE PROPORTIONAL HAZARDS MODEL

There are many survival distributions for modelling the survival experience of a homogeneous population. Usually, however, there are explanatory variables upon which failure time may depend. It is of interest, therefore, to consider generalisations of these models to take account of concomitant information on the individuals sampled.

Consider failure time $T > 0$ and suppose a vector $\underline{Z} = (Z_1, \ldots, Z_n)$ of explanatory variables (or coraniates) has been observed. Note that $\underline{Z}$ may include both quantitative variables and qualitative variables, such as first time home owner; the latter can be incorporated through the use of indicator variables. The principal problem that we deal with is that of modelling and determining the relationship between T and $\underline{Z}$. Certain of the covariates are usually of primary interest, such as those specifying particular demographic groups. One then wishes to evaluate, for example, mortgage prepayments effects, while accounting for heterogeneity in the individuals sampled.

If we take the hazard function to be a constant, that is $\phi(x) = \lambda > 0$, over the range of T, then the instantaneous failure rate is independent of t so that the conditional chance of failure in a time interval of specified length is the same regardless of how long the individual has been on trial (this is referred to as the memoryless property of the exponential distribution.) The survivor function and density functions of T are, respectively,

$$F(t) = \exp(-\lambda t) \text{ and } f(t) = -\lambda \exp(-\lambda t)$$

We can generalise the exponential distribution to obtain a regression model by allowing the failure rate to be a function of the covariates of $\underline{Z}$.

The hazard function at time t for an individual with covariates $\underline{Z}$ can be written

$$\lambda(t;\vec{Z}) = \lambda(\underline{Z}).$$

Thus the hazard for a given $\underline{Z}$ is a constant characterising an exponential failure time distribution, but the failure rate depends on $\underline{Z}$. The $\lambda(\underline{Z})$ function may be parametrised in many ways. If the effect of the components of $\underline{Z}$ is only through a linear function, $\underline{Z}\underline{\beta}$, one has

$$\lambda(t;\underline{Z}) = \lambda c(\underline{Z}\underline{\beta})$$

.

where $\beta^T = (\beta_1, \ldots, \beta_n)$ is a vector of regression parameters, λ is a constant and c is a specified functional form. A common functional form for c is $c(x) = \exp(x)$ which then enables, us to write

$$\lambda(t;\underline{Z}) = \lambda \exp(\underline{Z}\underline{\beta})$$

A further generalisation is to make λ a function of time t. If we now write the hazard function as

$$\lambda(t;Z) = \lambda_0(t) \exp(\underline{Z}\underline{\beta})$$

where $\lambda_0(t)$ is an arbitrary unspecified base-line hazard function for continuous T. $\lambda_0(t)$ is referred to as a base-line function because it is the hazard function if the value of each covariate is simultaneously zero. In other words if $\underline{Z} = (0, \ldots, 0)$, the null vector is taken as the base for all analyses.

As $\lambda_0(.)$ is arbitrary, the proportional hazards model is very flexible and has been applied to many alternative applications. There are, however, two important generalisations that do not substantially complicate the estimation of $\underline{\beta}$.

First, the nuisance function $\lambda_0(t)$ can be allowed to vary in specific subsets of these data. Suppose that the population divided into r strata and that the hazard $\lambda_j(t;\underline{Z})$ is the jth stratum depends on an arbitrary shape function $\lambda_{0j}(t)$ and can be written

$$\lambda_j(t;\underline{Z}) = \lambda_{0j} \exp(\underline{Z}\underline{\beta}) \qquad \text{for } j = 1, \ldots, r.$$

Such a generalisation is useful, for instance, if some explanatory variable or variables do not appear to have a multiplicative effect on the hazard function. The range of such variables can then be divided into strata with only the remaining regression variables contributing to the exponential factor.

The second important generalisation allows the regression variable $\underline{Z}$ to depend on time itself.

APPENDIX D

THE DISTRIBUTION OF PREPAYMENT-TIMES AND HAZARD FUNCTIONS

Suppose that we have a population of mortgages, each mortgage characterised by a non-negative random variable, X, called its PREPAYMENT-TIME. The random variable, X, is non-negative and there are in practice two main cases to consider:

a) There is a positive constant, h, such that the only possible values of X are$\{0, h, 2h, \ldots\}$; and

b) The random variable has an (absolutely) continuous distribution over the infinite range $(0, \infty)$, its distribution being determined by a probability density function (p.d.f.).

A probability density function is an expression giving the frequency of a variate value X as a function of X; or, for continuous variates, the frequency in an elemental range. Unless the contrary is specified the total frequency is taken to be unity, so that the frequency function represents the proportion of aviator values X. From a more sophisticated standpoint the frequency function is most conveniently regarded as the derivative of the distribution function.

The cumulative distribution function gives the probability that the life of the mortgage does not exceed some pre-specified level, X, say. In other words, the cumulative distribution function $\equiv$ probability $(X \leq x)$. We usually denote cumulative distribution functions by capital letters and probability density functions by lower case letters. Hence, for example,

$$F(x) = Prob(X \leq x)$$

and $f(x) = F'(x)$

where the prime represents differentiation.

For some purposes it is slightly more convenient to work with the function complementary to $F(x)$. This is the SURVIVOR FUNCTION, $H(x)$,

$$H(x) = Prob(X > x) = Prob(x < X)$$
$$= 1 - F(x)$$

giving the probability that a mortgage has not repaid up to time X. Clearly $H(0) = 1, H(\infty) = 0$ and $H(x)$ is a non-increasing function of X. Also

$$f(x) = -H'(x)$$

Another function equivalent to $f(x)$ is the AGE-SPECIFIC FAILURE RATE or HAZARD FUNCTION, $\phi(x)$, defined as follows. Consider a mortgage known not to have been repaid at time x and let $\phi(x)$ be the limit of the ratio to Δx of the probability of repayment in the time interval $(x, x + \Delta x)$. That is, in the usual notation for conditional probability

$$\phi(x) = \lim_{\Delta x \to 0+} \frac{Prob(x < X \leq x + \Delta x \mid x < X)}{\Delta x}$$

.

Thus, roughly speaking, $\phi(x)$ gives the probability of almost immediate repayment of a mortgage know to be of age x. This function is widely used in actuarial work. Now for any two events A and B,

$$Prob(A \mid B) = \frac{Prob(A \text{ and } B)}{Prob(B)}$$

But the event '$x < X \leq x + \Delta x$ and $x < X$' is the same as the event '$x < X \leq x + \Delta x$'. Thus

$$\phi(x) = \lim_{\Delta x \to 0+} \frac{Prob(x < X \leq x + \Delta x)}{\Delta x} \cdot \frac{1}{Prob(x < X)}$$

$$= \frac{f(x)}{H(x)}$$

Because $f(x) = -H'(x)$ we can rewrite $\phi(x)$ as

$$\phi(x) = -\frac{H'(x)}{H(x)}$$

$$= -\frac{d}{dx}\{\ln H(x)\}.$$

Hence, on using the condition $H(0) = 1$ and integrating, we have

$$H(x) = \exp\{-\int_0^x \phi(\mu) d\mu\}.$$

By differentiating this expression for $H(x)$ we obtain

$$f(x) = \phi(x) \exp\left\{ - \int_0^x \phi(\mu) d\mu \right\}$$

showing that $\phi(x)$ uniquely determines the p.d.f., $f(x)$.

APPENDIX E

Copy of the

MIT/HARVARD JOINT CENTER FOR HOUSING RESEARCH CONSUMER MAIL PANEL

(N879: 63-74,87-98)

Dear Panel Member:

In the past several years, you have helped us by completing one or more housing questionnaires. I am now sending you another housing questionnaire to fill out. The answers to this new questionnaire are very important, since a purpose of this study is to learn more about changes over time in your housing.

This questionnaire about housing is being sent to the men and women across the country who previously returned housing questionnaires. When we began this study, half of the surveys were sent to men, half to women. In your case the male head of household was asked to respond. This same male head of household should also fill out this questionnaire.

Dear Male Head of Household:

A purpose of this study is to learn more about changes over time in your housing. This questionnaire thus includes some questions you have answered previously and some new questions. Since we also hope to learn more about housing preferences, some of the new questions are about you and your family. Your answers are especially important to the success of this study, since you have responded with information about your housing in the past.

Please read each question carefully. You will see that most questions can be answered by circling the number which corresponds to your answer.

As my way of saying thank you, once all the questionnaires are checked in, I will be sending you a small gift. In addition, there will be a special drawing for those who return questionnaires by June 9th. Fourteen cash prizes in all will be awarded:

One:	First prize of $100
Three:	Second prizes of $50 each
Ten:	Third prizes of $25 each

After you have completed your questionnaire, please return it to me in the postage paid envelope I have enclosed.

Thank you.

Cordially,

Marie

(N879: 51-62,75-86)

Dear Panel Member:

In the past several years, you have helped us by completing one or more housing questionnaires. I am now sending you another housing questionnaire to fill out. The answers to this new questionnaire are very important, since a purpose of this study is to learn more about changes over time in your housing.

This questionnaire about housing is being sent to the men and women across the country who previously returned housing questionnaires. When we began this study, half of the surveys were sent to men, half to women. In your case the female head of household was asked to respond. This same female head of household should also fill out this questionnaire.

Dear Female Head of Household:

A purpose of this study is to learn more about changes over time in your housing. This questionnaire thus includes some questions you have answered previously and some new questions. Since we also hope to learn more about housing preferences, some of the new questions are about you and your family. Your answers are especially important to the success of this study, since you have responded with information about your housing in the past.

Please read each question carefully. You will see that most questions can be answered by circling the number which corresponds to your answer.

As my way of saying thank you, once all the questionnaires are checked in, I will be sending you a small gift. In addition, there will be a special drawing for those who return questionnaires by June 9th. Fourteen cash prizes in all will be awarded:

One:	First prize of $100
Three:	Second prizes of $50 each
Ten:	Third prizes of $25 each

After you have completed your questionnaire, please return it to me in the postage paid envelope I have enclosed.

Thank you.

Cordially,

Marie

1. Please circle the number below which best describes the building in which you live. (PLEASE CIRCLE ONE ANSWER ONLY.)

One family house, detached from any other house	1
One family house, attached to one or more other houses	2
A Building For:	
2 to 4 families	3
5 or more families	4
Mobile home single-wide	5
Mobile home multi-wide	6
Boat, van, etc.	7
Other _____ (SPECIFY)	8

2. Is your current dwelling unit ... (PLEASE CIRCLE THE ANSWER WHICH BEST APPLIES.)

Owned by you or someone in your household	1
Rented for cash	2
OR, Occupied without payment of cash rent	3

3. Is your dwelling unit ...

Part of a cooperative (property owned as a corporation where each shareholder occupies an individual unit)	1
Part of a condominium	2
OR, Neither	3

4. Can you enter your dwelling unit ...

Directly from the outside	1
Through a hallway, lobby or other shared entryway	2
OR, Either way	3

5. How many floors are there in this building? (INCLUDE BASEMENT AND ATTIC IF FURNISHED FOR LIVING PURPOSES.)

(WRITE IN FLOORS): _____

6. When was the structure you live in built? (IF NOT SURE, GIVE YOUR BEST ESTIMATE.) (INDICATE WHEN THE BUILDING WAS FIRST CONSTRUCTED, NOT WHEN IT WAS REMODELLED, ADDED TO, OR CONVERTED.)

(WRITE IN YEAR): _____

7. What month and year did you move into this current residence?

MONTH: _____ YEAR: _____

8. Approximately how many miles from the downtown or central business area of the largest city within 50 miles is your residence located?

MILES: _____

9. How many square feet of living space does your household have in this dwelling unit? (DO NOT COUNT UNFINISHED PORTIONS OF BASEMENT OR ATTIC) (IF NOT SURE, PLEASE GIVE YOUR BEST ESTIMATE.)

_____ SQUARE FEET

10. How many rooms are there in your residence? (DO NOT COUNT BATHROOMS, PORCHES, BALCONIES, HALLS, FOYERS OR HALF ROOMS.)

NUMBER OF ROOMS: _____

11. Which of the rooms or areas on the list below do your living quarters have? Define the rooms or areas by the way they are used. For example, if one of your bedrooms is usually used as a study, count it as a study. If you have any rooms or areas that are not on the list, please add them in the spaces provided. (EACH ROOM OR AREA SHOULD BE COUNTED ONLY ONCE.)

	Have These Rooms		Have Thes Rooms
Kitchen	1	Separate laundry room	1
Walk-in Pantry	1	Woodworking room/shop	1
Eating area in kitchen	1		
Bathroom 1 (include half baths)	1	Storage room	1
Bathroom 2	1	Unfinished basement (all or part)	1
Bathroom 3	1	Unfinished attic (do not count crawl space)	1
Entry hall	1		
Living room-dining room combination	1	Enclosed porch (windows or screens)	1
Separate living room	1	Covered porch	1
Separate dining room	1	Balcony	1
		Deck	1
Bedroom 1	1	Patio	1
Bedroom 2	1	Garage	1
Bedroom 3	1	Other enclosed parking space	1
Bedroom 4	1	Carport	1
Bedroom 5	1	Other _____ (SPECIFY)	1
Family room	1		
Recreation/game room	1	Other _____ (SPECIFY)	1
Den/study	1		
Office	1		

12. Which of the following do you have in your kitchen? (PLEASE CIRCLE ALL THAT APPLY.)

Cooking stove or range	1	Enough outlets	1
Microwave oven	1	Adequate voltage	1
Convection oven	1	Enough counter space	1
Washer and/or dryer	1	Enough shelving	1
Dishwasher	1	Table for eating	1
Garbage disposal	1	Counter for eating	1
Instant hot water dispenser	1	Ceramic counter tile	1
Trash compactor	1	Custom cabinets	1
Refrigerator	1	Desk	1
Freezer	1	Computer	1

13. Does your house or apartment have any of the following? (PLEASE CIRCLE ALL THAT APPLY.)

Stall shower(s)	1	Wet bar	1
Whirlpool tub	1	High/sloped ceilings	1
Hot tub	1	Hardwood floors	1
Sauna	1	Linen closet	1
Bay window	1	Bedroom/walk in closet	1
Greenhouse window(s)	1	Cable TV	1
Skylight(s)	1	Burglar alarm system	1
Double/triple pane insulating windows	1	Passive solar	1
Storm windows	1	Ceramic tile floors	1
Storm doors	1	Ceramic tile walls	1
Patio or sliding glass door	1	Track lighting	1
Smoke detectors	1	Recessed lighting	1
Fireplace	1	Ceiling fan	1

14a. What type of foundation does your dwelling have? (PLEASE CIRCLE ONE ANSWER ONLY.)

Structure with basement 1
Building at ground level with crawl space only 2
Building at ground level on concrete slab 3
OR, Building on piers 4

14b. What type of exterior does your dwelling have? (PLEASE CIRCLE ONE ANSWER ONLY.)

Wood siding 1
Wood shingle siding 2
Vinyl siding 3
Aluminum siding 4
Asbestos siding 5
Brick or masonry 6
Concrete 7
Stucco 8
Other _____ 9
(PLEASE SPECIFY)

14c. What type of roof does your dwelling have? (PLEASE CIRCLE ONE ANSWER ONLY.)

Asphalt shingle 1
Tile shingle 2
Slate shingle 3
Wood shingle 4
Metal 5
Composition or built-up roofing (asphalt type) 6
Other _____ 7
(PLEASE SPECIFY)

14d. Is the roof of your dwelling flat?

Yes 1
No 0

14e. What type floor or floor covering does most of your dwelling have? (PLEASE CIRCLE ONE ANSWER ONLY.)

Carpet on wood 1
Carpet on concrete 2
Hardwood 3
Tile 4
Other _____ 5
(PLEASE SPECIFY)

15. Do any of the rooms in your house or apartment have any of the following? (EXCLUDE UNFINISHED PORTIONS OF BASEMENT OR ATTIC. PLEASE CIRCLE ALL THAT APPLY.)

	Yes
Exposed wiring, i.e., NOT concealed in walls or metal coverings (DO NOT COUNT appliance cords or extension cords)	1
Broken light fixtures, i.e., NOT in working order	1
Open cracks or holes in the interior walls or ceiling (DO NOT COUNT hairline cracks)	1
Holes in the floor	1
Any area of broken plaster on the ceiling or inside walls which is larger than this piece of paper	1
Any area of peeling paint on the ceiling or inside walls which is larger than this piece of paper	1
Any broken or boarded-up windows	1

16. Which, if any, of the following have you experienced with this house or apartment during the past year? (PLEASE CIRCLE ALL THAT APPLY.)

	Yes
A leaky roof	1
A leaky basement	1
Times when there is not enough hot water ..	1
Heating equipment not in working order	1
Drafts from windows or doors	1

HOW YOU HEAT AND COOL YOUR DWELLING UNIT

17. Please indicate below the main heating equipment used for your dwelling. (PLEASE CIRCLE ONE ANSWER ONLY.)

	Main Equipment
Steam or hot water system	1
Central warm-air furnace with ducts to individual rooms (do not count electric heat pumps here)	2
Electric heat pumps	3
Other built-in electric units (permanently installed in wall, ceiling or baseboard)	4
Floor, wall or pipeless furnace	5
Room heaters with flue or vent, burning gas, oil or kerosene (not portable)	6
Fireplace or heating stove	7
Portable room or space heaters	8
Other (SPECIFY) _____	9

18. Which type of fuel is used by your main heating equipment? (PLEASE CIRCLE ONE ANSWER ONLY.)

	Main Fuel
Gas from underground pipes serving the neighborhood	1
Gas, LPG (bottled or tank gas)	2
Fuel oil	3
Kerosene or coal oil	4
Electricity	5
Coal or coke	6
Wood	7
Solar collectors	8
Other (SPECIFY) _____	9

19. How is your water heated?

Oil	1	Solar	4
Gas	2	Other (SPECIFY) _____	5
Electricity	3		
		Do not have hot water	6

20. Please indicate the type of cooling equipment you use. (PLEASE CIRCLE AS MANY AS APPLY.)

Evaporation cooler	1	Ceiling fans	1
Central air conditioning	1	Window fans	1
Room or window air conditioner	1	Attic/gable fans	1
Portable floor fans	1	No cooling equipment	1

THE LAND

These next questions are about the parcel of land the building you live in is on. For condominiums, cooperatives, multi-family buildings and mobile homes, this parcel includes the land your family uses exclusively and the land you share with the other residents. (IF THIS PARCEL OF LAND IS THE SAME SIZE AS THE BUILDING YOU LIVE IN, PLEASE "X" THIS BOX ☐ AND SKIP TO Q.23a; OTHERWISE CONTINUE.)

