AN EMPIRICAL INVESTIGATION OF PRICING AND COMPETITION IN THE UK CREDIT CARD MARKET

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Thesis submitted to the University of Nottingham for the Degree of Doctor of Philosophy

June 2010

PAGE NUMBERING AS ORIGINAL

Abstract

The UK credit card market has attracted significant interest since the late 1990s, partly because of the strong growth it has enjoyed and also because of the aggressive behaviour of a number of new entrants. The credit card market consists of two very different businesses: card issuance – the "consumer-end", which provides credit cards and bears the credit risk of the customer and merchant acquiring, and the "backroom business", which recruits outlets to accept credit cards and undertakes the processing of transactions. The two businesses are distinct and in the UK only a small number of firms operate within each segment. This thesis concentrates on issues connect to the card issuance business.

Credit card issuers bundle a wide range of characteristics into their product offering. Whilst this allows issuers to differentiate their product and better satisfy consumers who have heterogeneous preferences, the Office of Fair Trading has suggested that the bundling of characteristics makes informed choice problematic because consumers do not know the price of specific credit card characteristics. A hedonic pricing model with a two-level nested error component structure is estimated. It is found that individuals who hold either a student or an initial credit card are charged a risk premium by issuers. In addition, consumers must pay higher prices to hold credit cards with certain characteristics such as introductory balance transfer offers, an annual fee, a longer than average interest free period, particular loyalty schemes, or donate money to charities.

The research undertaken differentiates itself from the existing literature by testing for heterogeneities in the interest rate transmission mechanism by examining how retail credit card rates in the UK respond to changes in the Bank of England's base rate. Error-correction models are estimated to analyze long-run pass-through; long-run mark-up and the short-run spend of adjustment. A number of theoretical arguments have been put forward to explain why retail rate responses might be sluggish. These include tacit collusion between financial institutions, sunk/menu costs and dynamic price discrimination which relies on consumer inertia. Retail credit card rates are indeed found to be sticky and overshooting is commonplace. However, the adjustment process was found to vary considerably between depending upon card issuer and card type.

Asymmetries in interest rates have attracted considerable attention in the financial literature, thus the interest rate transmission mechanism is investigated further by examining sign asymmetry. No evidence of asymmetric pricing was found, which suggests that credit card issuers respond to base rate increases and decreases at the same speed.

The competitive price setting behaviour of UK credit card issuers is empirically analysed. A discrete choice framework is used to look for evidence of price leadership, or whether some banks systematically react to movements in input costs more quickly than other banks. No evidence is found to suggest that one issuer dominates the market and acts as a price leader or that different issuers are responsible for leading price movements in different directions. There is no general pattern of price (i.e. interest rate) leadership amongst leading issuers in the UK, however, the empirical

findings do however suggest that issuers do interact with each other and that some leader follower behaviour is observed at the portfolio level.

Naturally, the work undertaken suggests some policy implications for regulators, consumer bodies and government agencies. Given that approximately 70 percent of all active accounts incur interest charges every month, consumers need to be provided with clear information and to be educated further in the benefits of shopping around. It is clear that the money transmission mechanism does not impact on credit card interest rates as well as it could do. Regulatory efforts are therefore required to help reduce interest rates in the light of a decrease in the base rate, thus helping credit card revolvers to decrease their debt burden.

Acknowledgements

It would not have been possible to undertake this PhD without the support and help of the University of Nottingham, my family and my friends, who I would like to express my thanks and gratitude to. There are also a number of people who have played a very influential role throughout my research and I would like to thank these people individually.

I would like to express my sincere thanks to my supervisors, Dr Kevin Amess and Professor Leigh Drake, for their valuable supervision, advice, guidance, encouragement and patience throughout the process of conducting the thesis. In addition, I would like to thank my examiners, Professor Steve Thompson (internal) and Professor Andy Mullineux (external).

I am extremely grateful to my parents, Kevin and Janet Knight, for the love and support they have given me over the years, and without which, the opportunity to undertake this research would never have risen. I would also like to thank my partner, Daniel Rhodes, for his support and encouragement throughout.

Finally I am grateful to Nottingham University Business School for their financial support.

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CHAPTER 1
INTRODUCTION

1.1 The Development of the Credit Card Industry

The origins of the credit card can be found in the USA, where they arose within retail stores at the beginning of the twentieth century as an alternative to cash payments (Worthington and Horne, 1993). This section traces the history of the credit card industry to enable the understanding of the concept of a modern day credit card.

1.1.1 The History of Credit Cards in the UK

Consumer credit in the United Kingdom was pioneered by Joshua Kelly Waddilove, who in 1920 began issuing cheques and vouchers to needy mothers in Bradford. The cheques were redeemable by special arrangement with a local shop (Lindsey, 1994). D.G. Hansen wrote: 'It was the forerunner of credit cards in two respects, in that payment was made by a voucher and the customer enjoyed the benefits of revolving credit.'(Lindsey, 1994:136).