21. How large is this parcel of land? (IF NOT SURE, PLEASE GIVE YOUR BEST ESTIMATE.)

_____ ACRES - OR - _____ SQUARE FEET

(IF YOU DO NOT KNOW THE EXACT NUMBER OF SQUARE FEET, MULTIPLY APPROXIMATE WIDTH OF LOT BY APPROXIMATE LOT DEPTH (WIDTH ____ X DEPTH ____ = ANSWER _____)

22. Which of the following items are on this parcel of land? (PLEASE CIRCLE AS MANY AS APPLY.)

Trees or wooded areas	1	On street parking	1
Grassed area	1	Garden or flower beds	1
Patio or other stone, cement area (excluding deck)	1	Swimming pool	1
Driveway or off street parking	1	Tennis courts, golf course	1
		Play equipment	1

HOW MUCH IT COSTS TO LIVE IN RESIDENCE

IF YOU OR SOMEONE IN YOUR HOUSEHOLD OWNS THIS DWELLING UNIT PLEASE ANSWER THE FOLLOWING QUESTIONS. RENTERS SKIP TO Q.27a:

23a. Do you have a mortgage, deed of trust, contract to purchase, or similar debt on this property?

Yes, mortgage, deed of trust or similar debt 1
Yes, contract to purchase 2
No ..... 3 → SKIP TO Q.27a

23b. This question is about the mortgage that you obtained when you bought this property. Please provide the requested information below. (IF YOU STILL HAVE A CONTRACT TO PURCHASE, SKIP TO Q.24a; OTHERWISE PLEASE WRITE IN ANSWER UNDER Q.23b BELOW.)

23c. Do you now have a different first mortgage on this property than you initially had? If so, please provide the requested information below. (PLEASE WRITE IN ANSWER UNDER Q.23c BELOW.)

	Q.23b Initial Mortgage	Q.23c Current First Mortgage If Different from Initial One
Year obtained	19_____	19_____
Initial amount (principal)	$_____	$_____
Interest rate	_____%	_____%

23d. Do you have a second or junior mortgage on this property?

Yes 1
No ..... 0 → PLEASE SKIP TO Q.24a

23e. Did you obtain your second mortgage ...

To help purchase your dwelling 1
OR, By borrowing against your equity at some time after purchase 2

24a. How much is your total regular monthly payment on all mortgages (including second or junior), contract to purchase or similar debt on this property?

$ _____ EACH MONTH

- OR -

No regular payment required ..... ☐ → PLEASE "X" THIS BOX AND SKIP TO Q.25

24b. Does your regular monthly payment (amount entered in Q.24a) include payments for: (PLEASE CIRCLE AS MANY AS APPLY.)

	Yes
Real Estate Taxes	1
Fire and Hazard Insurance	1
Maintenance or Homeowners Association Fee	1

25. Of the current mortgage or mortgages, how much of the principal remains to be paid? (PLEASE WRITE IN EXACT AMOUNT. DO NOT COUNT INTEREST.)

$ _____

26. If you were to sell this house or apartment and lot today, what do you think it would sell for? (IF NOT SURE, PLEASE RECORD YOUR BEST ESTIMATE.)

 $ _____

IF YOU RENT YOUR DWELLING UNIT CONTINUE; OWNERS SKIP TO Q.28a

27a. How much does it cost you each month to rent this dwelling unit? (PLEASE WRITE IN EXACT AMOUNT.)

$_____ a month

27b. Does this include ... (PLEASE CIRCLE ALL THAT APPLY.)

Heating 1
Electricity 1
Gas or fuel 1
Water 1
Parking 1
Other _____ 1
(SPECIFY)

27c. Are you paying a lower rent because the Federal, State or local government is paying part of the cost?

Yes ..... 1 No 0

OWNERS AND RENTERS

28a. What, if anything, is your yearly payment for property or real estate taxes? (DO NOT INCLUDE TAXES IN ARREARS FOR PAST YEAR.)

$ _____ a year

28b. How much, if anything, is the yearly cost for fire and hazard insurance?

$ _____ a year

28c. How much, if anything, is your maintenance or homeowners association fee each month?

$_____ a month

28d. About how much did you pay for the following utilities in an average month during the past year?

Electricity ..... $ _____ a month
Gas ..... $ _____ a month
Fuel oil ..... $ _____ a month
Water ..... $ _____ a month
Garbage collection ..... $ _____ a month

(8879)

CHANGES/REPAIRS MADE

The next questions ask about the changes you have made in your current house or apartment.

29a. OWNERS: Which, if any, of the jobs on the lists below have you done or had someone do in the past 5 years (you moved in, if that was less than 5 years ago)? (DO NOT COUNT JOBS DONE ON PROPERTY YOU RENT TO O (INCLUDE JOBS DONE FOR YOU OR BY YOU BEFORE YOU MOVED IN.) (INCLUDE JOBS NOW UNDERWAY AND SCHEDULED FOR CO WITHIN THE NEXT FEW MONTHS.) (PLEASE ANSWER UNDER Q.29a BELOW.)

RENTERS: Which, if any, of the jobs on the lists below have you or your landlord done or had someone do in 5 years (or since you moved in, if that was less than 5 years ago)? (INCLUDE JOBS DONE FOR YOU OR BY YOU BE MOVED IN.) (INCLUDE JOBS NOW UNDERWAY AND SCHEDULED FOR COMPLETION WITHIN THE NEXT FEW MONTHS.) (PLEASE ANS UNDER Q.29a BELOW.)

29b. OWNERS: Which, if any, of the jobs on the lists below have you done or had someone do in the past year (you moved in, if that was less than 1 year ago)? (DO NOT COUNT JOBS DONE ON PROPERTY YOU RENT TO OTHERS.) JOBS DONE FOR YOU OR BY YOU BEFORE YOU MOVED IN.) (INCLUDE JOBS NOW UNDERWAY AND SCHEDULED FOR COMPLETIO THE NEXT FEW MONTHS.) (PLEASE ANSWER UNDER Q.29b BELOW.)

RENTERS: Which, if any, of the jobs on the lists below have you or your landlord done or had someone do in year (or since you moved in, if that was less than 1 year ago)? (INCLUDE JOBS DONE FOR YOU OR BY YOU BE MOVED IN.) (INCLUDE JOBS NOW UNDERWAY AND SCHEDULED FOR COMPLETION WITHIN THE NEXT FEW MONTHS.) (PLEASE ANS UNDER Q.29b BELOW.)

29c. OWNERS AND RENTERS: Approximately how much did you spend on the jobs you did or had someone do in the past since you moved in, if that was less than 1 year ago)? (REFER TO ANSWERS GIVEN IN Q.29b.) (INCLUDE COST OF AND MONEY PAID TO CONTRACTORS OR OTHERS.) (PLEASE ANSWER UNDER Q.29c BELOW.)

29d. OWNERS AND RENTERS: Thinking of all the jobs that were done in each category in the past year (REFER TO GIVEN IN Q.29b), how much of this work did you or a member of your household do -- most or all of it, about little or none of it? (PLEASE ANSWER UNDER Q.29d BELOW.)

	Q.29a Done in Last 5 Years	Q.29b Done in Last 1 Year	Q.29c Approximate Cost to You or Your Household for Work Done in Past Year	Q.29d Amount of Work Done by Household Member(s) Most or All	About Half	Little or None
A. MAJOR ADDITIONS						
Build a garage	1	1	$_____	3	2	1
Add porch or breezeway	1	1	$_____	3	2	1
Add new room or wing	1	1	$_____	3	2	1
B. MAJOR REMODELING						
Remove a wall to make one room out of two	1	1	$_____	3	2	1
Move walls to change floor plan	1	1	$_____	3	2	1
Remodel a kitchen	1	1	$_____	3	2	1
Remodel bathroom(s)	1	1	$_____	3	2	1
Remodel other room(s)	1	1	$_____	3	2	1
Convert garage to living space	1	1	$_____	3	2	1
Finish a basement room(s)	1	1	$_____	3	2	1
Finish an attic room(s)	1	1	$_____	3	2	1
ASIDE FROM JOBS REPORTED ABOVE, WHICH OF THE FOLLOWING HAVE YOU DONE?						
C. REPLACE OR REPAIR OUTSIDE OF DWELLING						
Replace all or part of roof	1	1	$_____	3	2	1
Add, replace or repair siding	1	1	$_____	3	2	1
Painting or staining exterior walls	1	1	$_____	3	2	1
Repairing exterior walls	1	1	$_____	3	2	1
Repairing chimney	1	1	$_____	3	2	1
Repairing or replacing porches, balconies, or decks	1	1	$_____	3	2	1
Replace windows (except storm windows)	1	1	$_____	3	2	1
Add or replace storm windows	1	1	$_____	3	2	1
Replace house entrance doors	1	1	$_____	3	2	1
Caulk or weatherstrip	1	1	$_____	3	2	1
D. REPLACE OR REPAIR UTILITIES						
Replace furnace, heating system	1	1	$_____	3	2	1
Replace central air conditioning	1	1	$_____	3	2	1
Replace water heater	1	1	$_____	3	2	1
Replace or upgrade electrical wiring	1	1	$_____	3	2	1
Replace or upgrade plumbing	1	1	$_____	3	2	1
E. REPLACE OR REPAIR INSIDE						
Panel interior walls	1	1	$_____	3	2	1
Paint interior walls	1	1	$_____	3	2	1
Paper interior walls	1	1	$_____	3	2	1
Other resurfacing of interior walls	1	1	$_____	3	2	1
Repair or replace flooring:						
Ceramic tile	1	1	$_____	3	2	1
Wood	1	1	$_____	3	2	1
Carpeting	1	1	$_____	3	2	1
Vinyl	1	1	$_____	3	2	1
Other flooring	1	1	$_____	3	2	1
Add insulation	1	1	$_____	3	2	1
F. ADD OR REPAIR AMENITIES OF LOT						
Repair, resurface or reseal driveway	1	1	$_____	3	2	1
Add, repair or resurface walks	1	1	$_____	3	2	1
Add or replace fence	1	1	$_____	3	2	1
Plant trees or shrubs	1	1	$_____	3	2	1
Seed or lay sod on entire lawn	1	1	$_____	3	2	1
Build or install new storage building	1	1	$_____	3	2	1
Add or replace patio	1	1	$_____	3	2	1
Other (SPECIFY) _____	1	1	$_____	3	2	1

30. Now think about all the jobs that have been done in each "category" labeled i Q.29 and also listed below. For each category:

30a. OWNERS AND RENTERS: Which, if any, of these types of jobs do you need to do c have done to your dwelling unit? (PLEASE CIRCLE AS MANY AS APPLY UNDER Q.3C BELOW.)

30b. OWNERS ONLY: Which of these do you plan to do or have someone do in the nex year or two? (PLEASE CIRCLE AS MANY AS APPLY UNDER Q.30b BELOW.)

30c. OWNERS ONLY: Which of these do you plan to have someone do over the next years, but not in the next year or two? (PLEASE CIRCLE AS MANY AS APPLY UNDE Q.30c BELOW.)

	Q.30a Need to do	Q.30b Will be done in next: 2 Years	Q.30c 5 Years
A. Major Additions	1	1	1
B. Major Remodeling	1	1	1
C. Replacing/Repairing Outside of Dwelling	1	1	1
D. Replacing/Repairing Utilities.	1	1	1
E. Replacing/Repairing Inside ...	1	1	1
F. Add/Repair Amenities of Lot ..	1	1	1

SATISFACTION WITH HOME OR APARTMENT

31. How satisfied are you with the particular aspects of your housing listed belo (CIRCLE ANY NUMBER FROM "1" TO "5", WHERE "1" IS EXTREMELY SATISFIED AND "5" I EXTREMELY DISSATISFIED FOR EACH ASPECT.)

	Extremely Satisfied				Extremely Dissatisfi
A) Overall, how satisfied are you with your house or apartment	1	2	3	4	5
How satisfied are you with ...					
... cost to live here	1	2	3	4	5
... quality of unit	1	2	3	4	5
... safety from burglars	1	2	3	4	5
B) How satisfied are you with the following aspects of the inside of your house or apartment:					
Age	1	2	3	4	5
Overall condition	1	2	3	4	5
Number of rooms	1	2	3	4	5
Amount of inside space	1	2	3	4	5
Layout (use) of inside space	1	2	3	4	5
Size of kitchen	1	2	3	4	5
Size of main bedroom	1	2	3	4	5
Size of main bathroom	1	2	3	4	5
Amount of privacy	1	2	3	4	5
OWNERS ONLY: Amount of maintenance needed	1	2	3	4	5
C) The exterior of your house or apartment:					
Condition	1	2	3	4	5
OWNERS ONLY: Amount of maintenance needed	1	2	3	4	5
D) The yard or open space around your house or apartment:					
Condition	1	2	3	4	5
Amount of space	1	2	3	4	5
Layout o 242ce	1	2	3	4	5
Amount of privacy	1	2	3	4	5
Safety from crime	1	2	3	4	5
OWNERS ONLY: amount of maintenance needed	1	2	3	4	5

NEIGHBORHOOD

32. How long have you lived in this neighborhood? _____ YEARS

33. Is your neighborhood ...

Predominantly residential 1
Mixed residential and commercial/industrial 2
Mixed residential and agricultural 3
Predominantly commercial/industrial 4
OR, Predominantly agricultural 5

34a. Are most of the dwelling units in your neighborhood ... ? (PLEASE CIRCLE ONE ANSWER ONLY UNDER Q.34a BELOW)

34b. What other types of dwelling units are there in your neighborhood? (PLEASE CIRCLE AS MANY AS APPLY UNDER Q.34b BELOW.)

	Q.34a Most Units	Q.34b Other Units
One-family houses detached from other houses	1	1
Units in multi-family buildings	2	1
Mobile homes	3	1

35. How does your dwelling unit compare with other dwelling units near yours ...

In Terms Of:	My Dwelling Unit Is:		
Age	Newer 1	Same 2	Older 3
Overall Condition	Better 1	Same 2	Worse 3
Quality	Higher 1	Same 2	Lower 3
Amount Of Outside Space	Larger 1	Same 2	Smaller 3
Amount Of Inside Space.	Larger 1	Same 2	Smaller 3
Value	Worth more ... 1	Same 2	Worth less ... 3

36. How satisfied are you with the following aspects of your neighborhood?

	Very Satisfied				Very Dissatisfied
A) Overall, how satisfied are you with your neighborhood					
... as a place to live	1	2	3	4	5
... as a place to raise children....	1	2	3	4	5
B) How satisfied are you with:					
Public schools	1	2	3	4	5
Police and fire protection	1	2	3	4	5
Public transportation	1	2	3	4	5
Other city services	1	2	3	4	5
Accessibility to shopping	1	2	3	4	5
Ease of getting to work	1	2	3	4	5
Friendliness of neighbors	1	2	3	4	5
Attractiveness of neighborhood	1	2	3	4	5
Upkeep of other property	1	2	3	4	5
Safety from crime	1	2	3	4	5
Prestige of neighborhood	1	2	3	4	5
Property taxes	1	2	3	4	5
Sales or income tax	1	2	3	4	5

CHANGES IN YOUR HOUSEHOLD WHILE IN CURRENT DWELLING

37a. Including yourself, how many people lived in your household when you first moved into this house or apartment?

TOTAL NUMBER OF PEOPLE: _____

37b. How many, at that time, were ...

0 to 5 years ..... # _____
6 to 18 years ..... # _____
19 to 34 years ..... # _____
35 to 64 years ..... # _____
65 and over ..... # _____
(BE SURE TO INCLUDE YOURSELF)

38. As far as you can recall, what was your total household income before taxes when you first moved into this house or apartment?

Less than $6,000 1	$17,500 - $19,999 6	$50,000 - $69,999 11
$6,000 - $9,999 2	$20,000 - $24,999 7	$70,000 - $89,999 12
$10,000 - $11,999 3	$25,000 - $29,999 8	$90,000 - $119,999 13
$12,000 - $14,999 4	$30,000 - $39,999 9	$120,000 or more 14
$15,000 - $17,499 5	$40,000 - $49,999 10	

39. Since the time you first moved into this house or apartment, do you feel your household is now ...

Much better off financially 1
Somewhat better off financially 2
About as well off financially 3
Somewhat worse off financially 4
Or, Much worse off financially 5

YOUR RESIDENCE IN SEPTEMBER, 1983

40a. Is the dwelling unit you occupied in September, 1983 the one that is ...

Your current dwelling unit ..... 1 → PLEASE SKIP TO Q.45a
Or, A different dwelling unit ..... 2 → CONTINUE

40b. What is the full address of the dwelling unit you occupied in September, 1983?

Number, Street: _____

City, State: _____

Zip Code: _____

40c. Was the September, 1983, dwelling unit ...

Your parents' household ..... 1 → PLEASE SKIP TO Q.48a
Owned by you or someone else in your household 2
Rented for cash 3
Occupied without payment of cash rent 4

40d. Please circle the number which best describes the building in which you lived.

One family house, detached from any other house ... 1
One family house, attached to one or more other houses 2
A building for:
2 to 4 families 3
5 or more families 4
Mobile home 5
Boat, van, etc. 6
Dormitory, barracks or other group quarters ..... 7 → PLEASE SKIP TO Q.48a

YOUR RESIDENCE IN SEPTEMBER, 1983 (CONT'D.)

41a. Was the dwelling unit you occupied in September, 1983 ...

Part of a cooperative (property owned as a corporation where each sharehold occupies an individual unit 1
Part of a condominium 2
Or, Neither 3

41b. When was the structure you lived in built? (IF NOT SURE, MAKE YOUR BEST ESTIMATE.) (INDICATE WHEN THE BUILDING WAS FIRST CONSTRUCTED, NOT WHEN IT WAS REMODELLED, ADDED TO, OR CONVERTED.)