The UK's first credit card was issued by Barclays Bank under the brand name of Barclaycard on 29th June 1966 (Lindsey, 1994; APACS, 2006a). The Barclays scheme followed the introduction of the Bank America card which was introduced in America during the 1950s. Barclays Bank was the first overseas licensee of the Bank America card (the predecessor of the Visa scheme) after the Bank of America announced that it would licence its blue, white and gold card to other banks.

However, while Barclays has been credited with introducing plastic cards to the United Kingdom, it was in fact Arthur Chesterfield, the chief general manager of the Westminster Bank, who was responsible for first introducing plastic cards to the UK, by persuading the Westminster Bank to purchase a 49% share in Diners Club (Nacelles, 2005). Plastic cards, in fact have been around since the 1950s when Diners Club and American Express launched so-called travel and entertainment cards (Nacelles, 2005). These cards were exclusive and very expensive. The introduction of plastic cards by Barclays was aimed at the mass market, and aimed to make a profit by lending money

rather than simply providing a convenient payment mechanism for a small fee. Originally, a customer was expected to repay the outstanding balance in full after receiving the monthly bill. In 1976, a breakthrough in the credit card industry was made, when the government allowed cards to offer extended credit. [1]

For many years, the Barclaycard was the only credit card available to consumers. The success of Barclaycard prompted the other three other major UK banks, Lloyds, Midland and the National Westminster together with the Royal Bank of Scotland to form the Joint Credit Card Company (JCCC) in 1973. The JCCC was established to provide the required marketing service and processing capacity to launch a rival card which would provide direct competition to Barclaycard. The rival card operated under the name of Access. While the Barclaycard brand remains a household name, the Access brand vanished during the early 1990s, becoming part of MasterCard.

Up until the late 1980s, the UK credit card market was dominated by the two players – Barclaycard (VISA) and the Access Group, who between them issued eight out of ten of the credit cards in circulation (Rowlingson and Kempson, 1994). The banks which issued credit cards all offered similar terms and conditions as well as charging similar rates of interest. Despite an increase in competition, credit card issuers were able to maintain extremely high interest rates throughout the 1980s.

The legalisation governing building societies, the Building Societies Act 1962, did not allow building societies to issue credit cards. However, this was made possible, following the enactment of the Building Societies Act 1986 and the subsequent remit made under it by the Building Societies Commission[2], which came into force on the 19th November 1987. Any building society in the UK, who had assets of at least £100 million, could issue credit cards and at the time, 65 building societies fell into this category (Monopoly and Mergers Commission, 1989). A number of building societies

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[1] The Credit Card is 40 this week, < http://news.bbc.co.uk/1/hi/business/5109663.stm> (accessed on 10/06/2006).

[2] The Building Societies Commission was replaced under the Financial Services and Markets Act 2000, by the Financial Supervisory Authority (FSA).

began to issue Visa credit cards including the Halifax, the Leeds Permanent, the National and Provincial and the Town and County.[3]

Until 1987 there was effectively only one merchant acquirer in the UK for each of the two international payment systems (MasterCard/ Eurocard and Visa). A monopoly type situation was thought to exist in relation to the supply of credit card services due to the absence of competition. The banks which issued credit cards all offered similar terms and conditions as well as charging similar rates of interest. MasterCard and Visa continue to dominate despite AMEX (American Express) entering into the market.

The Office of Fair Trading (OFT) and the Competition Commission (CC) are the two bodies who are responsible for regulating UK credit card companies. The OFT has the right to act if credit card companies breach certain regulatory acts such as the Consumer Credit Act and the Competition Act.

1.1.2 Recent Developments in the UK Credit Card Market

The UK is one of the most credit-card-intensive countries in the world with 67 million credit cards for a population of 59 million people (APACS, 2007). In the terms of cards per head the UK lies fifth in the world, lagging behind the USA, Canada, Japan and Singapore, as shown in Table 1.1. In 2005, the UK overtook Germany to become the most credit intensive country in Europe. The UK accounts for over 55 percent of the 155 million credit cards in circulation in Western Europe (Credit Card Consolidation Services, 2010). The DTI estimates that consumers could save £1.9bn a year in interest payments alone by switching to cheaper credit cards.

[3] The Halifax Building Society converted into plc. status on 2nd June 1997 and continues to issue credit cards. The Leeds Permanent Building Society was absorbed by the Halifax in 1995. The National Provincial Building Society was taken over by the Abbey National Plc. in 1996, while the Town and County Building Society was absorbed by the Woolwich Building Society in 1993. The Woolwich is now a trading name of Barclays Bank Plc.