(WRITE IN YEAR): _____

41c. What month and year did you move into your September, 1983 residence?

MONTH: _____ YEAR: _____

41d. Approximately how many miles from the downtown or central business area of the largest city within 50 miles was this residence located?

MILES: _____

41e. How many square feet of living space did your household have in this September, 1983 dwelling unit? (DO NOT COUNT UNFINISHED PORTIONS OF BASEMENT OR ATTIC.) (IF NOT SURE, PLEASE MAKE YOUR BEST ESTIMATE.)

_____ SQUARE FEET

41f. How many rooms were there in this residence? (DO NOT COUNT BATHROOMS, PORCHES, BALCONIES, HALLS, FOYERS OR HALF ROOMS.)

NUMBER OF ROOMS: _____

41g. How large was the parcel of land your September, 1983 building was on? (IF NOT SURE, GIVE YOUR BEST ESTIMATE.) For condominiums, cooperatives, multi-family buildings and mobile homes, this parcel includes the land your family used exclusively and the land you shared with the other residents. (IF THIS PARCEL OF LAND WAS THE SAME SIZE AS THE BUILDING YOU LIVED IN PLEASE "X" THIS BOX [ ] AND SKIP TO Q.42.)

_____ ACRES - OR - _____ SQUARE FEET

IF YOU DO NOT KNOW THE EXACT NUMBER OF SQUARE FEET, MULTIPLY APPROXIMATE WIDTH OF LOT BY APPROXIMATE LOT DEPTH (WIDTH _____ X DEPTH _____ = ANSWER _____)

42. OWNERS OF SEPTEMBER, 1983 DWELLING UNIT: If you had sold your September, 1983 house or apartment and lot in September, 1983, what do you think it would have sold for? (PLEASE GIVE YOUR BEST ESTIMATE.)

$_____ → PLEASE SKIP TO Q.44

43a. RENTERS OF SEPTEMBER, 1983 DWELLING UNIT: How much did it cost you each month to rent your September, 1983 dwelling unit? (PLEASE WRITE IN EXACT AMOUNT.)

$ _____ a month

43b. RENTERS OF SEPTEMBER, 1983 DWELLING UNIT: Did this include ...
(PLEASE CIRCLE ALL THAT APPLY.)

Heating.....1 Water.....4
Electricity.....2 Parking.....5
Gas or Fuel.....3 Other_____6
(Please Specify)

44. Were most of the dwelling units in your September, 1983 neighborhood...
(PLEASE CIRCLE ONE ANSWER ONLY)

245 One-family houses detached from other houses 1
Units in multi-family buildings 2
OR, Mobile homes 3

CHANGES IN YOUR HOUSEHOLD SINCE SEPTEMBER, 1983

45a. Including yourself, how many people lived in your household in September, 1983?

TOTAL NUMBER OF PEOPLE:_____

46b. How many, at that time, were:

0 to 5 years.....#_____
6 to 18 years.....#_____
19 to 34 years.....#_____
35 to 64 years.....#_____
65 and over.....#_____
(BE SURE TO INCLUDE YOURSELF)

46. As far as you can recall, what was your total household income before taxes in September, 1983?

Less than $6,000 1	$17,500 - $19,999 6	$50,000 - $69,999 11
$6,000 - $9,999 2	$20,000 - $24,999 7	$70,000 - $89,999 12
$10,000 - $11,999 3	$25,000 - $29,999 8	$90,000 - $119,999 13
$12,000 - $14,999 4	$30,000 - $39,999 9	$120,000 or more 14
$15,000 - $17,499 5	$40,000 - $49,999 10	

47. Compared to September, 1983, do you feel your household is now ...

Much better off financially.....1
Somewhat better off financially.....2
About as well off financially.....3
Somewhat worse off financially.....4
Or, Much worse off financially.....5

YOUR RESIDENCE IN SEPTEMBER, 1978

48a. Is the dwelling unit you occupied in September, 1978 the one that is ...

Your current dwelling unit.....1
Your September, 1983 dwelling unit (as described in Q.40a - Q.44).....2 → PLEASE SKIP TO Q.55a
Or, A different dwelling unit.....3

48b. What is the full address of the dwelling unit you occupied in September, 1978?

Number, Street:_____
City, State:_____
Zip Code:_____

49. How long did you live in this dwelling unit?

MONTHS:_____(IF LESS THAN ONE YEAR) [- OR -] YEARS:_____

50. Was the September, 1978 dwelling unit ...

Your parents' household.....1 → PLEASE SKIP TO Q. 5
Owned by you or someone else in your household..2
Rented for cash.....3
OR, Occupied without payment of cash rent.....4

51. Please circle the number which best describes the building in which you lived in September, 1978.

One family house, detached from any other house.....1
One family house, attached to one or more other houses...2
A building for:
2 to 4 families.....3
5 or more families.....4
Mobile home.....5
Boat, van, etc.....6
Dormitory, barracks or other group quarters.....7→PLEASE SKIP TO Q.57

52. Was this dwelling unit ...

Part of a cooperative (property owned as a corporation where each shareholder occupies an individual unit.....1
Part of a condominium.....2
OR, Neither.....3

53. Approximately how many miles from the downtown or central business area of the largest city within 50 miles was your September, 1978 residence located?

Miles:_____

54a. How many square feet of living space did your household have in this dwelling unit? (DO NOT COUNT UNFINISHED PORTIONS OF BASEMENT OR ATTIC.) (IF NOT SURE, PLEASE GIVE YOUR BEST ESTIMATE.)

_____SQUARE FEET

54b. How many rooms were there in your September, 1978 dwelling unit? (DO NOT COUNT BATHROOMS, PORCHES, BALCONIES, HALLS, FOYERS, OR HALF ROOMS)

NUMBER OF ROOMS: _____

CHANGES IN YOUR HOUSEHOLD SINCE SEPTEMBER, 1978

55a. Including yourself, how many people lived in your household in September, 1978?

TOTAL NUMBER OF PEOPLE:_____

55b. How many, at that time, were:

0 to 5 years.....#_____
6 to 18 years.....#_____
19 to 34 years.....#_____
35 to 64 years.....#_____
65 and over.....#_____
(BE SURE TO INCLUDE YOURSELF)

56a. As far as you can recall, what was your total household income before taxes in September, 1978?

Less than $6,000 1	$17,500 - $19,999 6	$50,000 - $69,999 11
$6,000 - $9,999 2	$20,000 - $24,999 7	$70,000 - $89,999 12
$10,000 - $11,999 3	$25,000 - $29,999 8	$90,000 - $119,999 13
$12,000 - $14,999 4	$30,000 - $39,999 9	$120,000 or more 14
$15,000 - $17,499 5	$40,000 - $49,999 10	

56b. Compared to September, 1978, do you feel your household is now ...

Much better off financially.....1
Somewhat better off financially.....2
About as well off financially.....3
Somewhat worse off financially.....4
Or, Much worse off financially.....5

HOME AND HOUSEHOLD CARE IN THE PAST

The following questions about home and household care in the past refer to whatever dwelling or dwellings you lived in during each time period indicated below.

57. For each of the three time periods 1970-78, 1979-83, and 1984-86, which of the following changes or uses of your dwelling occurred? (PLEASE CIRCLE ALL THAT APPLY FOR EACH GIVEN TIME PERIOD BELOW.)

	1970-1978	1979-1983	1984-1986
Altered or changed the structure of dwelling to make it more convenient (such as adding 1st floor bathroom)...	1	1	1
Altered use of a room to make it more convenient, without changing the structure (such as making a 1st floor den into a bedroom).....	1	1	1
Closed off a room or part of the dwelling unit for all or part of the year.....	1	1	1
Took on boarders or rented out part of the dwelling unit.....	1	1	1

58a. For each of the years 1970, 1978, 1983, and 1986, which of the groups of people listed below helped with upkeep of the interior of your dwelling unit (ie: cleaning, maintenance)? (PLEASE CIRCLE ALL THAT APPLY FOR EACH YEAR.)

	1970	1978	1983	1986
Your household.....	1	1	1	1
Relative/friends.....	1	1	1	1
Paid help.....	1	1	1	1
Social programs (free).....	1	1	1	1

58b. For each of the years 1970, 1978, 1983, and 1986, which of the groups of people listed below helped with the outside of your dwelling (ie: lawn care, yard work)? (PLEASE CIRCLE ALL THAT APPLY FOR EACH YEAR.)

	1970	1978	1983	1986
Your household.....	1	1	1	1
Relative/friends.....	1	1	1	1
Paid help.....	1	1	1	1
Social programs (free).....	1	1	1	1

59a. For each of the years 1970, 1978, 1983, and 1986, which of the groups of people listed below helped with the preparation of meals (including buying and bringing food home)? (PLEASE CIRCLE ALL THAT APPLY FOR EACH YEAR.)

	1970	1978	1983	1986
Your household.....	1	1	1	1
Relative/friends.....	1	1	1	1
Paid help.....	1	1	1	1
Social programs (free).....	1	1	1	1

59b. For each of the years 1970, 1978, 1983, and 1986, which of the groups of people listed below helped with health care of household (ie: taking care of ill, disabled household member)? (PLEASE CIRCLE ALL THAT APPLY FOR EACH YEAR.)

	1970	1978	1983	1986
Your household.....	1	1	1	1
Relative/friends.....	1	1	1	1
Paid help.....	1	1	1	1
Social programs (free).....	1	1	1	1

SECOND HOME

60a. Do you own a second, vacation, or retirement home?

Yes ..... 1 No ..... 0 ⟶ PLEASE SKIP TO Q. 61a

60b. How many square feet of living space does this dwelling have? (DO NOT COUNT UNFINISHED PORTIONS OF BASEMENT OR ATTIC.) (IF NOT SURE, PLEASE GIVE YOUR BEST ESTIMATE.)

_____ SQUARE FEET

60c. What is the current market value of this home? (IF NOT SURE, PLEASE GIVE YOUR BEST ESTIMATE)

$ _____

61a. Are you considering buying a second home?

Yes ..... 1 No ..... 0 ⟶ PLEASE SKIP TO Q. 62a

61b. How large will your second home be?

Less than 1000 square feet 1
1000 to 1500 square feet 2
OR, More than 1500 square feet 3

61c. How much are you willing to pay for your second home?

Less than $10,000 1
$10,000 to $25,000 2
$25,000 to $50,000 3
OR, More than $50,000 4

61d. Will your second home ... (PLEASE CIRCLE ONE ANSWER ONLY.)

Be used for vacations only 1
Be used for vacation now and as a permanent home after retirement 2
Be used as rental property 3
OR, Be used for another purpose _____ 4
(Please Specify)

HOUSEHOLD CHARACTERISTICS

62a. What was your marital status in 1978 and in 1983? (PLEASE CIRCLE ONE ANSWER ONLY FOR EACH YEAR UNDER Q. 62a BELOW.)

62b. What is your current marital status? (PLEASE CIRCLE ONE ANSWER ONLY UNDER Q. 62b BELOW.)

	Q. 62a		Q. 62b
	1978	1983	Current Marital Status
Single, never married	1	1	1
Married	2	2	2
Living with someone, but not married	3	3	3
Widowed	4	4	4
Divorced	5	5	5
OR, Separated	6	6	6

63. WOMEN ONLY: At the beginning of each of the years 1978, 1983, 1986, how many children had you given birth to by that time?

1978: _____ 1983: _____ 1986: _____

64. On the chart below, please list all the people who live in your household now and their ages. Begin with yourself. List other household members from oldest to youngest , providing the age for each. DO NOT GIVE THEIR NAMES. PLEASE LIST THEM BY THEIR RELATIONSHIP TO YOU.

Relationship to you	Age	Relationship to you	Age
1. RESPONDENT (SELF)	_____	5. _____	_____
2. _____	_____	6. _____	_____
3. _____	_____	7. _____	_____
4. _____	_____	8. _____	_____

65a. Where did you live when you were fourteen years old? (PLEASE WRITE-IN ANSWER UNDER Q. 65a BELOW.)

65b. MARRIED ONLY: Where did your spouse live when he/she was fourteen years old? (PLEASE WRITE-IN ANSWER UNDER Q. 65b BELOW.)

	Q.65a Respondent		Q.65b Spouse
Zip Code:	_____	Zip Code:	_____
City or Town:	_____	City or Town:	_____
County:	_____	County:	_____
State:	_____	State:	_____

65c. Which of the phrases listed below best describes where you lived the longest while you were growing up? (PLEASE ANSWER UNDER Q.65c BELOW.)

65d. MARRIED ONLY: Which of the phrases listed below best describes where your spouse lived the longest while he/she was growing up? (PLEASE ANSWER UNDER Q.65d BELOW.)

	Q.65c Respondent	Q.65d Spouse
Large urban area	1	1
Small urban area	2	2
Small town	3	3
Rural town	4	4

66a. How many times have you moved since the beginning of 1978?

TIMES MOVED: _____

66b. For each year listed below, please write the number of times you moved that year.

1978: _____ 1981: _____ 1984: _____
1979: _____ 1982: _____ 1985: _____
1980: _____ 1983: _____

67a. What was your total household income last year (1985) from all sources--wages, dividends, social security, and so forth--before taxes?

Less than $6,000 1	$17,500 - $19,999 6	$50,000 - $69,999 11
$6,000 - $9,999 2	$20,000 - $24,999 7	$70,000 - $89,999 12
$10,000 - $11,999 3	$25,000 - $29,999 8	$90,000 - $119,999 13
$12,000 - $14,999 4	$30,000 - $39,999 9	$120,000 or more 14
$15,000 - $17,499 5	$40,000 - $49,999 10	

67b. Excluding any equity you may have in your current residence, what is the current value of your assets? (INCLUDE VALUE OF STOCKS, BONDS, SAVINGS ACCOUNTS, PROPERTY, FURNISHINGS, CARS, ETC.)

Less than $5,000 1	$50,000 to $99,000 5
$5,000 to $9,999 2	$100,000 to $249,999 6
$10,000 to $24,999 3	$250,000 or more 7
$25,000 to $49,999 4	

67c. Compared to November 1984, is your household now . . .

Much better off financially.....1
Somewhat better off financially.....2
About as well off financially.....3
Somewhat worse off financially.....4
Or, Much worse off financially.....5

68. During each year since 1978, which of the following changes did your household experience? (PLEASE CIRCLE ALL THAT APPLY UNDER EACH YEAR.)

	1978	1979	1980	1981	1982	1983	1984	1985	1986
You started new job	1	1	1	1	1	1	1	1	1
Spouse started new job	1	1	1	1	1	1	1	1	1
You retired.....	1	1	1	1	1	1	1	1	1
Spouse retired.....	1	1	1	1	1	1	1	1	1
Spouse or companion died.....	1	1	1	1	1	1	1	1	1
Spouse or companion left household (divorced, separated, broke-up)	1	1	1	1	1	1	1	1	1
New spouse or companion moved in (marriage, new relationship).....	1	1	1	1	1	1	1	1	1
Other person moved in	1	1	1	1	1	1	1	1	1

69. For each of the years 1970, 1978, 1983, and 1986, was anyone in your household (INCLUDING YOURSELF) unable to care for himself/herself because of serious illness, disability or handicap? (PLEASE CIRCLE ALL YEARS THAT APPLY.)

1970	1978	1983	1986
1	1	1	1

70. For each of the three time periods 1970-78, 1979-83, and 1984-86, which of the following types of people ceased living in dwellings fairly close to you because they moved away or died? (CIRCLE ALL THAT APPLY FOR EACH TIME PERIOD.)

	1970-1978	1979-1983	1984-1986
Relatives	1	1	1
Close friends	1	1	1
Neighbors you had grown attached to	1	1	1

71a. During each year since 1978, what phrase below describes your employment status best? (PLEASE CIRCLE ONE EMPLOYMENT STATUS ONLY FOR EACH YEAR UNDER Q.71a BELOW. IF MORE THAN ONE STATUS APPLIES, CIRCLE THE ONE HELD FOR THE LONGEST PERIOD DURING THAT YEAR.)

71b. What is your current employment status? (CIRCLE ONE EMPLOYMENT STATUS ONLY UNDER Q. 71b BELOW.)

	Q. 71a								Q. 71b
	1978	1979	1980	1981	1982	1983	1984	1985	Current Status
Working for someone else . full-time	1	1	1	1	1	1	1	1	1
Temporarily unemployed	2	2	2	2	2	2	2	2	2
Self-employed.....	3	3	3	3	3	3	3	3	3
Working for someone else part-time only.....	4	4	4	4	4	4	4	4	4
Retired and not employed...	5	5	5	5	5	5	5	5	5
Disabled, student, etc., and not employed.....	6	6	6	6	6	6	6	6	6
Or, Full-time homemaker.....	7	7	7	7	7	7	7	7	7

72a. MARRIED ONLY: During each year since 1978, what describes your spouse's employment status best? (PLEASE CIRCLE ONE EMPLOYMENT STATUS ONLY FOR EACH YEAR UNDER Q. 72a BELOW. IF MORE THAN ONE STATUS APPLIES, CIRCLE THE ONE HELD FOR THE LONGEST PERIOD DURING THAT YEAR.) (ANSWER ONLY FOR YEARS IN WHICH YOU WERE MARRIED.)

72b. MARRIED ONLY: What is your spouse's current employment status? (PLEASE CIRCLE ONE EMPLOYMENT STATUS ONLY UNDER Q.72b BELOW.)

	Q. 72a								Q. 72b
	1978	1979	1980	1981	1982	1983	1984	1985	Current Status
Working for someone else . full-time	1	1	1	1	1	1	1	1	1
Temporarily unemployed	2	2	2	2	2	2	2	2	2
Self-employed.....	3	3	3	3	3	3	3	3	3
Working for someone else part-time only.....	4	4	4	4	4	4	4	4	4
Retired and not employed...	5	5	5	5	5	5	5	5	5
Disabled, student, etc., and not employed.....	6	6	6	6	6	6	6	6	6
Or, Full-time homemaker.....	7	7	7	7	7	7	7	7	7

73a. For which years since 1978, if any, did you experience more than 4 weeks of temporary unemployment? (PLEASE ANSWER UNDER Q.73a BELOW.)