Table 1.1: An International Comparison of Credit Card Usage

	Number of Cards in Issue (millions)					Increase in the Number of Cards (% change on previous year)					Number of Cards per Inhabitant				
	2004	**2005**	**2006**	**2007**	**2008**	**2004**	**2005**	**2006**	**2007**	**2008**	**2004**	**2005**	**2006**	**2007**	**2008**
Canada	56.54	60.23	61.77	68.41	72.68	6.7	6.5	2.6	10.8	6.2	1.76	1.86	1.89	2.07	2.17
France	-	31.16	28.90	32.72	34.01	-	-	-7.3	13.2	3.9	-	0.5	0.46	0.51	0.53
Germany	-	-	-	2.84	3.05	-	-	-	-	7.1	-	-	-	0.03	0.04
Italy	27.02	28.89	31.27	34.51	35.98	5.4	6.9	8.2	10.3	4.3	0.47	0.5	0.54	0.59	0.61
Japan	273.38	289.05	292.66	308.59	-	3.7	5.7	1.2	5.4	-	2.14	2.26	2.29	2.42	-
Singapore	3.93	4.44	5.09	5.65	6.28	12.5	12.9	14.6	11.0	11.1	0.94	1.04	1.16	1.23	1.30
Sweden	4.20	3.91	4.58	4.30	4.67	48.6	-6.9	17.1	-6.2	8.7	0.47	0.43	0.50	0.47	0.50
Switzerland	3.39	3.45	3.87	4.31	4.50	1.0	1.8	12.2	11.3	4.4	0.45	0.46	0.51	0.57	0.58
United Kingdom	69.89	69.86	69.52	67.31	66.16	4.6	0.0	-0.5	-3.2	-1.7	1.17	1.16	1.15	1.10	1.08
United States	1,246.30	1,274.91	1,317.47	1,326.75	1,280.50	-2.3	2.3	3.3	0.7	-3.5	4.24	4.29	4.39	4.39	4.21
Total	**1,684.65**	**1,765.91**	**1,815.13**	**1,855.39**	**1,507.83**	**-0.6**	**3.0**	**2.8**	**2.1**	**-2.5**	**2.85**	**2.68**	**2.74**	**3.44**	**2.77**

Source: Statistics on Payments and Settlement Systems in Selected Countries – Figures for 2008, CPSS Publication Number 88

Notes: - indicates that there is no information available for that year

During the last 20 years, the UK's financial services sector has undergone extraordinary change. Deregulation in the 1980s, combined with technological developments and consumer change have bought about demand-led retail banking strategies implying the renewal of institution and market structures (Clarke et al., 1998). As a result financial institutions have diversified their product ranges and distribution channels (Gardner et al., 1999). Important changes to the credit card market include rapid growth in direct mail solicitations and related marketing innovations; expansion in the use of electronic payment method and in levels of consumer debt burdens; and increased default charges.

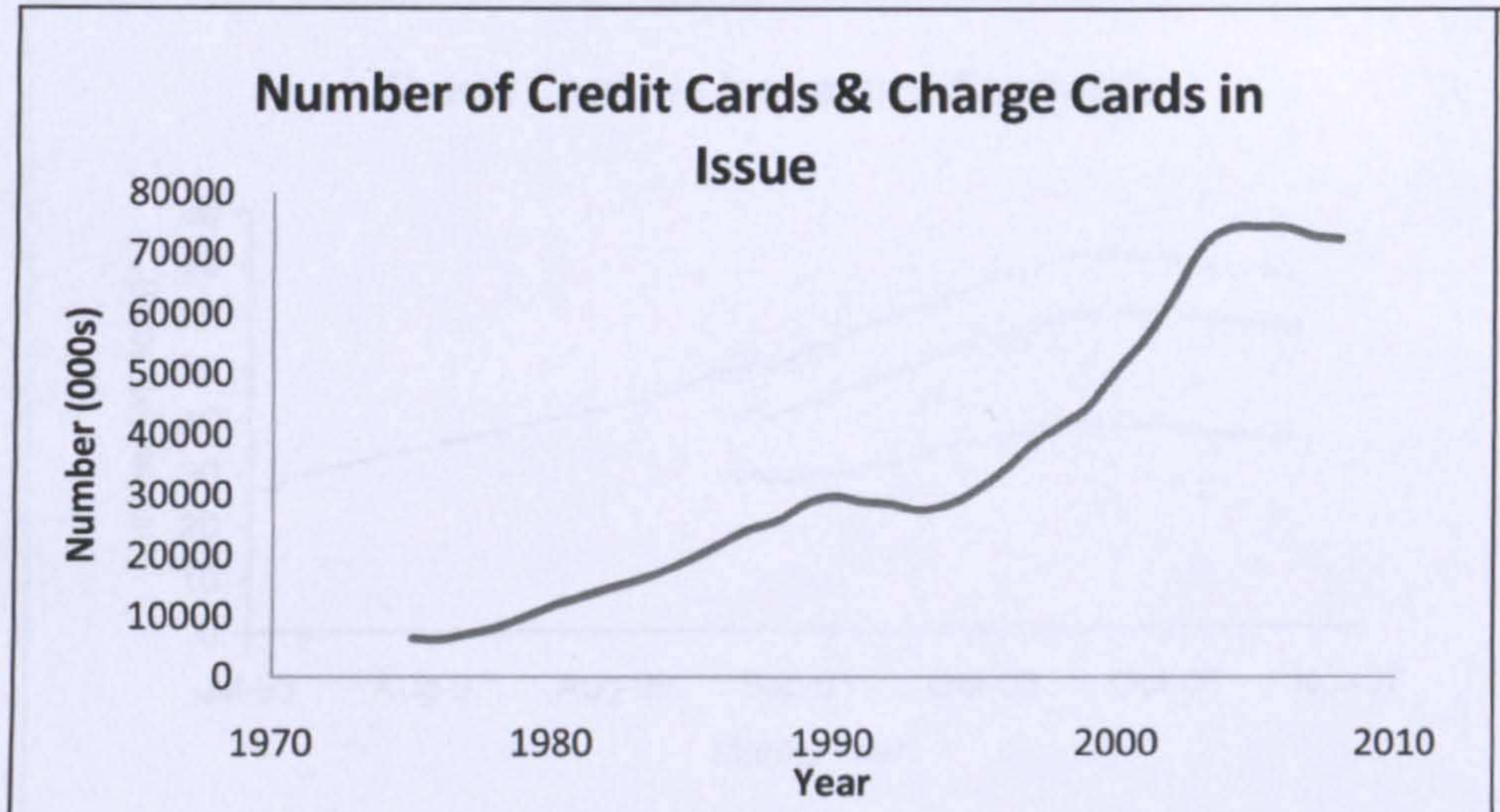
1.1.2.1 Background on Current Climate in Credit Card Market