73b. MARRIED ONLY: For which years since 1978, if any, did your spouse experience more than 4 weeks of temporary unemployment? (PLEASE ANSWER UNDER Q. 73b BELOW.) (ANSWER ONLY FOR YEARS IN WHICH YOU WERE MARRIED.)

	1978	1979	1980	1981	1982	1983	1984	1985	1986
Q.73a: Self Unemployment....	1	1	1	1	1	1	1	1	1
Q.73b: Spouse's Unemployment	1	1	1	1	1	1	1	1	1

74a. This question is about your current job, and jobs you held in 1978 and 1983. For each of these jobs, please provide the requested information. (IF YOU HAD MORE THAN ONE JOB DURING A YEAR, PROVIDE INFORMATION FOR THE ONE HELD THE LONGEST DURING THAT YEAR.) (IF YOU HAD THE SAME JOB FOR 2 OR ALL 3 OF THESE YEARS, ONLY PROVIDE ANSWERS TO "MILES FROM HOME" FOR PREVIOUS YEAR OR YEARS.) (IF YOU WERE NOT EMPLOYED FOR ANY YEAR, LEAVE SPACES FOR THAT YEAR BLANK.) (PLEASE ANSWER UNDER Q.74a BELOW.)

74b. MARRIED ONLY: This question is about your spouse's job, and his or her jobs in 1978 and 1983. For each of these jobs, please provide the requested information. (ANSWER ONLY FOR YEARS IN WHICH YOU AND YOUR SPOUSE WERE MARRIED.) (IF YOUR SPOUSE HAD THE SAME JOB FOR 2 OR ALL 3 OF THESE YEARS, ONLY PROVIDE ANSWERS TO "MILES FROM HOME" FOR PREVIOUS YEAR OR YEARS.) (IF YOUR SPOUSE WAS NOT EMPLOYED FOR ANY YEAR, LEAVE SPACES FOR THAT YEAR BLANK.) (PLEASE ANSWER UNDER Q. 74b BELOW.)

	Q. 74a Respondent's Employment History	Q. 74b Spouse's Employment History
A. CURRENT JOB		
Year began	_____	_____
Miles from home.....	_____	_____
Is this job ...(CIRCLE ONE ANSWER BELOW:)		
• In the largest city or town within 50 miles from your home.....	1	1
• In a city next to/very close to this largest city (but not a suburb).....	2	2
• In a suburb of this largest city.....	3	3
• In another city or town	4	4
• In a rural area.....	5	5
B. 1983 JOB		
Year began.....	_____	_____
Miles from 1983 home (ANSWER EVEN IF 1983 JOB WAS SAME AS CURRENT JOB).....	_____	_____
Was this job ... (CIRCLE ONE ANSWER BELOW:)		
• In the largest city or town within 50 miles from your 1983 home.....	1	1
• In a city next to/very close to this largest city (but not a suburb).....	2	2
• In a suburb of this largest city.....	3	3
• In another city or town	4	4
• In a rural area.....	5	5
C. 1978 JOB		
Miles from 1978 home (ANSWER EVEN IF 1978 JOB WAS SAME AS 1983 JOB).....	_____	_____
Was this job ... (CIRCLE ONE ANSWER BELOW:)		
• In the largest city or town within 50 miles from your 1978 home.....	1	1
• In a city next to/very close to this largest city (but not a suburb).....	2	2
• In a suburb of this largest city.....253..	3	3
• In another city or town	4	4
• In a rural area.....	5	5

THOUGHTS ABOUT MOVING OVER THE PAST YEAR

75. During the past year have you done any of the following...? (PLEASE CIRCLE AS MANY AS APPLY BELOW.)

	Yes
Look at advertisements for houses or apartments	1
Call a real estate agent	1
Visit a model unit or go to an open house	1
Look at any houses or apartments for sale or rent	1
Talk to a builder or architect about a new home	1
Visit a mobile home show room	1
Make an offer to purchase or rent	1
Make an application for mortgage financing	1
OWNERS ONLY: Did you .....?	
... have your current home appraised in anticipation of selling.	1
... list your house or apartment with a broker	1
... advertise your house for sale in a newspaper	1

76. How many dwelling units have you looked at the inside of, during the past year?

LOOKED AT _____ UNITS INSIDE ⟶ PLEASE ANSWER Q. 77
(Write in #)
NONE.....0 ⟶ PLEASE SKIP TO Q. 80

77. During the past year did you look at the inside of ...

Units to rent and units to purchase..... 1
Units to rent only..... 1
Units to purchase only..... 1

78. What types of units did you look at the inside of, during the past year? (PLEASE CIRCLE AS MANY AS APPLY.)

	LOOKED AT INSIDE
One-family house detached from other houses	1
Condominium	1
Unit in small multi-family building (2-4 units)	1
Unit in large multi-family building (5 or more units)	1
Mobile home	1

79. What was the farthest distance from your dwelling that you looked at the inside of a unit during the past year?

_____ MILES

80. IF YOU CONSIDERED UNITS TO RENT: Why were you considering renting rather than buying? (PLEASE CIRCLE AS MANY AS APPLY BELOW)

Did not have money for down payment 1	Did not want responsibility for maintaining home 1
Interest rates too high 1	Not sure how long I (we) could live in area 1
Could not find suitable mortgage terms 1	Did not see kind of home I (we) wanted 1
Could not qualify for mortgage 1	Good, affordable rental housing was available 1
Could not afford closing costs 1	Could not find home in area in which I (we) wanted to live 1
Did not want long-term debt .. 1	Other _____ (PLEASE SPECIFY) .. 1
Did not have enough money for maintenance costs and mortgage payments 1	

81. IF YOU CONSIDERED UNITS TO PURCHASE: Why were you considering buying rather than renting? (PLEASE CIRCLE AS MANY AS APPLY BELOW)

Wanted to own property for investment purposes. 1	Found very attractive residence for sale 1
Wanted to own property for tax reasons..... 1	Worried about rents going up. 1
Wanted to settle down, have roots..... 1	Wanted to own my own house, didn't want to pay someone rent 1
Worried about house prices going up, making it difficult to buy later..... 1	Wanted to accumulate equity for possible use during retirement..... 1
Found good, affordable mortgage plan..... 1	Other _____ (PLEASE SPECIFY) . 1
Did not want to be dependent on landlord..... 1	

MOVING

82. Have you moved since November 1984?

Yes .....1 ⟶ PLEASE ANSWER Q. 83
No.....2 ⟶ PLEASE SKIP TO Q. 92

83. How long did you actively look for housing? (HOW LONG WAS IT FROM LOOKING AT THE INSIDE OF A UNIT FOR THE FIRST TIME UNTIL YOU MADE AN OFFER TO PURCHASE OR RENT THIS DWELLING UNIT?)

_____ MONTHS SINCE LOOKED AT INSIDE OF FIRST UNIT.

84a. What were the most important sources of information you used in searching for a home? (PLEASE RANK IN ORDER OF IMPORTANCE BY GIVING A "1" TO THE MOST IMPORTANT, "2" TO THE NEXT MOST IMPORTANT, ETC.) (PUT "0" NEXT TO SOURCES YOU DID NOT USE.)

Real estate agent/Relocation services..____
Newspaper advertisement/Magazines.....____
Knew the seller.....____
Signs.....____
Friends/people at work.....____
Other_____
(PLEASE SPECIFY)

84b. What was the one source which led you to the dwelling unit you finally chose? (PLEASE CIRCLE ONE ANSWER ONLY.)

Real estate agent/Relocation services.. 1
Newspaper advertisement/Magazines..... 2
Knew the seller..... 3
Signs..... 4
Friends/people at work..... 5
Other_____ 6
(PLEASE SPECIFY)

85. How did you obtain the major appliances listed below, if any, for your house or apartment? (PLEASE CIRCLE ONE ANSWER FOR EACH APPLIANCE BELOW.)

	Moved in Appliance from Previous Unit	Bought New Appliance for this Unit	New Appliance Came with this Unit	Used Appliance Came with this Unit	Do not have this Appliance
Refrigerator....	1	2	3	4	5
Stove.....	1	2	3	4	5
Dishwasher.....	1	2	3	4	5
Clothes washer..	1	2	3	4	5
Clothes dryer...	1	2	3	4	5
Freezer.....	1	2	3	4	5
Microwave oven..	1	2	3	4	5

IF OWN CURRENT DWELLING UNIT ANSWER Q.86a-88; OTHERWISE SKIP TO Q.89a

86a. Did you purchase this dwelling unit or inherit it?

Purchase..... 1 Inherit..... 2

86b. When did you or someone in your household purchase or inherit this house or apartment?

MONTH: _____ YEAR: _____

86c. What was the purchase price of your house or apartment? (IF UNSURE PLEASE GIVE BEST ESTIMATE.)

$_____

86d. How much was your down payment? (IF UNSURE, PLEASE GIVE BEST ESTIMATE.)

$_____

87a. What type of financing, if any, do you have on this house or apartment? (PLEASE CIRCLE ONE ANSWER ONLY.) (IF MORE THAN ONE MORTGAGE, PLEASE DESCRIBE FIRST MORTGAGE.)

No mortgage/no financing..... 1 → SKIP TO Q. 89a
Private mortgage..... 2
FHA mortgage..... 3
VA mortgage..... 4
Farmers Home Administration mortgage. 5
Other _____. 6
(PLEASE SPECIFY)

87b. Who holds the mortgage on this house or apartment? (PLEASE CIRCLE ONE ANSWER ONLY.) (IF MORE THAN ONE MORTGAGE, PLEASE DESCRIBE FIRST MORTGAGE.)

Commercial bank.....1
Savings bank.....2
Savings and loan association...3
Mortgage company.....4
Previous owner.....5
Other_____.....6
(PLEASE SPECIFY)

87c. Did you assume the mortgage or mortgages held by the previous owner?

Yes.....1 No.....0

87d. What is the monthly payment on this mortgage or loan?

$_____

87e. How frequently is the interest rate on your mortgage renegotiated or adjusted?

Never, rate is fixed 0
Renegotiated or adjusted every _____ years
(WRITE-IN)

87f. Do you have a mortgage with a reduced interest rate provided by a state or local housing financing agency?

Yes.....1 No.....0

88. If your mortgage interest were not deductible on your income taxes, would you have ... (PLEASE CIRCLE ONE ANSWER FOR EACH STATEMENT BELOW.)

	Definitely Would Have	Probably Would Have	Probably Would Not Have	Definitely Would Not Have
Bought this dwelling unit anyway.....	1	2	3	4
Bought a less expensive dwelling unit.....	1	2	3	4
Rented a unit.....	1	2	3	4

YOUR PREVIOUS DWELLING UNIT

PLEASE ANSWER THE FOLLOWING IF YOU HAVE MOVED SINCE NOVEMBER 1984 ONLY; OTHERWISE SKIP TO Q.92.

89a. How far is your previous dwelling from your current dwelling?

Less than 5 miles..... 1
5 to 25 miles..... 2
25 to 50 miles..... 3
50 to 500 miles..... 4
Over 500 miles..... 5

89b. How does your previous unit compare to your current unit ...

In terms of:	My PREVIOUS dwelling unit was:		
Age	Newer.....1	Same.....2	Older.....3
Overall Condition	Better.....1	Same.....2	Worse.....3
Amount Of Upkeep Needed .	Less.....1	Same.....2	More.....3
Amount Of Inside Space ..	Larger.....1	Same.....2	Smaller....3
Layout (Use) Of Inside Space	Better.....1	Same.....2	Worse.....3
Amount Of Outside Space..	Larger.....1	Same.....2	Smaller....3
Cost To Live In	More.....1	Same.....2	Less.....3
Quality	Higher.....1	Same.....2	Lower.....3
Value	Worth More.1	Same.....2	Worth Less.3

IF LAST DWELLING UNIT WAS IN SAME NEIGHBORHOOD AS CURRENT DWELLING UNIT, SKIP TO QUESTION 90a; OTHERWISE CONTINUE.

89c. How did your last neighborhood compare to your current neighborhood ...

In terms of:	My LAST Neighborhood HAD/WAS:		
Public schools	Better.....1	Same.....2	Worse.....3
Police and fire protection	Better.....1	Same.....2	Worse.....3
Public transportation ...	Better.....1	Same.....2	Worse.....3
Other city services	Better.....1	Same.....2	Worse.....3
Ease of getting to work .	Better.....1	Same.....2	Worse.....3
Attractiveness of neighborhood	More.....1	Same.....2	Less.....3
Upkeep of other property	Better.....1	Same.....2	Worse.....3
Safety from crime	Safer.....1	Same.....2	Less Safe....3
Property taxes	Higher.....1	Same.....2	Lower.....3
Density	Less Crowded.1	Same.....2	More Crowded.3
Place to raise children .	Better.....1	Same.....2	Worse.....3

SELLING YOUR PREVIOUS DWELLING (PREVIOUS OWNERS WHO MOVED SINCE NOVEMBER 1984)

90a. Which of the following did you use in trying to sell your home? (PLEASE CIRCLE AS MANY AS APPLY.)

Real estate agent/Relocation services..	1	Signs.....	1
Employer.....	1	Friends/people at work...	1
Newspaper advertisement/Magazines.....	1	Other_____ (PLEASE SPECIFY)	1
Knew the seller	1		

90b. How much money, if any, did you spend to fix up your dwelling unit in order to sell it? (IF UNSURE, PLEASE GIVE YOUR BEST ESTIMATE.)

Nothing.....0 $_____

90c. IF STILL TRYING TO SELL YOUR DWELLING UNIT: How long has your dwelling unit been on the market?

_____ # days→SKIP TO Q. 92

91a. IF YOU SOLD YOUR PREVIOUS DWELLING UNIT: How long did it take to sell your house after you put it up for sale?

_____ # days

91b. How much did you sell it for?

$ _____

91c. Is this price...

More than you expected..... 1
About what you expected..... 2
OR, Less than you expected..... 3

91d. How much money did you make from the sale of your home after payments to retire mortgages, payment of broker's commission and other expenses of selling your home? (IF UNSURE, PLEASE GIVE YOUR BEST ESTIMATE.)

$ _____

YOUR NEXT RESIDENCE

92. Are you currently in the process of moving or planning to make a move....

In the next year.....	1	In 4 to 5 years.....	5
In 1 to 2 years.....	2	More than 5 years from now	6
In 2 to 3 years.....	3	Don't know.....	7 →SKIP TO Q. 102
In 3 to 4 years.....	4	Have no plans to move..	0 →SKIP TO Q. 102

93a. What type of dwelling unit would you be most likely to move to? (PLEASE CIRCLE ONE ANSWER ONLY UNDER Q.93a BELOW.)

93b. What other types, if any, would you consider? (PLEASE CIRCLE AS MANY AS APPLY UNDER Q.93b BELOW.)

	Q.93a Plan to to move	Q.93b Would also consider
One family house, detached from any other house.....	1	1
One family house, attached to one or more other houses..	2	1
A building for:		
2 to 4 families.....	3	1
5 or more families.....	4	1
Mobile home.....	5	1
Other _____ (PLEASE SPECIFY)	6	1

94a. If you were to move, where would you be most likely to move? (PLEASE CIRCLE ONE ANSWER ONLY UNDER Q.94a BELOW.)

94b. What other options, if any, would you consider? (PLEASE CIRCLE AS MANY AS APPLY UNDER Q.94b BELOW.)

	Q.94a Plan to move to	Q.94b Would also consider
In the neighborhood you live in now....	1	1
Somewhere else in this city/town.....	2	1
In a nearby city or town.....	3	1
Somewhere else in this state.....	4	1
In another state.....	5	1
Outside the U.S.....	6	1

95a. If you were to move, what kind of a place would you be most likely to move to? (PLEASE CIRCLE ONE ANSWER ONLY UNDER Q.95a BELOW.)

95b. What other options, if any, would you consider? (PLEASE CIRCLE AS MANY AS APPLY UNDER Q.95b BELOW.)

	Q.95a Plan to move to	Q.95b Would also consider
The central part of a large city.....	1	1
The outer edges of a large city.....	2	1
A small city.....	3	1
A suburb.....	4	1
A small town.....	5	1
A rural area.....	6	1

The next questions refer to the type of dwelling you think you would most likely move into if you did move.

96. Compared to your current dwelling unit, how would you describe the dwelling unit you would most likely move into?

In terms of:	NEXT dwelling unit would most likely be:		
Age	Newer.....1	Same.....2	Older.....3
Overall condition	Better.....1	Same.....2	Worse.....3
Amount of upkeep needed .	Less.....1	Same.....2	More.....3
Amount of inside space ..	Larger.....1	Same.....2	Smaller....3
Layout (use) of inside space	Better.....1	Same.....2	Worse.....3
Amount of outside space .	Larger.....1	Same.....2	Smaller....3
Cost to live in	More.....1	Same.....2	Less.....3
Quality	Higher.....1	Same.....2	Lower.....3
Value	Worth More.1	Same.....2	Worth Less.3

97. Would you...

buy this unit..... 1
rent this unit for cash..... 2 → PLEASE SKIP TO Q.99
OR, occupy this unit without payment of cash rent.. 3 → PLEASE SKIP TO Q.99

98. Would you buy this unit as a condominium or cooperative?

No..... 0
Yes, part of a cooperative (property owned as a corporation where each share-holder occupies an individual unit).... 1
Yes, part of a condominium development..... 2

99. IF YOU PLAN TO RENT: If you moved today, how much do you think you would have to pay each month for a unit like the one you just described?

$_____ → (PLEASE SKIP TO Q. 101)

100. IF YOU PLAN TO BUY: What would the total purchase price be for a unit like the one you just described?

$_____

101. ALL: Are there units in this price range in or near the community you want to live in?

Yes 1
No 0
Don't know 9

102. As far as you know, over the next 5 years, will the number of people in your family or household

Increase..... 1
Stay the same..... 2
Or, Decrease..... 3

103. As far as you know, which of the following changes will your household experience over the next 5 years? (PLEASE CIRCLE AS MANY AS APPLY.)