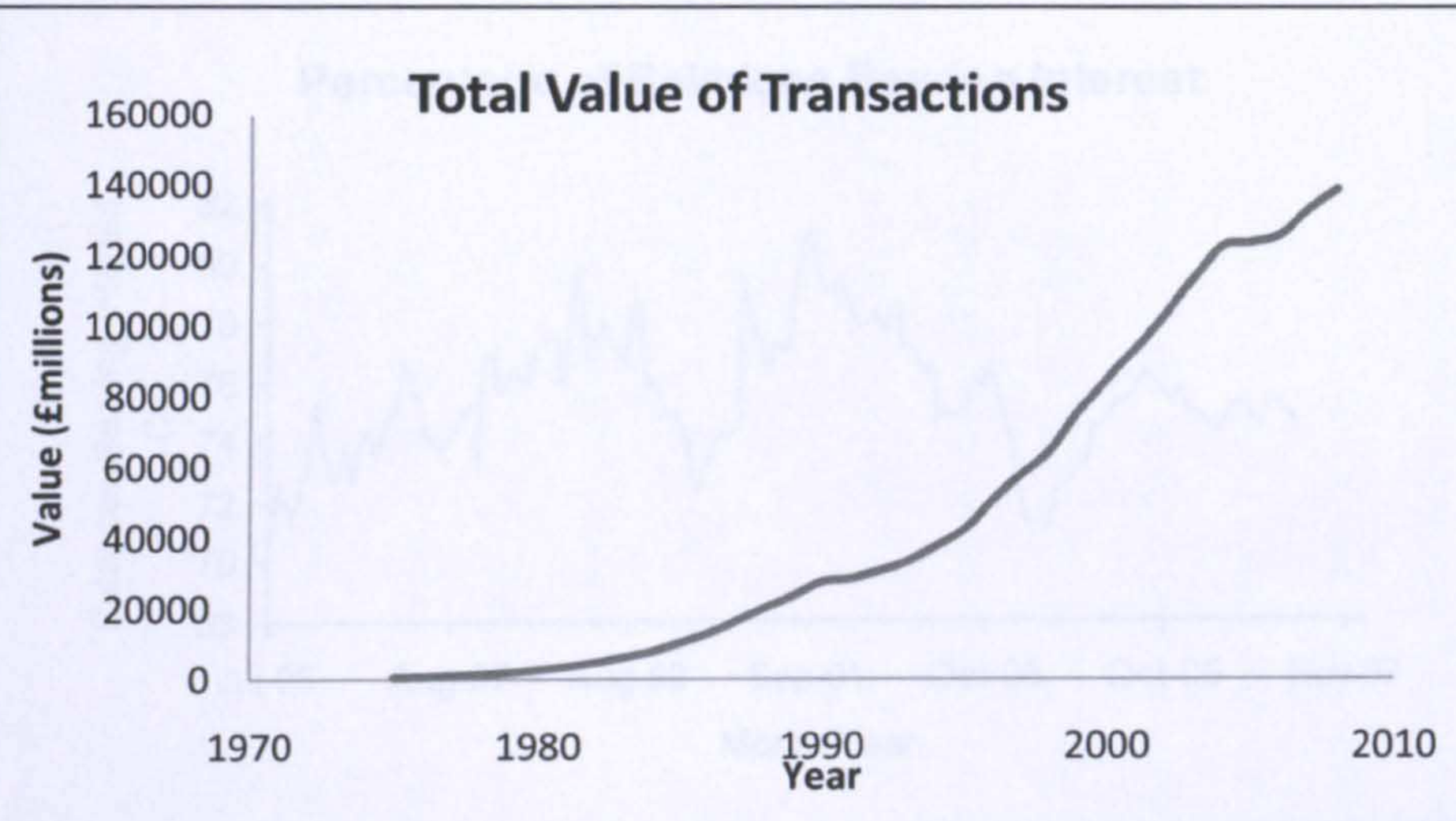
The UK credit card market has grown markedly since the first credit cards were introduced in 1966. Figure 1.1 illustrates the growth in credit cards since 1975 in the terms of number of cards in issue and transaction volumes. In 1975 there were 6,410 thousand credit and charge cards issued by banks, compared to 72598 thousand cards in 2008. The number of credit cards in issue have been in slight decline since 2005 when the number of credit cards in issue peaked at 74583 thousand. Figure 1.1 also illustrates the impact of card innovations within the market. Since the introduction of premium credit cards in the early 1990s greater numbers of premium, affinity and co-branded cards have been introduced.[4]