	Yes
You will retire/leave labor force	1
Spouse or companion will retire/leave labor force	1
You will enter/re-enter labor force	1
Spouse or companion will enter/re-enter labor force	1

104. Which number, from 1 to 5, best describes how much you agree or disagree with each of the following statements?

	Agree A Lot				Disagree A lot
Owning a home takes a lot of time	1	2	3	4	5
Renting makes sense if you plan to move frequently	1	2	3	4	5
When you buy a home, it is smart to buy the most expensive home you can afford, even if it means temporarily foregoing other expenses	1	2	3	4	5
These days it takes a two-income household to afford a mortgage	1	2	3	4	5
People like me are better off renting than buying	1	2	3	4	5
Owning a home or condominium is a sign of success	1	2	3	4	5
Buying real estate is the best investment someone like me can make today	1	2	3	4	5
The most important thing to consider in buying a home is the quality of local schools	1	2	3	4	5
Homes are not worth what they cost today	1	2	3	4	5
It's important to me to have a yard for the private use of my household	1	2	3	4	5
I enjoy gardening or working in the yard	1	2	3	4	5
It's important to me to have neighbors who are good friends	1	2	3	4	5
I'd prefer to save some of my income for travel, recreation or entertainment rather than spend more on housing	1	2	3	4	5
Owning a home makes sense because of the income tax advantages	1	2	3	4	5

105. In the next two years, what do you think will happen to each of the following in the neighborhood where you now live?

In this area:	Increase A Lot	Increase A Little	Stay the Same	Decrease A Little	Decrease A Lot
The cost of living will	5	4	3	2	1
Rental prices for apartments will	5	4	3	2	1
Purchase prices for housing will	5	4	3	2	1
Interest rates on car loans and mortgages will	5	4	3	2	1
Unemployment will	5	4	3	2	1
Property tax rates will	5	4	3	2	1
Sales or income taxes will	5	4	3	2	1

106. Sex of person filling out questionnaire:

FEMALE ..... 1 MALE 2

THANK YOU VERY MUCH FOR YOUR HELP WITH THIS SURVEY!

APPENDIX F

Copy of

NOP'S CURRENT SURVEY
(reference number 5702)

A

JOB NUMBER 4702 (1 - 5) SERIAL NUMBER (6 - 9)

CARD 0 | 10

ASK ALL (Savings)
ADULTS AGED 16+ YEARS SECTION ANSWERED — 1 ASK Q1
ADULTS AGED 16+ YEARS SECTION REFUSED — 2 GO TO NEXT
OTHERS NOT APPLICABLE — 2 SECTION | 11

BATCH NO (12 - 13)

INTERVIEWER READ OUT INTRODUCTION : Now I would like to ask you some questions about banks and building societies and the services they provide.

Q1. Do you have a personal current account with a cheque book INCLUDE ANY JOINT ACCOUNTS BUT EXCLUDE HIGH INTEREST CHEQUE ACCOUNTS (26)
Yes — 1 ASK Q2
No — 2
Don't know — 3 GO TO Q13
Refused — 4 | SKIP TO COL. 26

Q2. Did you open your very first current account with a cheque book within the last 12 months, or was it longer ago than that? | 26
Longer ago — 6 GO TO Q3
Within the last 12 months — 7 ASK Q2a

Q2a In which month did you open that current account? WRITE IN BOXES. INTERVIEWER EXAMPLE : September 0 9 (27)(28) | 27 / 28

Q3. How many current accounts with cheque books do you have at present? PLEASE INCLUDE ANY JOINT ACCOUNTS
RING — 1 2 3 4 5+ | 29

INTERVIEWER : IF ONLY ONE ACCOUNT ASK Q4-Q6a ABOUT THAT ACCOUNT. IF MORE THAN ONE ACCOUNT ASK Q4-Q6a ABOUT MAIN ACCOUNT AND SECOND AND THIRD ACCOUNTS. DO NOT ASK ABOUT MORE THAN THREE ACCOUNTS.

	MAIN ACCOUNT OR FIRST ACCOUNT (30)	SECOND ACCOUNT (34)	THIRD ACCOUNT (38)	
Q4. Is this current account just in your name or is it a joint account with another person?				
Personal Account	1	1	1	
Joint Account	2	2	2	
	(31)	(35)	(39)	
Q5. Who is the current account with?				
Abbey National Building Society	1 ASK Q5a	1 ASK Q5a	1 ASK Q5a	
Barclays Bank	2	2	2	
Bank of Scotland	3	3	3	
Clydesdale Bank	4	4	4	30
Co-Operative Bank (Co-op)	5	5	5	
Girobank	6	6	6	/
Lloyds Bank Ordinary	7	7	7	
Lloyds Bank Classic Account	8 ASK Q5b	8 ASK Q5b	8 ASK Q5b	41
Midland Bank	9	9	9	
Nationwide Anglia Building Society	0	0	0	
National Westminster Bank	X	X	X	
Royal Bank of Scotland (Williams & Glyn's)	Y	Y	Y	
	(32)	(36)	(40)	
T.S.B. Bank	1	1	1	
Yorkshire Bank	2	2	2	
Other (write in & ring)				
	3	3	3	
Refused/Don't know	4	4	4	

INTERVIEWER: Please distinguish between Lloyds "Ordinary" and Lloyds "Classic". If in doubt put "Ordinary".

- ASK Q5a OF ABBEY NATIONAL CURRENT ACCOUNT HOLDERS ONLY
- ASK Q5b OF LLOYDS CLASSIC HOLDERS ONLY
- OTHERS - GO TO Q6

Q5a. Did you have a Cheque Save account with Abbey National before your current account?				
Yes	5	5	5	
No	6	6	6	
Q5b. Did you have a current account with Lloyds before opening your Classic Account?				
Yes	7	7	7	
No	8	8	8	
Q6. When you opened this account with (name at Q5) did you already have any kind of savings or deposit account with them?				
Yes	9	9	9	
No	0	0	0	
	(33)	(37)	(41)	
Q6a. Have you opened this current account within the last 12 months or was it longer ago? IF 'LONGER AGO' SAY : How long have you had this current account with (Name at Q5)?	DETAILS	DETAILS	DETAILS	
Within last 12 months	1 BELOW	1 BELOW	1 BELOW	
1 year but less than 2 years	2	2	2	
2 years but less than 5 years	3	3	3	
5 years but less than 10 years	4	4	4	
10 years or more	5	5	5	
Don't know /Can't remember	6	6	6	

IF IN LAST 12 MONTHS, PROBE CAREFULLY FOR MONTH AND WRITE IN BOXES

MONTH (42) (43) (44) (45) (46) (47) | 42 / 47

Q7. Have you paid any account charges in the last 12 months on your (Main) current account? (48)
Yes — 1
No — 2
Don't know — 3

Q8. Do you have a cheque card, I mean a card which guarantees payment of a cheque of up to £50?
Yes — 4
No — 5 | 48

Q9. Have you ever transferred your (Main) current account, not just a change of branch but to a different institution?
Yes — 6
No — 7 GO TO Q13

Q10. When did you last transfer your current account?
Within last 12 months — 8
Over a year ago — 9 GO TO Q13

Q10a. And in which month did you transfer that account?
MONTH (49) (50) | 49 / 50

-B-

Q10b. How long did you hold the previous account before you transferred it?

(51)

Less than 1 year	1	
1 year but less than 2 years.	2	
2 years but less than 5 years.	3	
5 years but less than 10 years	4	51
10 years or more	5	
Don't know/Can't remember	6	

Q11. Thinking about the last time you transferred your current account, who did you transfer it from? RECORD BELOW

Q12. Who did you transfer your current account to? RECORD BELOW

	Q11 Transfer from (52)	Q12 Transfer to (54)	
Abbey National Building Society	1	1	
Barclays Bank	2	2	
Bank of Scotland	3	3	
Clydesdale Bank	4	4	
Co-Operative Bank (Co-Op)	5	5	
Girobank	6	6	
Lloyds Bank	7	7	
Midland Bank	8	8	
Nationwide Anglia Building Society	9	9	52
National Westminster Bank	0	0	/
Royal Bank of Scotland (William & Glyn's)	X	X	55
T.S.B. Bank	Y	Y	
	(53)	(55)	
Yorkshire Bank	1	1	
Other (write in & ring)			
	2	2	
Don't know/Refused	3	3	

INTERVIEWER ASK : CAN I CHECK, YOU HAD AN ACCOUNT AT (CODE AT Q11) AND YOU TRANSFERRED IT TO (CODE AT Q12)

ASK ALL

Q13. Apart from transfers, have you ever closed any current account? INCLUDE ANY JOINT ACCOUNTS

(56)

Yes	1	ASK Q13a
No	2	
Don't know	3	GO TO
Refused	4	Q13d/e

Q13a. How long ago did you close your last current account? IF MORE THAN ONE CLOSED ASK ABOUT THE MOST RECENTLY CLOSED CURRENT ACCOUNT.

Within last 12 months	5		56
1 year but less than 3 years	6	ASK Q13b	
3 years or more	7	GO Q13d/e	

Q13b. Who was that current account with?

(57)

Abbey National Building Society	1	
Barclays Bank	2	
Bank of Scotland	3	
Clydesdale Bank	4	
Co-Operative Bank (Co-Op)	5	
Girobank	6	
Lloyds Bank	7	
Midland Bank	8	57
Nationwide Anglia Building Society	9	/
National Westminster	0	
Royal Bank of Scotland (Williams & Glyn's)	X	58
T.S.B. Bank	Y	
	(58)	
Yorkshire Bank	1	
Other (write in & ring)		
	2	
Don't know/Refused	3	

Q13c. How long did you have that current account before closing it?

(59)

Less than 1 year	1	
1 year but less than 2 years	2	
2 years but less than 5 years	3	59
5 years but less than 10 years.	4	
10 years or more	5	
Don't know/Can't remember	6	

Q13d. ASK ALL WITH CURRENT ACCOUNTS (Q1 code 1). Just supposing you had to change your main current account from (name at Q5) who else would you go to? RECORD BELOW

Q13e. ASK ALL WITHOUT CURRENT ACCOUNTS (Q1 code 2,3,4). Just supposing you were going to open a current account with a cheque book tomorrow, who would you go to? RECORD BELOW

	Q13d/Q13e (60)	
Abbey National Building Society	1	
Barclays Bank	2	
Bank of Scotland	3	
Clydesdale Bank	4	
Co-Operative Bank (Co-Op)	5	
Girobank	6	
Lloyds Bank	7	
Midland Bank	8	60
Nationwide Anglia Building Society	9	/
National Westminster Bank	0	61
Royal Bank of Scotland	X	
T.S.B. Bank	Y	
	(61)	
Yorkshire	1	
Other (write in & ring)		
	2	
Don't know/Refused	3	

ASK ALL

-C-

Q14. SHOW CARD 1 (PINK) Please would you look through this booklet and tell me if you have any of these bank accounts, including any joint accounts. (62)

Yes — 1 ASK Q15
No — 2 GO TO FILTER
Don't know — 3 BEFORE Q22a

62

Q15. How many of these accounts do you have altogether at present?

RING — 1 2 3 4+ 63

Q16. SHOW CARD 1 Please would you give me the code number of the account and the name of the Bank.

INTERVIEWER : RECORD BELOW DETAILS OF UP TO 4 ACCOUNTS ALTOGETHER, USING A SEPARATE COLUMN FOR EACH ACCOUNT, ASK Q17 - Q20 FOR EACH ACCOUNT.

ACCOUNT NAME	Accounts 1st (64)	2nd (68)	3rd (72)	4th (76)
1. Ordinary Deposit	1	1	1	1
2. Budget	2	2	2	2
3. Save & Borrow	3	3	3	3
4. High Interest (Cheque) A/C	4	4	4	4
5. Regular Income	5	5	5	5
6. Term Deposit	6	6	6	6
7. Mortgage Saver	7	7	7	7
8. Monthly Savings	8	8	8	8
9. Extra Interest	9	9	9	9
0. No Notice	0	0	0	0
X. Interest Bearing Current A/C	X	X	X	X
Y. Cashcard - based Deposit	Y	Y	Y	Y
Other (Write in & ring) (65)		(69)	(73)	(77)
_____	1			
_____	1			
_____	1			
_____	1			

64

/

BANK NAME	(66)	(70)	(74)	(78)
Barclays	1	1	1	1
Citibank	2	2	2	2
Clydesdale	3	3	3	3
Co-Operative	4	4	4	4
Lloyds	5	5	5	5
Midland	6	6	6	6
National Girobank	7	7	7	7
National Westminster	8	8	8	8
Royal Bank of Scotland (inc. Williams & Glyn's)	9	9	9	9
Bank of Scotland	0	0	0	0
Trustee Savings Bank	X	X	X	X
	(67)	(71)	(75)	(79)
Yorkshire	1	1	1	1
Western Trust & Savings	2	2	2	2
Other (Write in & ring)				
_____	3	3	3	3

79

/

CARD (X) 10

Q17. Is this account in your name only or is it a joint account with another person? (11) (12) (13) (14)

Personal — 1 — 1 — 1 — 1
Joint — 2 — 2 — 2 — 2

Q18. When did you open this account? Was it ...? READ OUT

Within last 6 months — 3 — 3 — 3 — 3
7 to 12 months ago — 4 — 4 — 4 — 4
Longer ago — 5 — 5 — 5 — 5

11

/

Q19. Have you paid any money into this account within the last 6 months?

Yes — 6 — 6 — 6 — 6
No — 7 — 7 — 7 — 7

14

Q20. Have you withdrawn any money from this account in the last 6 months?

Yes — 8 — 8 — 8 — 8
No — 9 — 9 — 9 — 9

IF ORDINARY DEPOSIT ACCOUNT IS WITH TSB, ASK Q21 - OTHERS GO TO FILTER BEFORE Q22a

Q21. Is this account with the TSB ...? READ OUT. (15)

An Ordinary Passbook Savings/Service Account. 1
A Deposit or Investment Account — 2
Don't know — 3

ASK ALL WITH ANY BANK ACCOUNT - OTHERS GO TO Q23

INTERVIEWER SAY : Now I am going to ask you about Cash Dispenser Cards supplied by Banks.

Q22a. SHOW PHOTO A Which, if any, of these do you have? RECORD BELOW

ASK Q22b FOR EACH AT Q22a - OTHERS GO TO Q23

Q22b. Have you ever used your ... card? RECORD BELOW

ASK Q22c FOR EACH AT Q22b - OTHERS GO TO Q23

Q22c. And have you used your ... card in the last 4 weeks? RECORD BELOW

	Q22a Have (16)	Q22b Ever Used (18)	Q22c 4 Weeks (20)
Bank of Scotland :			
Keycard - Ordinary	1	1	1
Keycard - Deposit	2	2	2
Barclays :			
Barclaybank	3	3	3
Barclayplus	4	4	4
*Connect Card	5 GO TO Q22d		
Clydesdale :			
Autobank (BLACK)	6	6	6
Autocash (MAROON)	7	7	7
Co-Operative Bank Electron	8	8	8
Girobank Link	9	9	9
Lloyds :			
Cashpoint	0	0	0
*Visa	X GO TO Q22d		
Cashpoint - Deposit	Y	Y	Y
Midland :	(17)	(19)	(21)
Autobank	1	1	1
Autobank - Access	2	2	2
Autocheque	3	3	3
Saver Plus	4	4	4
National Westminster Servicecard:			
* - Blue	5 GO TO Q22d		
- Orange (include cashcard)	6	6	6
- Black (deposit)	7	7	7
Royal Bank of Scotland (inc. Williams & Glyn's) :			
Cashline (Current Account)	8	8	8
Cashline (Deposit)	9	9	9
Trustee Savings Bank Speedbank	0	0	0
Yorkshire Bank Minibank	X	X	X
Other (Write in and ring)			
_____	Y	Y	Y
None of these/No	N	N	N

IF LLOYDS VISA BARCLAYS CONNECT CARD, OR NAT WEST BLUE (*) AT Q22a THEN ASK Qs22d AND e. OTHERS GO TO PAGE D.

Q22d. Have you used your ..... card for any of the following? READ OUT. RECORD BELOW

Q22e. And have you used it for any of these in the last 4 weeks? READ OUT. RECORD BELOW

	Q22d Ever Used (22)	Q22e Last 4 Weeks
Cash Machine Withdrawal	1	6
As payment for goods and services where money is taken directly from your current account	2	7
For cheque guarantee	3	8
None of these	4	9
Don't know/refused	5	0

D

ASK ALL
SHOW CARD 2 (BLUE) Now I would like to ask you about Building Society Accounts.

Q23. Do you have any savings accounts at a Building Society, including those held jointly with another person?

Yes, do hold an account at a Building Society ——— N ASK Q24
No, do not hold an account at a Building Society ——— N GO TO Q37

Q24. How many Building Society accounts do you have in total?

RING ——— 1 ——— 2 ——— 3 ——— 4 ——— 5+ 23

RECORD DETAILS OF UP TO FIVE ACCOUNTS, USING A SEPARATE COLUMN FOR EACH ACCOUNT. THE NUMBER OF COLUMNS COMPLETED SHOULD EQUAL THE NUMBER RINGED IN Q24. SEE INSTRUCTIONS.

Accounts

	1st	2nd	3rd	4th	5th
	(24)	(29)	(34)	(39)	(44)

Q25. Which Building Society is the account with?