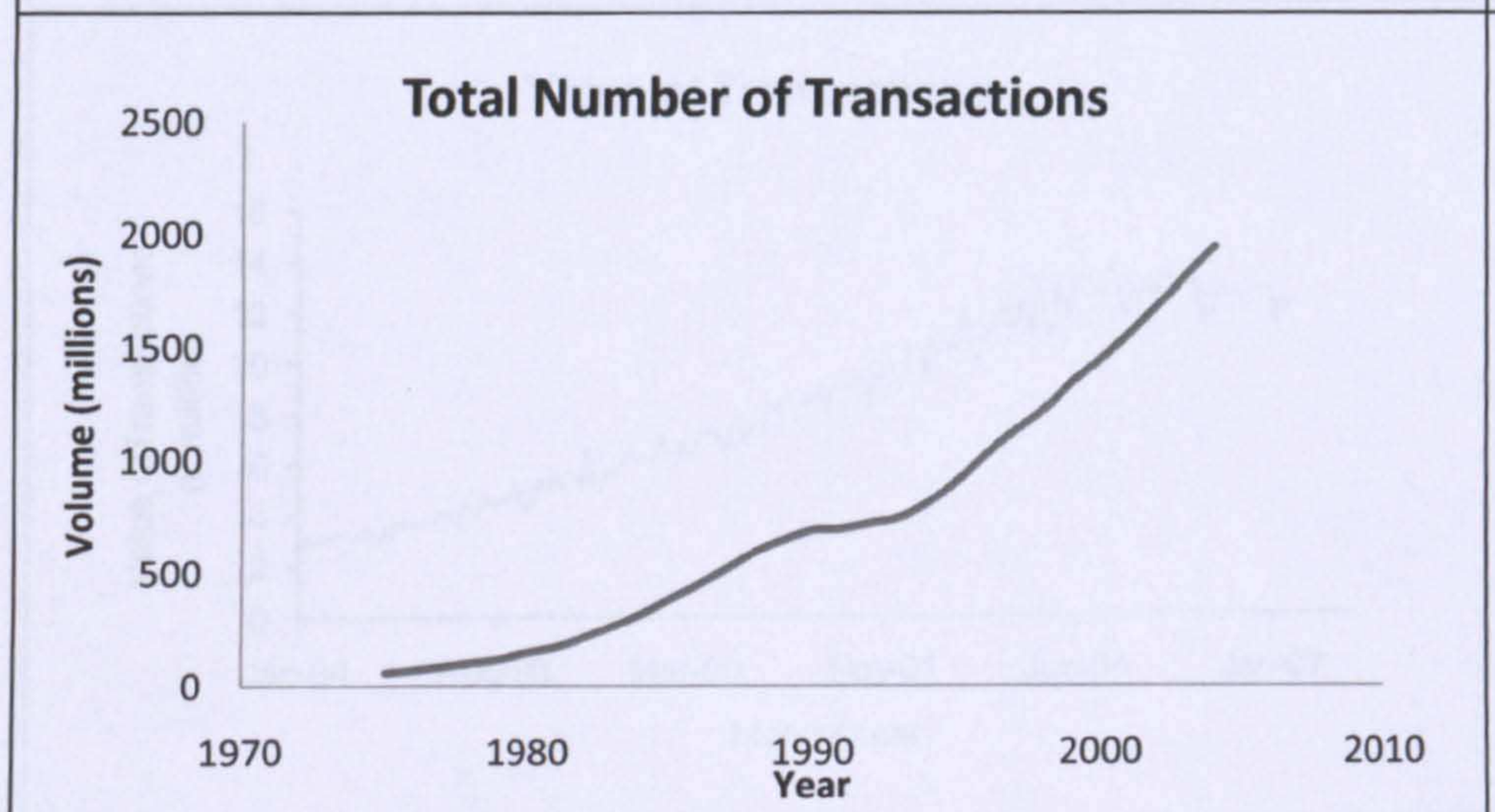
In the mid-1980s, the credit card business provided significant profits for the retail banking industry in the UK. The bulk of these profits came from three sources; interest charged to cardholders on unpaid balances, late payment charges and fees paid by the retailers that honoured the cards. By the early spring of 1989, the consistently high profitability of the UK credit card industry appeared to be threat. Many of the smaller banks were beginning to enter the market, the fees paid by retailers declined due to increased competition and outstanding balances appeared to be falling. Up until 1989, no UK bank had charged an annual fee for the use of a credit card.

[4] Types of credit cards will be discussed in detail in Chapter 2.

Figure 1.1: The Growth of the UK Credit Card Market







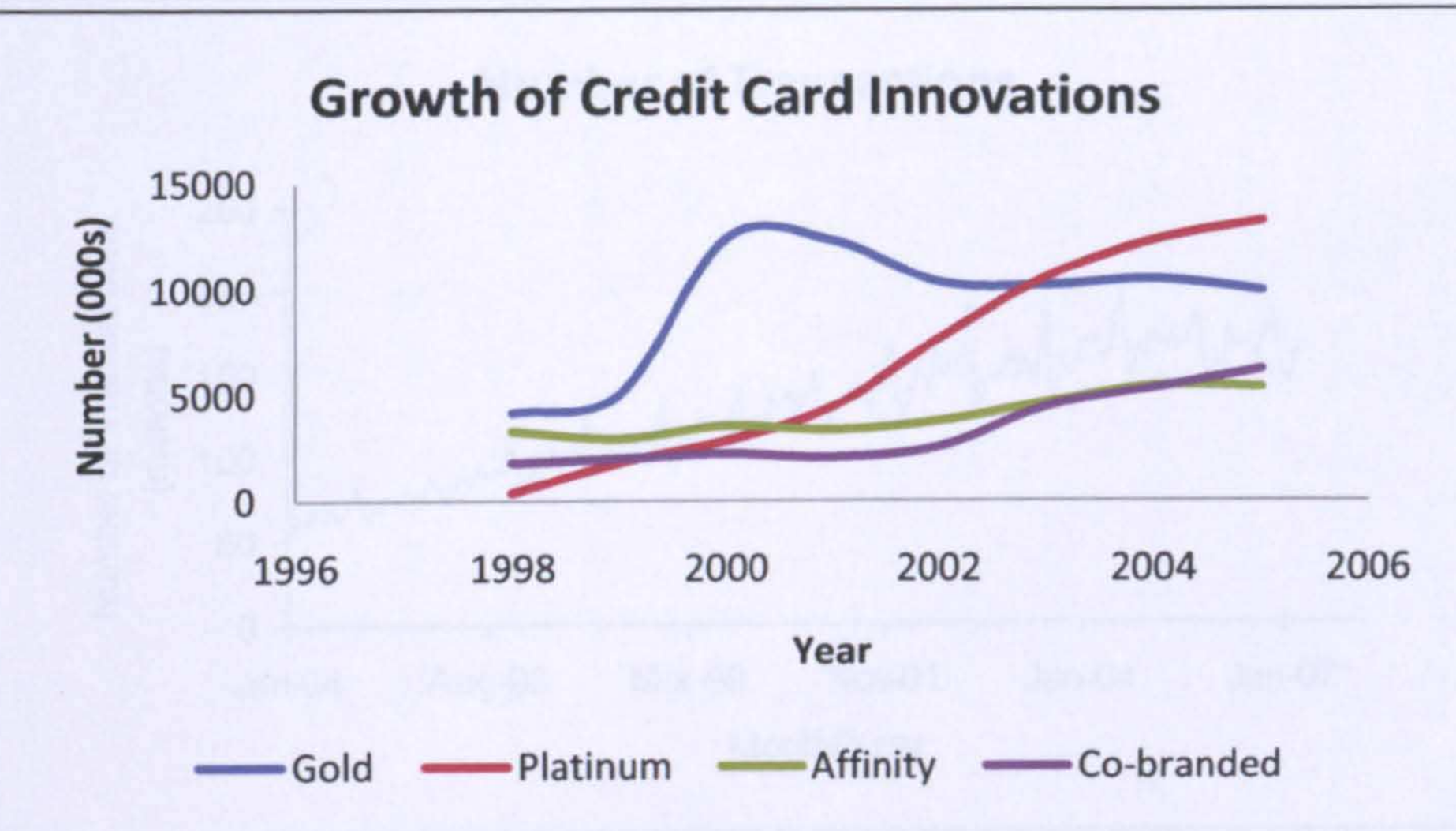
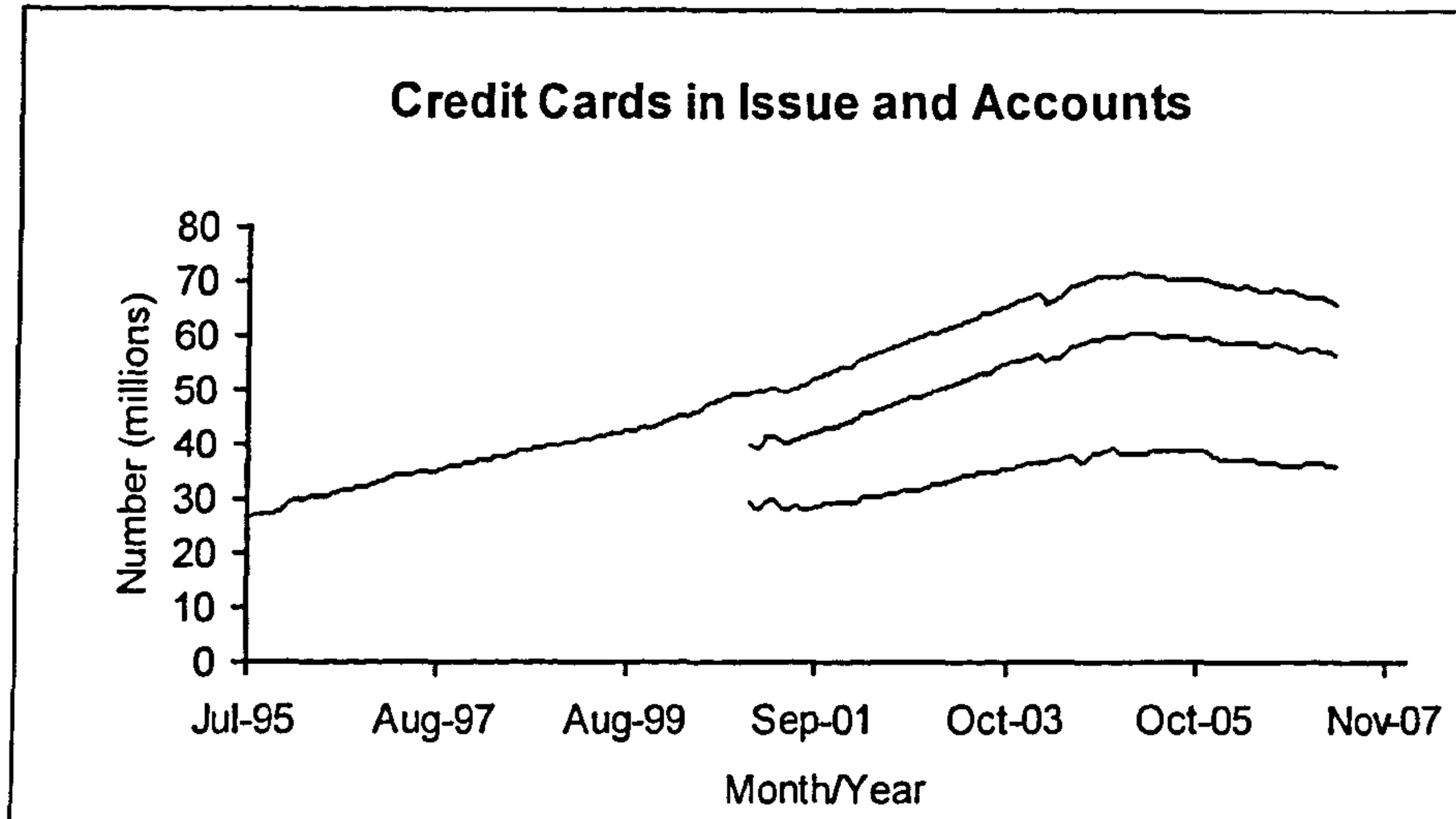