Abbey National	1	1	1	1	1
Alliance & Leicester	2	2	2	2	2
Bradford & Bingley	4	4	4	4	4
Bristol & West	5	5	5	5	5
Britannia	6	6	6	6	6
Cheltenham & Gloucester	7	7	7	7	7
Gateway					
Halifax	9	9	9	9	9
Leeds Permanent	0	0	0	0	0
Birmingham Midshires	X	X	X	X	X
	(25)	(30)	(35)	(40)	(45)
National & Provincial	1	1	1	1	1
Nationwide Anglia	2	2	2	2	2
Northern Rock	3	3	3	3	3
Woolwich	4	4	4	4	4
Yorkshire	5	5	5	5	5
Other (write in & ring)					
_____	6				
_____		6			
_____			6		
_____				6	
_____					6

Q26. SHOW CARD 2 AGAIN Which of these accounts do you have with the (name Building Society in turn at Q25) including any joint accounts? Please would you give me the code number from the card. 24

	(26)	(31)	(36)	(41)	(46)	
1. Ordinary/ Share	1	1	1	1	1	/
2. SAYE	2	2	2	2	2	
3. Subscription/Monthly Savings	3	3	3	3	3	48
4. Gold/No Notice Accounts	4	4	4	4	4	
5. Seven Day	5	5	5	5	5	
6. Extra Interest	6	6	6	6	6	
7. Term Share	7	7	7	7	7	
8. Life Assurance Linked	8	8	8	8	8	
9. Cheque Book	9	9	9	9	9	
0. Credit Card	0	0	0	0	0	
X. Cash Card	X	X	X	X	X	
Y. Flex Account	Y	Y	Y	Y	Y	
Other (write in & ring)	(27)	(32)	(37)	(42)	(47)	
_____	1					
_____		1				
_____			1			
_____				1		
_____					1	
Don't know	2	2	2	2	2	

ASK Q27-31 FOR EACH ACCOUNT AT Q26. ASK ALL QUESTIONS FOR FIRST ACCOUNT, THEN REPEAT FOR SECOND ACCOUNT ETC.

		(28)	(33)	(38)	(43)	(48)
Q27. Is this account in your name only or is it a joint account with another person?	Personal	1	1	1	1	1
	Joint	2	2	2	2	2
Q28. Have you opened this account in the last 6 months or was it longer ago?	Within the last 6 months	3	3	3	3	3
	7 to 12 months ago	4	4	4	4	4
	Longer ago	5	5	5	5	5
Q29. Have you paid any money into this account in the last 6 months?	Yes	6	6	6	6	6
	No	7	7	7	7	7
Q30. Have you withdrawn any money from this account in the last 6 months?	Yes	8	8	8	8	8
	No	9	9	9	9	9
Q31. Is this your first ever account with a Building Society?	Yes	0	0	0	0	0
	No	X	X	X	X	X

49
/
50

FOR OFFICE USE ONLY : OTHER SOCIETY [ ][ ] (49) (50)

- E -

ASK ALL WHO HAVE AN ACCOUNT WITH A BUILDING SOCIETY AT Q23 (CODE 1) - OTHERS GO TO Q37

SHOW PHOTO B, BUILDING SOCIETY CASH DISPENSERS

Q32. Which, if any of these do you have?

ASK Q33 FOR EACH AT Q32

Q33. Have you ever used your ... card?

ASK Q34 FOR EACH AT Q33

Q34. And have you used your ... card in the last 4 weeks?

	Q32 Have (51)	Q33 Ever Used (53)	Q34 4 Weeks (55)
Abbey Link (Abbey National)	1	1	1
Alliance & Leicester Card	2	2	2
Angliacard (Nationwide Anglia)	3	3	3
Bluecard/Matrixcard (Bristol & West)	4	4	4
Britannia Link (Britannia)	5	5	5
Cardcash (Halifax)	6	6	6
Cashbase (Woolwich)	7	7	7
Cashkey (Yorkshire)	8	8	8
Cashlink (Nationwide Anglia)	9	9	9
Gateway (Woolwich)	0	0	0
Moneycard (Leeds)	X	X	X
Money Manager (National & Provincial)	Y	Y	Y
	(52)	(54)	(56)
Passcard (Bradford & Bingley)	1	1	1
Timesaver (Bradford & Bingley)	2	2	2
Other (write in and ring)			
	3	3	3
None	4 GO TO		
Don't know	5 Q37		

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GO TO Q37 - ASK ALL

Q37. SHOW CARD 3 (WHITE) Do you hold any of the following? RECORD BELOW

SKIP TO COL 58

IF YES, ASK Q38-Q41 FOR EACH SAVINGS HELD AT Q37. IF NONE HELD GO TO Q41a

Q38. Is this account/investment in your name only, or is it jointly held with another person? RECORD BELOW

Q39. When was this investment first opened/purchased? Was it ... ? READ OUT RECORD BELOW

Q40. Have you paid any money into, or added to, this investment in the last 6 months? RECORD BELOW

Q41. Have you withdrawn money from, or cashed in any part of, this investment in the last 6 months? RECORD BELOW

	Q37	Q38		Q39			Q40		Q41	
	Savings Held (58)	Personal (59)	Joint (60)	Within last 6 months (61)	7-12 months ago (62)	Longer ago (63)	Yes (64)	No (65)	Yes (66)	No (67)
Post Office Savings Bank										
- Ordinary	1	1	1	1	1	1	1	1	1	1
- Investment	2	2	2	2	2	2	2	2	2	2
National Savings Certificates										
- Index Linked	3	3	3	3	3	3	3	3	3	3
- Fixed Interest	4	4	4	4	4	4	4	4	4	4
Premium Bonds	5	5	5	5	5	5	5	5	5	5
National Savings Income Bonds	6	6	6	6	6	6	6	6	6	6
National Savings Deposit Bonds	7	7	7	7	7	7	7	7	7	7
National Savings (SAYE) (Save As You Earn)	8	8	8	8	8	8	8	8	8	8
National Savings Yearly Plan	9	9	9	9	9	9	9	9	9	9
National Savings Index Linked Income Bonds	0	0	0	0	0	0	0	0	0	0
Government Gilt Edged Stocks	X	X	X	X	X	X	X	X	X	X
NONE HELD	N									
Q41a SAVINGS CLUBS	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

58 / 67

Are you a member of a savings club such as a holiday club or Christmas club?
(IF "YES" CODE Q37 AND ASK Q38-Q41.
IF "NO" GO TO Q42).

ASK ALL

F

Q42. SHOW CARD 4 (WHITE) Here is a list of other ways in which people can save. Which, if any, of these savings or investments do you personally have - including joint accounts or joint savings?

ASK Q43-47 FOR EACH HELD AS RELEVANT

Q43. SHARE HOLDERS ONLY: Did you obtain your shares via your employer or otherwise?

Q44. Thinking of your savings in ... are they in your name only or held jointly with another person? RECORD BELOW

Q45. When did you first invest in ... ? Was it ... ? READ OUT AND RECORD BELOW

Q46. Have you ADDED to your savings in ... in the last 6 months? RECORD BELOW

Q47. Have you WITHDRAWN any money from, or cashed in, any of these savings in the last 6 months? RECORD BELOW

Date Privatised		Q42 Savings Held (68)	Q43 Shares Empl-oyer (69)	Q43 Via other (70)	Q44 Per-sonal (71)	Q44 Joint (72)	Q45 Within last 6 months (73)	Q45 7-12 months ago (74)	Q45 Longer ago (75)	Q46 Yes (76)	Q46 No (77)	Q47 Yes (78)	Q47 No (79)
	Stocks and Shares												
Aug 1987	British Airports Auth. Shares	1	1	1	1	1	1	1	1	1	1	1	1
Dec 1986	British Gas Shares	2	2	2	2	2	2	2	2	2	2	2	2
Dec 1988	British Steel Shares	3	3	3	3	3	3	3	3	3	3	3	3
1985	British Telecom Shares	4	4	4	4	4	4	4	4	4	4	4	4
Jun 1987	Rolls Royce Shares	5	5	5	5	5	5	5	5	5	5	5	5
Oct 1986	TSB Bank Shares	6	6	6	6	6	6	6	6	6	6	6	6
	Other de-nationalised shares	7	7	7	7	7	7	7	7	7	7	7	7
	Stocks and Shares (in any other organisation)	8	8	8	8	8	8	8	8	8	8	8	8
	Other												
	Personal Equity Plan (P.E.P.)	9			9	9	9	9	9	9	9	9	9
	Local Authority Bonds	0			0	0	0	0	0	0	0	0	0
	Unit Trusts	X			X	X	X	X	X	X	X	X	X
	Investment Trusts	Y			Y	Y	Y	Y	Y	Y	Y	Y	Y
	None held	N	GO TO FILTER BEFORE Q48										

CARD Y 1C

ASK ALL AGED 18 AND OVER - OTHERS GO TO PAGE L, Q109

INTERVIEWER : Now I am going to ask you about Retail Store Accounts.

Q48. Do you have an account or card with a shop or store? This does not include personal loans or hire purchase agreements.

(11)
Yes — 1 ASK Q49
No — 2 GO TO
Don't know/Refused — 3 Q56

1:

Q49. SHOW PHOTO C Which of the following shops or stores do you have an account with? READ OUT EACH STORE EXAMPLE.
INTERVIEWER : RING A SEPARATE COLUMN FOR EACH CARD HELD.

	1st Card (12)	2nd Card (15)	3rd Card (18)	4th Card (21)
Marks & Spencer	1	1	1	1
Co-Operative	2	2	2	2
Debenhams	3	3	3	3
Hepworths/Next	4	4	4	4
Burtons/Dorothy Perkins/Top Man/Top Shop/Evans/Principles/Fentons (Personal Accts)	5	5	5	5
House of Fraser (eg. D.H.Evans/Harrods/Army & Navy/Dickens & Jones)	6	6	6	6
Style/Goldbergs	7	7	7	7
John Lewis Partnership	8	8	8	8
Sears (eg. Lewis's/Selfridges/Wallis/Miss Selfridge/Fosters)	9	9	9	9
Dixons	0	0	0	0
Curry's	X	X	X	X
Storecard (BHS/Mothercare/Habitat/Heals/Richards)	Y	Y	Y	Y
	(13)	(16)	(19)	(22)
Other (write in & ring)	1	1	1	1

1:
2:

Q50. SHOW CARD 5 (PINK) Please look at the show card and tell me which type of account you hold for each card mentioned. INTERVIEWER ; READ OUT TYPE OF CARD HELD

Have to pay in full at end of each month	5	5	5	5
Pay a fixed monthly amount	6	6	6	6
Pay all or part of the balance as you choose	7	7	7	7
Don't know	8	8	8	8

Q51. Have you ever used your ... account?

Yes	9	9	9	9
No	0	0	0	0

Q52. Have you used your ... account in the last 4 weeks?

Yes	X	X	X	X
No	Y	Y	Y	Y
	(14)	(17)	(20)	(23)

Q53. Have you opened this account in the last 12 months or was it longer ago?

Opened in last 12 months	1	1	1	1
Longer ago	2	2	2	2
Refused/Don't know	3	3	3	3

Q54. Is this account in your name only or is it a joint account with another person?

Personal	4	4	4	4
Joint	5	5	5	5

ASK Q55 IF Q50 CODE 7 HELD (Pay all or part of the balance as you choose) - OTHERS GO TO Q56

Q55. Do you usually pay back the full amount shown on the statement each month, or do you pay back over a period of time?

Pay back over a period of time.	6	6	6	6
Pay back full amount	7	7	7	7
It varies	8	8	8	8
Don't know/Refused	9	9	9	9

ASK ALL AGED 18 OR OVER

Q56. SHOW PHOTO D Now I am going to ask you about Credit Cards. Which, if any, of these do you have?
RECORD DETAILS OF UP TO 3 CARDS, USING A SEPARATE COLUMN FOR EACH CARD. SEE INSTRUCTIONS.

G

	1st Card (24)	2nd Card (29)	3rd Card (34)
American Express (Green)	1	1	1
American Express (Gold)	2	2	2
Bank of Scotland Premier	3	3	3
Barclays Premier	4	4	4
Diners Club	5	5	5
Midland Bank Mastercard	6	6	6
National Westminster Mastercard	7	7	7
*Access	8	8	8
*Bank of Scotland Visa	9	9	9
*Bank of Scotland/A.A. Visa	0	0	0
*Barclaycard or Barclaycard Visa	X	X	X
*Chase Manhattan Bank Visa	Y	Y	Y
	(25)	(30)	(35)
*Co-Operative Bank Visa	1	1	1
*Girobank Visa	2	2	2
*Halifax Building Society Visa	3	3	3
*The Leeds Permanent Building Society Visa	4	4	4
*Save and Prosper Classic Card Visa	5	5	5
*Trustcard or Trustcard Visa	6	6	6
*Yorkshire Bank Barclaycard	7	7	7
*Any other Visa	8	8	8
Any Hotel credit card	9	9	9
Any Petrol Station credit card	0	0	0
Other (write in & ring)			
	(26)	(31)	(36)
	1	1	1
None of these	2 GO TO		
Refused	3 Q64		

Q57. When did you obtain your ..... card? Was it ..... ? READ OUT

Within the last 6 months	4	4	4
7 to 12 months ago	5	5	5
Longer ago	6	6	6

Q58. Have you ever used your ..... card as a credit card?

Yes, have ever used	7	7	7	24
No	8 FILTER BEFORE Q63	8 FILTER BEFORE Q63	8 FILTER BEFORE Q63	/

Q59. Have you used your .... card as a credit card in the last month? 39

Yes, used in last month	9	9	9
No,	0	0	0

Q60. Have you ever used your .... card to withdraw cash?

Yes, have ever used	X	X	X
No	Y	Y	Y

Q61. Are you personally responsible for the repayments on your .... card or is it a supplementary card on someone else's account or a company card?

	(27)	(32)	(37)
Yes, responsible	1	1	1
No, supplementary	2	2	2
No, company	3	3	3
Don't know/Refused	4	4	4

IF RESPONSIBLE FOR REPAYMENTS, ASK Q62 FOR EACH (*) CARD AT Q56 - OTHERS GO TO FILTER BEFORE Q63

Q62. Do you normally pay back the full amount shown on the statement each month, or do you pay back over a period of time?

	(28)	(33)	(38)
Pay back over period	1	1	1
Pay full amount	2	2	2
It varies	3	3	3
Don't know/Refused	4	4	4

IF ACCESS AT Q56 ASK Q63 - OTHERS GO TO Q64

Q63. What is the name of the bank on your Access card?

Clydesdale	5	5	5
Lloyds	6	6	6
Midland	7	7	7
National Westminster	8	8	8
Royal Bank of Scotland (Williams & Glyn's)	9	9	9
Other	0	0	0
Don't know	X	X	X

ASK ALL AGED 18 OR OVER

Q64. Are you currently using .... ? READ OUT

	(39)
Mail order or credit from a catalogue	1
Bank overdraft agreed with bank	2
Check Trading (eg. Provident)	3
No, none of these	4
Refused	5

- H -

PUNCHING SKIP TO COL. 44

ASK ALL 18+ (LOANS)

(44)

Q65. Excluding any mortgages or overdrafts, are you paying back any type of loans or hire purchase, personally or jointly?

Yes — 1 ASK Q66
No — 2 GO TO
Don't know/Refused — 3 Q76

44

Q66. How many loans or hire purchase agreements do you have at present?

RING: 1 2 3+

45

Q67. SHOWCARD 6 (BLUE) Which of these are you using the loan to buy, or pay off. Please answer for each loan that you have.

	1st Loan (46)	2nd Loan (52)	3rd Loan (58)
New Car	1	1	1
Second Hand Car	2	2	2
Motorbike	3	3	3
Holiday	4	4	4
Electrical Goods eg. Hi-Fi	5	5	5
Central Heating	6	6	6
Double Glazing	7	7	7
Kitchen or Bathroom Fitments	8	8	8
Furniture or Floor Covering	9	9	9
Gas Appliances	0	0	0
Other Home Improvements	X	X	X
To pay off other loans/debts	Y	Y	Y
	(47)	(53)	(59)
Any other purposes	1	1	1
Don't know/refused	2	2	2

46 - 63

Q68. SHOWCARD 6A Who do you repay for this loan?

	1st Loan	2nd Loan	3rd Loan
Bank	3 ASK	3 ASK	3 ASK
Building Society	4 Q69	4 Q69	4 Q69
Finance House or Hire Purchase Company	5 ↓	5 ↓	5 ↓
Car Dealer/Garage	6 GO	6 GO	6 GO
Shop/Retailer/Salesman	7	7	7
Credit Card Company	8 TO	8 TO	8 TO
Family/Friends	9 Q70	9 Q70	9 Q70
Employer	0	0	0
Other (write in & ring)			
	X	X	X
Don't know/refused	Y	Y	Y

Q69. SHOWCARD 7 (BLUE) To which Bank or Building Society do you repay this loan?
Please call out code.
INTERVIEWER : WRITE CODES IN BOXES eg. '6' is written: 0 6 Don't know Code 99

1st Loan (48) (49)	2nd Loan (54) (55)	3rd Loan (60) (61)

Q70 SHOWCARD 7A How did you actually arrange this loan?

	1st Loan (50)	2nd Loan (56)	3rd Loan (62)
You answered an advert	1	1	1
You answered a circular or mail-shot	2	2	2
You visited the lender	3	3	3
You arranged it as part of the sale	4	4	4
A representative visited you	5	5	5
A broker arranged the loan	6	6	6
At the shop/car dealer	7	7	7
Other (write in and ring)			
	8	8	8
Don't know	9	9	9

Q71. How long have you had this loan? Is it .....? READ OUT

	1st Loan (51)	2nd Loan (57)	3rd Loan (63)
6 months or less	1	1	1
7 - 12 months	2	2	2
Longer	3	3	3

Q72. Is that a personal loan or a joint loan with a partner?

Personal	4	4	4
Joint	5	5	5

Q73. Did you take out an insurance policy to cover yourself for repaying this loan in case of sickness or unemployment?

Yes	6	6	6
No	7	7	7
Don't know/Refused	8	8	8

Q74. Did you provide any sort of security for this loan, such as your home?

Yes	9	9	9
No	0	0	0

Q75. Do you pay interest on this loan or is it interest-free?

Pay Interest	X	X	X
Interest Free	Y	Y	Y

ASK ALL 18+ (MORTGAGES)

Q76. Are you buying any property using a mortgage or loan? Please do not include bridging loans, but do count jointly held mortgages or loans.

(66)
Yes — 1 ASK Q76a)
No — 2 GO TO
Don't know/Refused — 3 Q85

Q76a). How many mortgages are you repaying at present?

One — 4
Two — 5
Three or more — 6

66

Q77. Is your main mortgage in your name only or jointly held?

Name only — 7
Joint — 8

(67)

Q78. When did you arrange your main mortgage? Was it .....? READ OUT

Within last 6 months — 1 ASK
7 - 12 months ago — 2 Q78a)
1 - 2 years ago — 3
3 - 5 years ago — 4 GO
6 - 10 years ago — 5 TO
Over 10 years ago — 6 Q79
Don't know/Refused — 7

67

(68) (69)

Q78a. In which month did you take out this mortgage?

INTERVIEWERS : WRITE IN MONTH IN BOXES (e.g. November = 11)

68 / 69

(70)

Q78b. Is this a fixed interest or variable interest mortgage?

Fixed — 1
Variable — 2
Don't know — 3

70

(71) (72)

Q78c. Could you please tell me the approximate value of the mortgage, to the nearest thousand pounds?

Over £100,000 — code 00
Don't know — code 99
Refused — code XX

71 / 72

(73)

Q79. SHOW CARD 9 (GREEN) What type of mortgage is it? Please read the categories carefully.

Repayment, with protection — 1 ASK Q80
Repayment, no protection — 2 GO TO
Repayment, unsure about protection — 3 Q81
Endowment mortgage — 4
Pension mortgage — 5 ASK Q80
Unit Linked mortgage — 6
Other (write in & ring)
— 7 GO TO Q81
Don't know/Refused — 8

73

RAND RESPONDENT SPARE SHOW CARD 9 (WHITE)

Q80. SHOW CARD 9 (GREEN) Which life assurance company do you pay your endowment or protection premiums to?

(74) (75) Don't know Code 99

INTERVIEWER : WRITE CODES IN BOXES eg. '8' is written : 08

74 / 75

Q81. Which Bank, Building Society or other institution is your main mortgage with?

BUILDING SOCIETIES

(76)
TOP COLUMN
Abbey National — 1
Alliance & Leicester — 2
Bradford & Bingley — 4
Bristol & West — 5
Britannia — 6
Cheltenham & Gloucester — 7
Gateway
Halifax — 9
Leeds Permanent — 0
Birmingham Midshires — X

(77)
LOWER COLUMN
National & Provincial — 1
Nationwide Anglia — 2
Northern Rock — 3
Woolwich — 4
Yorkshire — 5
Other Building Society — 6
Don't know — 9

BANKS

(78)
Bank of Ireland — 1
Barclays — 2
Bank of Scotland — 3
Canadian Imperial — 4
Chemical — 5
Citibank — 6
Clydesdale — 7
Co-Operative — 8
Girobank — 9
Lloyds — 0
Midland — X
National Westminster — Y

(79)
Royal Bank of Scotland — 1
T.S.B. — 2
Yorkshire — 3
Any Other Overseas Bank — 4
Other Bank — 5
Don't know — 9

OTHER INSTITUTIONS

(80)
Household Mortgage Corporation — 1
Mortgage Express — 2
National Home Loans Corporation — 3
The Mortgage Corporation — 4
Any Insurance Company — 5
Local Council/Local Authority — 6
Employer — 7
Other (write in & ring)
— 8
Don't know — 9

76 / 80

CARD A | 10

Q82. SHOW CARD 10 (YELLOW) Who did you initially arrange this mortgage with?

(11) (12) DON'T KNOW Code 99

OTHER: Code and give details .....

(13)

Q83. Have you changed the lending institution your main mortgage is with, without moving house, in the last 12 months?

Yes — 1
No — 2

11 / 13

Q83a). Have you increased the size of your main mortgage in the last 12 months? That is, without moving house?

Yes — 3
No — 4

Q84. Is this your first ever mortgage?

Yes, first — 5 GO TO Q85
No, second — 6
No, third — 7 ASK Q84a
Fourth or more — 8

(14)

Q84a). How long did you have your previous mortgage?

Less than 6 months — 1
7 - 12 months — 2
1 - 2 years — 3
3 - 5 years — 4
6 - 10 years — 5
Over 10 years — 6

14

Q84b. Was this in your name only or jointly held?

Name only — 7
Joint — 8

Q84c. What type of mortgage was it?

Repayment — 9
Endowment — 0
Other (write in & ring)
— X
Don't know — Y

Q84d. Which bank, building society or other institution was your previous mortgage with?
INTERVIEWER: WRITE IN ONE CODE USING THE LIST OF BUILDING SOCIETIES/BANKS/OTHER INSTITUTIONS IN Q81.

	BUILDING SOCIETY (15)	BANK (16)	OTHER (17)
TOP COLUMN OF Q81	270		

	(18)	(19)
LOWER COLUMN OF Q81		

15 / 19

J1

ASK ALL 18+ (PRIVATE MEDICAL AND PENSION)

Q85. Have you ever had contributions paid into any of these pension arrangements? READ OUT. CAN BE MORE THAN ONE ANSWER. RECORD BELOW

Q86. Are contributions presently being made to any of these? RECORD BELOW

	Q85 Ever Contributed (20)	Q86 Presently Contributing (21)	
Personal Pension Plan (PPP)	1	1 ASK Q86a	20 / 21
SERPS (State Earnings Related Pension Scheme)	2	2 GO	
Non-Contributory Company Pension Scheme	3	3 TO	
Contributory Company Pension Scheme	4	4 Q89	
Company Pension and Additional Voluntary Contributions (AVC's)	5	5	
None	6 GO TO	6	
Don't know/Refused	7 Q89	7	

ASK Q86a. OF PERSONAL PENSION PLAN HOLDERS ONLY. OTHERS GO TO Q89

Q86a. Did you personally contract out of SERPS (State Earnings Related Pension Scheme)?

Yes 8
No 9

HAND RESPONDENT SPARE SHOW CARD 9 (WHITE)

Q87. SHOW CARD 9 (GREEN) With which company do you have your Personal Pension Plan? (22) (23)

Don't know Code 99 — 22 / 23

Q87a. SHOW CARD 10 (YELLOW) With whom did you initially arrange this Pension Plan? 24 / 25

OTHER: code and give details (24) (25)

IF BUILDING SOCIETY (CODE 01), BANK (02), OR ESTATE AGENT (07) ASK :
Which Building Society/Bank/Estate Agent was this? WRITE IN.

Q88. How long have you had this plan? (26)

6 months or less 1
7 - 12 months 2
Longer 3
Don't know/Refused 4

Q88a. Did you opt out of a company pension scheme to start this plan? — 26

Yes 5
No 6

Q89. Are you covered by any type of Private Medical or Health Scheme, not including holiday insurance?

Yes 7
No 8
Don't know 9
Refused 0

ASK ALL 19+ (GENERAL INSURANCE)

Q90. Which of the following types of insurance policy are you covered by? READ OUT AND RECORD BELOW ANSWER YES OR NO FOR EACH

J2

a) Home Contents insures possessions, are yours covered?
b) House Structure insures the building structure itself, is yours covered?
c) Motor Insurance applies to private cars, motorbikes, vans etc. Are you covered? Exclude company cars.

	(a) HOME CONTENTS (27)	(b) HOUSE STRUCTURE (34)	(c) MOTOR INSURANCE Excluding Company Cars (41)
Respondent Covered:			
Yes	1	1	1
No	2	2	2
Don't know/Refused	3	3	3

NOW ASK Q91 - 96 FOR EACH POLICY COVERED. IF NONE AT ALL GO TO FILTER BEFORE Q97

HAND RESPONDENT SPARE SHOW CARD 9 (WHITE)

		(29) (29)	(35) (36)	(42) (43)
Q91.	SHOW CARD 9 (GREEN) Which company is the Policy with (Don't know code 99)			
Q92.	SHOW CARD 10 (YELLOW) How was this insurance initially obtained?	(30) (31)	(37) (38)	(44) (45)

OTHER : Code and give details ———————————————————

IF BUILDING SOCIETY (CODE 01) BANK (02), OR ESTATE AGENT (07) ASK : Which Building Society/Bank/Estate Agent was this? WRITE IN

Q92a. What prompted you to first make contact with them? READ OUT

	(32)	(39)	(46)
A leaflet or offer through the mail	1	1	1
An advertisement	2	2	2
They were personally recommended to you	3	3	3
A visiting representative	4	4	4
You acted on your own initiative	5	5	5
Someone else in your household made the contact	6	6	6
Other : (write in & ring)			
	7	7	7
Don't know	N	N	N

27

Q93. How frequently are the premiums paid on this policy? Is it .... READ OUT

/ 47

Weekly	8	8	8
Monthly	9	9	9
Yearly	0	0	0
Other time period	X	X	X
Don't know/Refused	Y	Y	Y

Q94. Are these payments paid to an agent who calls regularly at your home and enters the payments into a premium receipt book?

	(33)	(40)	(47)
Yes	1	1	1
No	2	2	2

Q94a. Do you yourself pay these premiums?

Yes	3	3	3
No	4	4	4

Q95. How long have you had this type of insurance?

Less than a year	5	5	5
1 - 5 years	6	6	6
6 - 10 years	7	7	7
Longer	8	8	8
Don't know/Refused	9	9	9

Q96. The last time this insurance was renewed did you change company or stay with the same one?

Same	0	0	0
Changed	X	X	X
Never renewed/Don't know	Y	Y	Y

Q96a. MOTOR INSURANCE ONLY Which vehicles are you insured for : READ OUT

	(48)
Car/Van	1
Moped	2
Motorbike	3
Other	4

48

SKIP TO Q97

K1

ASK ALL 18 + (PROTECTION INSURANCE)

SHOW CARD 11 (YELLOW) This card explains two types of protection policy. Premiums are paid regularly into either, but money is only paid out in the event of death. They are a means of insurance rather than a means of savings. Mortgage Protection policies are excluded.

Q97. Which of these are you covered by, either personally or jointly with a spouse or partner?
READ OUT EACH POLICY NAME.
ANSWER YES/NO FOR EACH.

		WHOLE LIFE POLICY (50)	TERM POLICY (57)
Respondent covered?	Yes	1	1
	No	2	2
	Don't know/Refused	3	3

ASK Q98 - 102 FOR EACH POLICY HELD, IF NONE GO TO FILTER BEFORE Q103

Q98. How many policies are you covered by?

	(51)	(58)
One	1	1
Two	2	2
Three or more	3	3
Don't know/Refused	4	4

Q98a. How many policies have you taken out in the last year?

50 / 63

None	5	5
One	6	6
Two	7	7
Three or more	8	8

Q98b. How long have you had your (main) policy?

6 months or less	9	9
7 - 12 months	0	0
Longer	X	X
Don't know/Refused	Y	Y

HAND RESPONDENT SPARE SHOW CARD 9 (WHITE)

Q99. SHOW CARD 9 (GREEN) With which company is your .... policy held?

(52)(53) [ ] (59)(60) [ ]

Q100. SHOW CARD 10 (YELLOW) How was this policy initially obtained?

(54)(55) [ ] (61)(62) [ ]

OTHER: Code and give details ----------

IF BUILDING SOCIETY (01) BANK (02)
ESTATE AGENT (07) ASK :
Which building society, bank, or estate agent was this? WRITE IN

Q101. How frequently are the premiums paid on the policy? READ OUT

	WHOLE LIFE POLICY (56)	TERM POLICY (63)
Weekly	1	1
Monthly	2	2
Yearly	3	3
Other	4	4
Don't know/Refused	5	5

Q102. Are the premiums paid to an insurance agent who calls regularly at your house and enters the payments into a premium receipt book?

Yes	6	6
No	7	7

Q102a. Do you yourself pay these premiums?

Yes	8	8
No	9	9

ASK ALL AGED 18+ (SAVINGS BASED POLICIES) K2 | CARD B | 1C

SHOW CARD 12 (BLUE) This card explains two types of policy for regular savings and two types for lump-sum investments.

Q103. Which of these do you hold; either personally or jointly with a spouse or partner? READ OUT EACH POLICY NAME. ANSWER YES.NO FOR EACH.

	UNIT LINKED ENDOWMENT (11)	WITH PROFITS ENDOWMENT (17)	ANNUITY (23)	INVESTMENT TYPE BONDS (29)
Respondent Covered?				
Yes	1	1	1	1
No	2	2	2	2
Don't know/Refused.	3	3	3	3

ASK Q104 -106 FOR EACH POLICY HELD.
IF NONE AT ALL. GO TO Q109

Q104. How many policies do you hold?

	(12)	(18)	(24)	(30)	
One	1	1	1	1	11
Two	2	2	2	2	/
Three or more	3	3	3	3	
Don't know/Refused.	4	4	4	4	34

Q104a. How many policies have you taken out in the last year?

None	5	5	5	5
One	6	6	6	6
Two	7	7	7	7
Three or more	8	8	8	8

Q104b. How long have you had your (main) policy?

6 months or less	9	9	9	9
7 - 12	0	0	0	0
Longer	X	X	X	X
Don't know/Refused.	Y	Y	Y	Y

HAND RESPONDENT SPARE SHOW CARD 9 (WHITE)

	(13)(14)	(19)(20)	(25)(26)	(31)(32)
Q105. SHOW CARD 9 (GREEN) With which company is this policy held?		.		

	(15)(16)	(21)(22)	(27)(28)	(33)(34)
Q106. SHOW CARD 10 (YELLOW) How was this policy originally obtained?				

IF BUILDING SOCIETY (01) BANK (02) ESTATE AGENT (07) ASK :
Which building society, bank, or estate agent was this? WRITE IN

ASK Q107 - 108 OF ENDOWMENT POLICIES ONLY

Q107. How frequently are the premiums paid on the policy?

	UNIT LINKED ENDOWMENT (35)	WITH-PROFIT ENDOWMENT (36)	
Weekly	1	1	
Monthly	2	2	
Yearly	3	3	35
Other	4	4	/
Don't know/Refused	5	5	36

Q107a. Do you yourself pay these premiums?

Yes	6	6
No	7	7

Q108. Are these premiums paid to an insurance agent who calls regularly at your house and enters the payments into a premium receipt book?

	UNIT LINKED ENDOWMENT (37)	WITH PROFITS ENDOWMENT (38)	
Yes	1	1	37 / 38
No	2	2	

ASK ALL

Q109. Are you personally a private member of any of the following motoring organisation? READ OUT

	(39)	
AA	1	39
RAC	2	
National Breakdown	3	
Other	4	
None	5	
Don't know	6	

Q109a. SHOW CARDS 13 (BLUE) Which one of these best applies to you? RE RECORD ONTO PERSONAL DETAILS

	(40)		
Employee working full time (over 30 hours per week)	1		40
Employee working part time (8-29 hours per week)	2	ASK Q110	
Self-Employed	3		
Still at School	4	GO TO NOTE ABOVE Q115	
Retired	5		
In full-time education (eg. University, Teacher-Training or Polytechnic)	6	ASK Q112	
Unemployed/Not Working/Not in full time education	7		
Other	8		

Q110. Would you describe yourself as working in a commercial organisation or not? By this I would include most types of business but would exclude all government bodies - for example teaching, civil service, armed forces, public services etc.

Yes	9
No	0
Don't know	X

Q110a. How often are you paid your wages or salary?

	(41)	
Daily	1	41
Weekly	2	
Fortnightly	3	
Four-Weekly	4	
Monthly	5	
Other	6	
Self-Employed	7	
Refused	8	

Q111. How is the money paid to you?

	(42)	
Cash	1	42
Cheque	2	
Direct transfer to bank account/bank Giro current account	3	
Direct transfer to bank account/bank Giro savings account	4	
Direct transfer to building society	5	
Other	6	
Refused	7	

Q112. Which of these best applies to you? READ OUT: Are you?

	(43)		
Married	1	ASK Q113	43
Single	2		
Divorced/Separated	3	ASK Q114	
Widowed	4		

Q113. Which one of these best applies to you and your husband/wife? READ OUT AND RECORD BELOW. GO TO NEXT SECTION.

Q114. Which one of these best applies to you personally? READ OUT AND RECORD BELOW. GO TO NEXT SECTION.

	(44)	
Pay income tax at basic rate	1	44
Pay income tax at a higher rate	2	
Do not pay income tax	3	
Refused/Don't know	4	

ASK ALL WITHOUT A 'PHONE IN HOUSEHOLD - OTHERS GO TO NEXT SECTION

Q115. In the near future, we will be conducting a survey about spending, saving and payments among a carefully chosen sample of adults throughout Britain. People will be asked to keep a diary for one month to record any payments they make of £5 or more. All those who return a completed diary will be entered in a draw, with a first prize of £1000, a second prize of £500 and fifty third prizes of £10

IF NECESSARY, EXPLAIN: All the information given will be treated in strict confidence and your answers will be put together with those from all the other people who reply, to give an overall picture. Would you be prepared to keep a record for us of your spending over a one month period?

	(45)		
Yes	1	READ OUT STATEMENT BELOW	45
No	2	GO TO NEXT SECTION	

"You will probably receive your diary by post within the next few weeks. We will include detailed instructions on how to fill in and return the diary".

ASK ALL (Willing to be reinterviewed)

carried out by our sister company NOP

Q1. Would you be willing to take part in future surveys concerning the topics and answers in this questionnaire or on other matters either by phone or in person?

	(46)	
Yes - both/either	1	46
Yes - phone	2	
Yes - personal	3	
No/Don't know	4	

APPENDIX G

The Mortgage Prepayment Model Variables

Postal Codes By Region	Length of Tenure	Age of head of Household
Greater London	0-1	18-20
NW	2-4	21-25
NE	5-8	26-30
SE	9-13	31-37
SW	14-20	38-45
South West	> 20	46-55
South East		> 55
Midlands		
North East		
North West		
Wales		
Scotland		

No. of children	Education	Marital Status
< 2	O levels	Married
3-4	A levels	Single
> 4	1st degree	Divorced/Separated
	Graduate School	Widowed

Household income

< 8,000
8,000-9,999
10,000-14,999
15,000-19,999
20,000-29,999
30,000-39,999
40,000-49,999
50,000-59,999
60,000-69,999
70,000-79,999
80,000-89,999
> 90,000

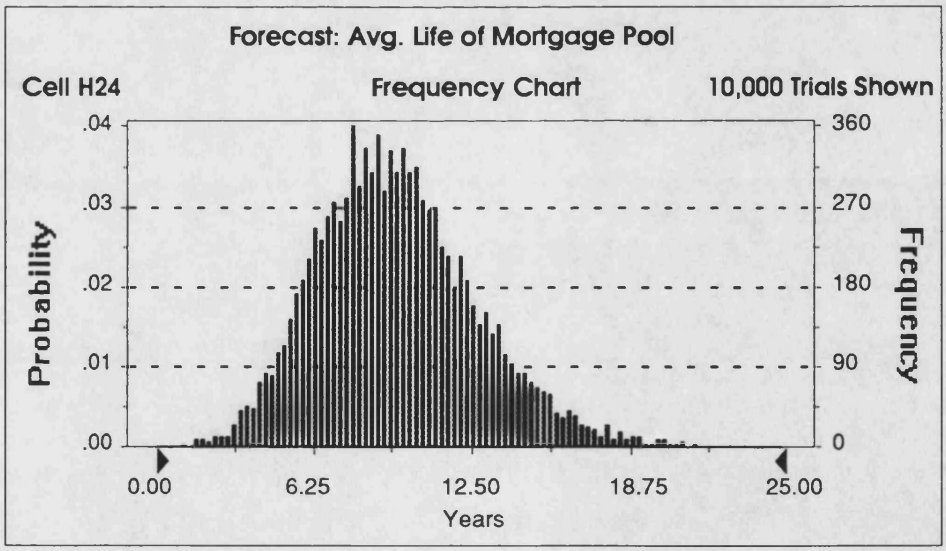
APPENDIX H

Simulation started on 11/14/92 at 16:33:29
Simulation stopped on 11/14/92 at 17:20:47

Forecast: Avg. Life of Mortgage Pool **Cell: H24**

Summary:
Display Range is from 0.00 to 25.00 Years
Entire Range is from 0.16 to 23.43 Years
After 10,000 Trials, the Std. Error of the Mean is 0.03

Statistics:	Display Range	Entire Range
Trials	10000	10000
Mean	9.58	9.58
Median	9.35	9.35
Mode	7.96	7.96
Standard Deviation	3.17	3.17
Variance	10.04	10.04
Skewness	0.48	0.48
Kurtosis	3.42	3.42
Coeff. of Variability	0.33	0.33
Range Minimum	0.00	0.16
Range Maximum	25.00	23.43
Range Width	25.00	23.27
Mean Std. Error	0.03	0.03



Forecast: Avg. Life of Mortgage Pool (cont'd) **Cell: H24**

Percentiles for Entire Range (Years):

Percentile	Avg. Life of Mortgage Pool
0%	0.16
5%	4.84
25%	7.35
50%	9.35
75%	11.49
95%	15.21
100%	23.43

Frequency Counts for Entire Range (Years):

Frequency:

Group	Start Value	End Value	Prob.	Freq.
	-Infinity	0.00	0.000000	0
1	0.00	0.25	0.000100	1
2	0.25	0.50	0.000100	1
3	0.50	0.75	0.000200	2
4	0.75	1.00	0.000100	1
5	1.00	1.25	0.000300	3
6	1.25	1.50	0.000100	1
7	1.50	1.75	0.000900	9
8	1.75	2.00	0.000800	8
9	2.00	2.25	0.000700	7
10	2.25	2.50	0.001100	11
11	2.50	2.75	0.001300	13
12	2.75	3.00	0.001300	13
13	3.00	3.25	0.002600	26
14	3.25	3.50	0.004000	40
15	3.50	3.75	0.004500	45
16	3.75	4.00	0.004300	43
17	4.00	4.25	0.007200	72
18	4.25	4.50	0.008300	83
19	4.50	4.75	0.007900	79
20	4.75	5.00	0.010600	106
21	5.00	5.25	0.011300	113
22	5.25	5.50	0.014400	144
23	5.50	5.75	0.017200	172
24	5.75	6.00	0.018800	188
25	6.00	6.25	0.021200	212
26	6.25	6.50	0.024600	246
27	6.50	6.75	0.023300	233

Forecast: Avg. Life of Mortgage Pool (cont'd) **Cell: H24**

Group	Start Value	End Value	Prob.	Freq.
28	6.75	7.00	0.025900	259
29	7.00	7.25	0.027400	274
30	7.25	7.50	0.025400	254
31	7.50	7.75	0.027900	279
32	7.75	8.00	0.036000	360
33	8.00	8.25	0.029300	293
34	8.25	8.50	0.033400	334
35	8.50	8.75	0.030800	308
36	8.75	9.00	0.035200	352
37	9.00	9.25	0.028700	287
38	9.25	9.50	0.033300	333
39	9.50	9.75	0.030800	308
40	9.75	10.00	0.033500	335
41	10.00	10.25	0.030800	308
42	10.25	10.50	0.031300	313
43	10.50	10.75	0.027800	278
44	10.75	11.00	0.026700	267
45	11.00	11.25	0.026700	267
46	11.25	11.50	0.022400	224
47	11.50	11.75	0.021500	215
48	11.75	12.00	0.017900	179
49	12.00	12.25	0.021300	213
50	12.25	12.50	0.018900	189
51	12.50	12.75	0.015900	159
52	12.75	13.00	0.013700	137
53	13.00	13.25	0.015100	151
54	13.25	13.50	0.012800	128
55	13.50	13.75	0.013800	138
56	13.75	14.00	0.010400	104
57	14.00	14.25	0.009400	94
58	14.25	14.50	0.008200	82
59	14.50	14.75	0.008300	83
60	14.75	15.00	0.007100	71
61	15.00	15.25	0.006600	66
62	15.25	15.50	0.006200	62
63	15.50	15.75	0.006000	60
64	15.75	16.00	0.003700	37
65	16.00	16.25	0.003300	33
66	16.25	16.50	0.004000	40
67	16.50	16.75	0.003600	36
68	16.75	17.00	0.002600	26

Forecast: Avg. Life of Mortgage Pool (cont'd) **Cell: H24**

Group	Start Value	End Value	Prob.	Freq.
69	17.00	17.25	0.002300	23
70	17.25	17.50	0.002000	20
71	17.50	17.75	0.001100	11
72	17.75	18.00	0.002600	26
73	18.00	18.25	0.000800	8
74	18.25	18.50	0.001700	17
75	18.50	18.75	0.001000	10
76	18.75	19.00	0.001200	12
77	19.00	19.25	0.001200	12
78	19.25	19.50	0.000400	4
79	19.50	19.75	0.000400	4
80	19.75	20.00	0.000900	9
81	20.00	20.25	0.000800	8
82	20.25	20.50	0.000300	3
83	20.50	20.75	0.000500	5
84	20.75	21.00	0.000600	6
85	21.00	21.25	0.000100	1
86	21.25	21.50	0.000400	4
87	21.50	21.75	0.000200	2
88	21.75	22.00	0.000100	1
89	22.00	22.25	0.000100	1
90	22.25	22.50	0.000200	2
91	22.50	22.75	0.000000	0
92	22.75	23.00	0.000100	1
93	23.00	23.25	0.000000	0
94	23.25	23.50	0.000200	2
95	23.50	23.75	0.000000	0
96	23.75	24.00	0.000000	0
97	24.00	24.25	0.000000	0
98	24.25	24.50	0.000000	0
99	24.50	24.75	0.000000	0
100	24.75	25.00	0.000000	0
	25.00	+Infinity	0.000000	0
Total:			1.000000	10000

Cumulative:

Group	Start Value	End Value	Prob.	Freq.
	-Infinity	0.00	0.000000	0
1	0.00	0.25	0.000100	1
2	0.25	0.50	0.000200	2
3	0.50	0.75	0.000400	4

Forecast: Avg. Life of Mortgage Pool (cont'd) **Cell: H24**

Group	Start Value	End Value	Prob.	Freq.
4	0.75	1.00	0.000500	5
5	1.00	1.25	0.000800	8
6	1.25	1.50	0.000900	9
7	1.50	1.75	0.001800	18
8	1.75	2.00	0.002600	26
9	2.00	2.25	0.003300	33
10	2.25	2.50	0.004400	44
11	2.50	2.75	0.005700	57
12	2.75	3.00	0.007000	70
13	3.00	3.25	0.009600	96
14	3.25	3.50	0.013600	136
15	3.50	3.75	0.018100	181
16	3.75	4.00	0.022400	224
17	4.00	4.25	0.029600	296
18	4.25	4.50	0.037900	379
19	4.50	4.75	0.045800	458
20	4.75	5.00	0.056400	564
21	5.00	5.25	0.067700	677
22	5.25	5.50	0.082100	821
23	5.50	5.75	0.099300	993
24	5.75	6.00	0.118100	1181
25	6.00	6.25	0.139300	1393
26	6.25	6.50	0.163900	1639
27	6.50	6.75	0.187200	1872
28	6.75	7.00	0.213100	2131
29	7.00	7.25	0.240500	2405
30	7.25	7.50	0.265900	2659
31	7.50	7.75	0.293800	2938
32	7.75	8.00	0.329800	3298
33	8.00	8.25	0.359100	3591
34	8.25	8.50	0.392500	3925
35	8.50	8.75	0.423300	4233
36	8.75	9.00	0.458500	4585
37	9.00	9.25	0.487200	4872
38	9.25	9.50	0.520500	5205
39	9.50	9.75	0.551300	5513
40	9.75	10.00	0.584800	5848
41	10.00	10.25	0.615600	6156
42	10.25	10.50	0.646900	6469
43	10.50	10.75	0.674700	6747
44	10.75	11.00	0.701400	7014

Forecast: Avg. Life of Mortgage Pool (cont'd) **Cell: H24**

Group	Start Value	End Value	Prob.	Freq.
45	11.00	11.25	0.728100	7281
46	11.25	11.50	0.750500	7505
47	11.50	11.75	0.772000	7720
48	11.75	12.00	0.789900	7899
49	12.00	12.25	0.811200	8112
50	12.25	12.50	0.830100	8301
51	12.50	12.75	0.846000	8460
52	12.75	13.00	0.859700	8597
53	13.00	13.25	0.874800	8748
54	13.25	13.50	0.887600	8876
55	13.50	13.75	0.901400	9014
56	13.75	14.00	0.911800	9118
57	14.00	14.25	0.921200	9212
58	14.25	14.50	0.929400	9294
59	14.50	14.75	0.937700	9377
60	14.75	15.00	0.944800	9448
61	15.00	15.25	0.951400	9514
62	15.25	15.50	0.957600	9576
63	15.50	15.75	0.963600	9636
64	15.75	16.00	0.967300	9673
65	16.00	16.25	0.970600	9706
66	16.25	16.50	0.974600	9746
67	16.50	16.75	0.978200	9782
68	16.75	17.00	0.980800	9808
69	17.00	17.25	0.983100	9831
70	17.25	17.50	0.985100	9851
71	17.50	17.75	0.986200	9862
72	17.75	18.00	0.988800	9888
73	18.00	18.25	0.989600	9896
74	18.25	18.50	0.991300	9913
75	18.50	18.75	0.992300	9923
76	18.75	19.00	0.993500	9935
77	19.00	19.25	0.994700	9947
78	19.25	19.50	0.995100	9951
79	19.50	19.75	0.995500	9955
80	19.75	20.00	0.996400	9964
81	20.00	20.25	0.997200	9972
82	20.25	20.50	0.997500	9975
83	20.50	20.75	0.998000	9980
84	20.75	21.00	0.998600	9986
85	21.00	21.25	0.998700	9987

Forecast: Avg. Life of Mortgage Pool (cont'd) **Cell: H24**

Group	Start Value	End Value	Prob.	Freq.
86	21.25	21.50	0.999100	9991
87	21.50	21.75	0.999300	9993
88	21.75	22.00	0.999400	9994
89	22.00	22.25	0.999500	9995
90	22.25	22.50	0.999700	9997
91	22.50	22.75	0.999700	9997
92	22.75	23.00	0.999800	9998
93	23.00	23.25	0.999800	9998
94	23.25	23.50	1.000000	10000
95	23.50	23.75	1.000000	10000
96	23.75	24.00	1.000000	10000
97	24.00	24.25	1.000000	10000
98	24.25	24.50	1.000000	10000
99	24.50	24.75	1.000000	10000
100	24.75	25.00	1.000000	10000
	25.00	+Infinity	1.000000	10000

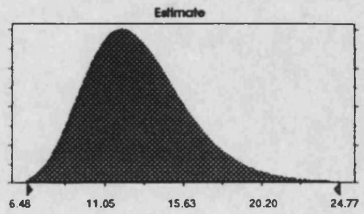
End of Forecast

Assumptions

Assumption: Estimate **Cell: C5**

Lognormal distribution with parameters:
Mean 12.99
Standard Dev. 2.94

Selected range is from 0.00 to 25.00
Mean value in simulation was 0.00



Assumption: Greater London **Cell: C7**

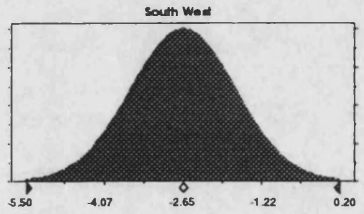
Normal distribution with parameters:
Mean -3.06
Standard Dev. 1.10

Selected range is from -Infinity to +Infinity
Mean value in simulation was -0.00

Assumption: South West **Cell: C8**

Normal distribution with parameters:
Mean -2.65
Standard Dev. 0.95

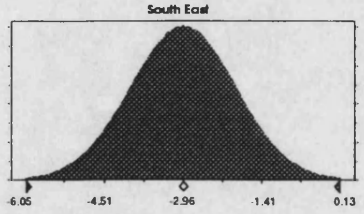
Selected range is from -Infinity to +Infinity
Mean value in simulation was -0.00



Assumption: South East **Cell: C9**

Normal distribution with parameters:
Mean -2.96
Standard Dev. 1.03

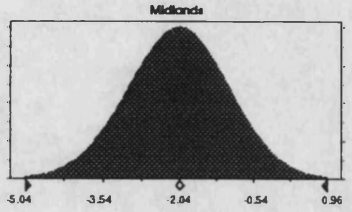
Selected range is from -Infinity to +Infinity
Mean value in simulation was -0.00



Assumption: Midlands **Cell: C10**

Normal distribution with parameters:
Mean -2.04
Standard Dev. 1.00

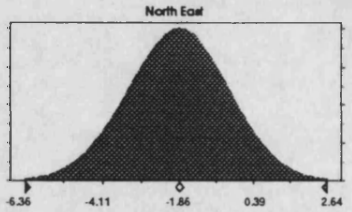
Selected range is from -Infinity to +Infinity
Mean value in simulation was -0.00



Assumption: North East **Cell: C11**

Normal distribution with parameters:
Mean -1.86
Standard Dev. 1.50

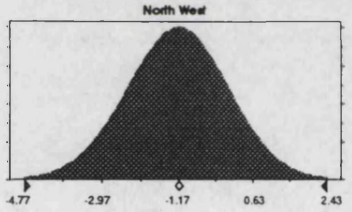
Selected range is from -Infinity to +Infinity
Mean value in simulation was -0.00



Assumption: North West **Cell: C12**

Normal distribution with parameters:
Mean -1.17
Standard Dev. 1.20

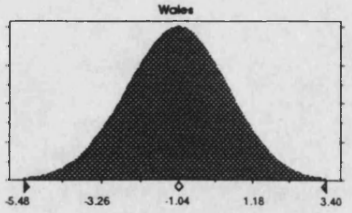
Selected range is from -Infinity to +Infinity
Mean value in simulation was -0.00



Assumption: Wales **Cell: C13**

Normal distribution with parameters:
Mean -1.04
Standard Dev. 1.48

Selected range is from -Infinity to +Infinity
Mean value in simulation was -0.00

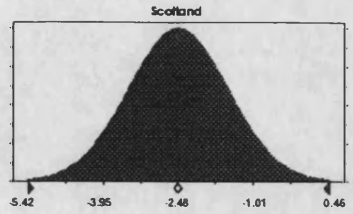


Assumption: Scotland **Cell: C14**

Normal distribution with parameters:

Mean	-2.48
Standard Dev.	0.98

Selected range is from -Infinity to +Infinity
Mean value in simulation was -0.00

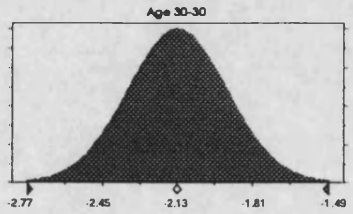


Assumption: Age 30-30 **Cell: C17**

Normal distribution with parameters:

Mean	-2.13
Standard Dev.	0.21

Selected range is from -Infinity to +Infinity
Mean value in simulation was -0.00

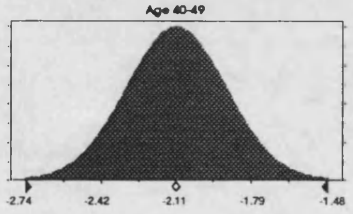


Assumption: Age 40-49 **Cell: C18**

Normal distribution with parameters:

Mean	-2.11
Standard Dev.	0.21

Selected range is from -Infinity to +Infinity
Mean value in simulation was -0.00

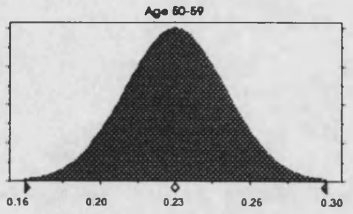


Assumption: Age 50-59 **Cell: C19**

Normal distribution with parameters:

Mean	0.23
Standard Dev.	0.02

Selected range is from -Infinity to +Infinity
Mean value in simulation was -0.00

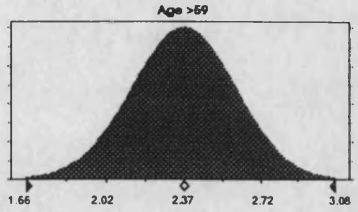


Assumption: Age >59 **Cell: C20**

Normal distribution with parameters:

Mean	2.37
Standard Dev.	0.24

Selected range is from -Infinity to +Infinity
Mean value in simulation was -0.00

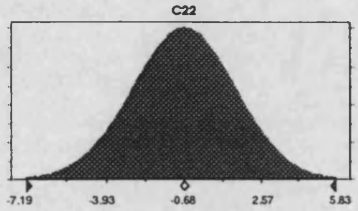


Assumption: C Married **Cell: C22**

Normal distribution with parameters:

Mean	-0.68
Standard Dev.	2.17

Selected range is from -Infinity to +Infinity
Mean value in simulation was -0.00



End of Assumptions

Endnotes

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7. Council of Mortgage Lenders "Housing Finance Fact Book" September 1989 p. 18

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