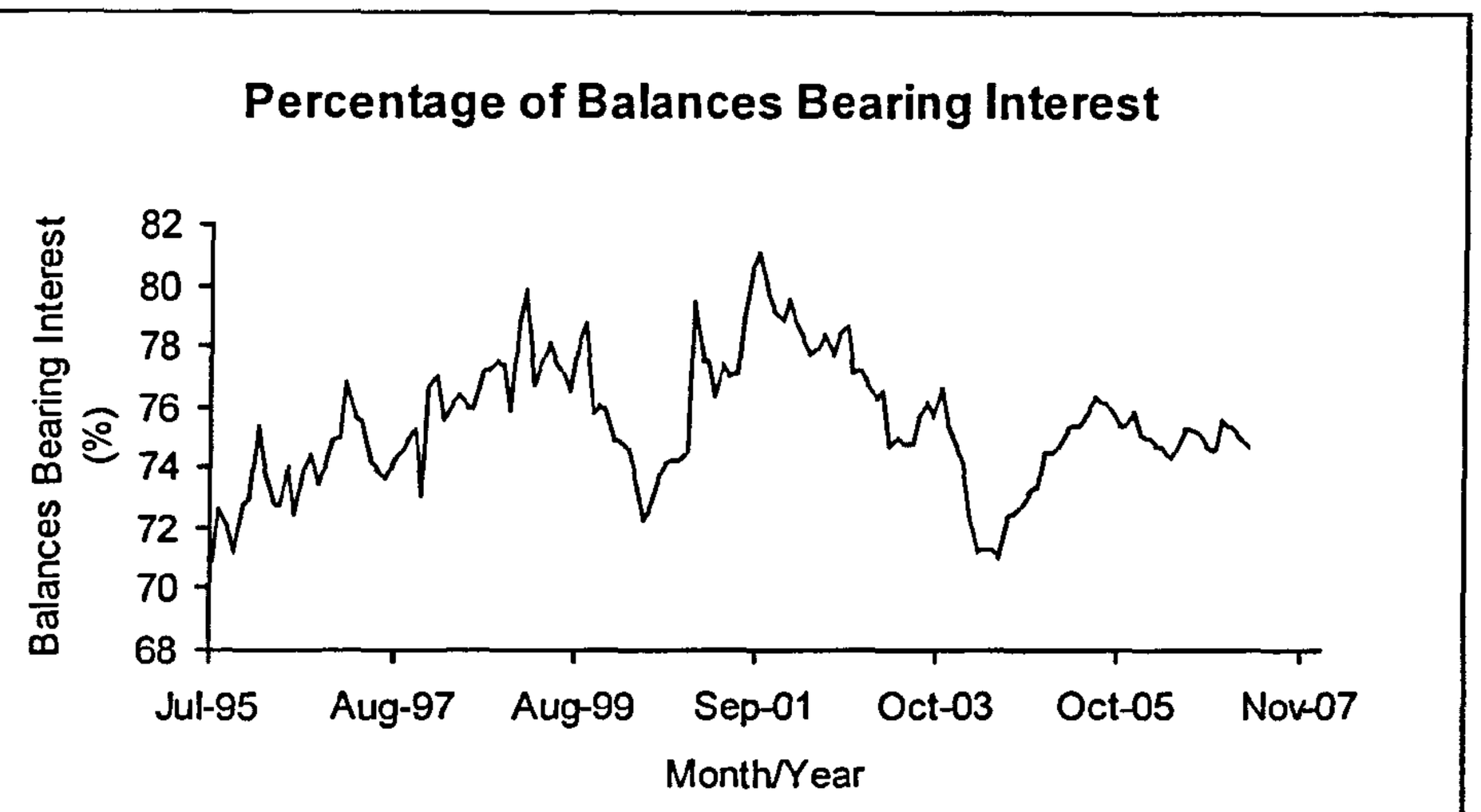
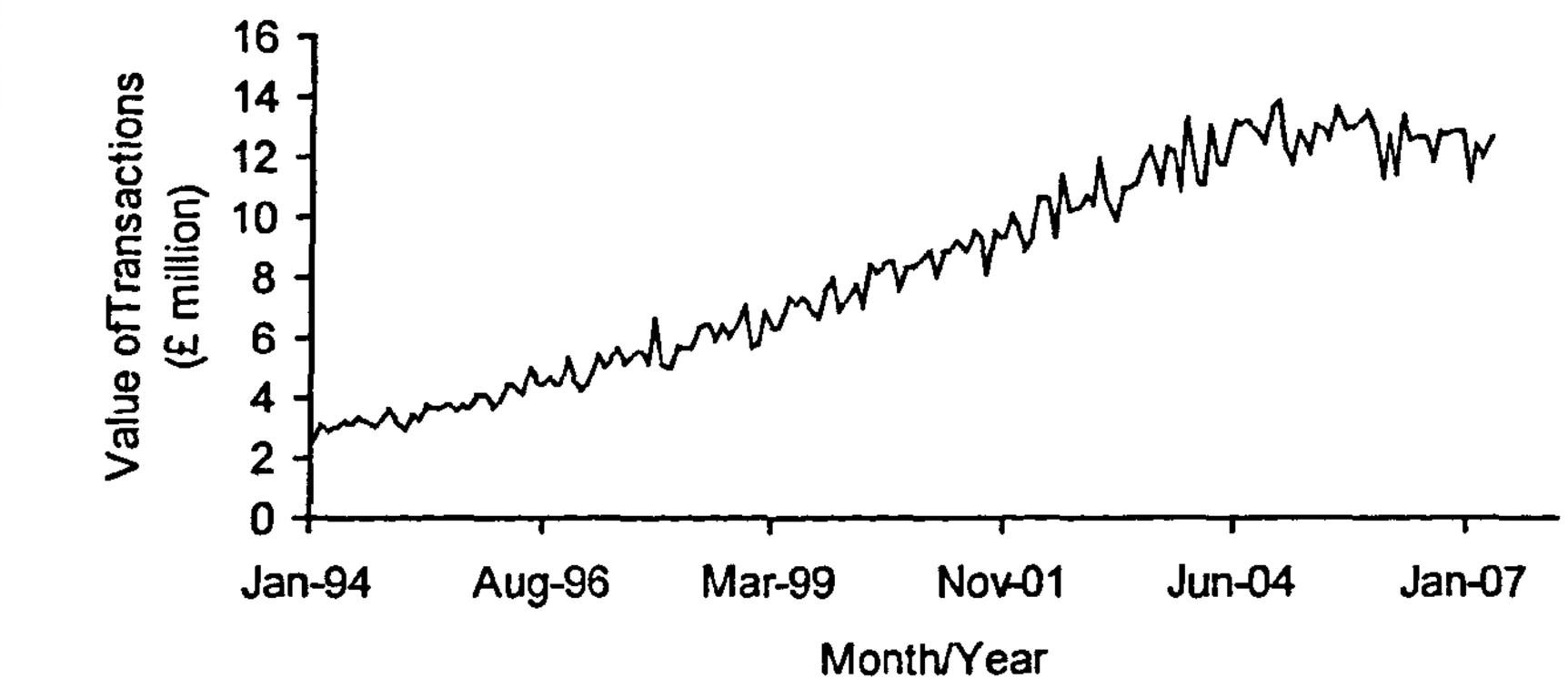
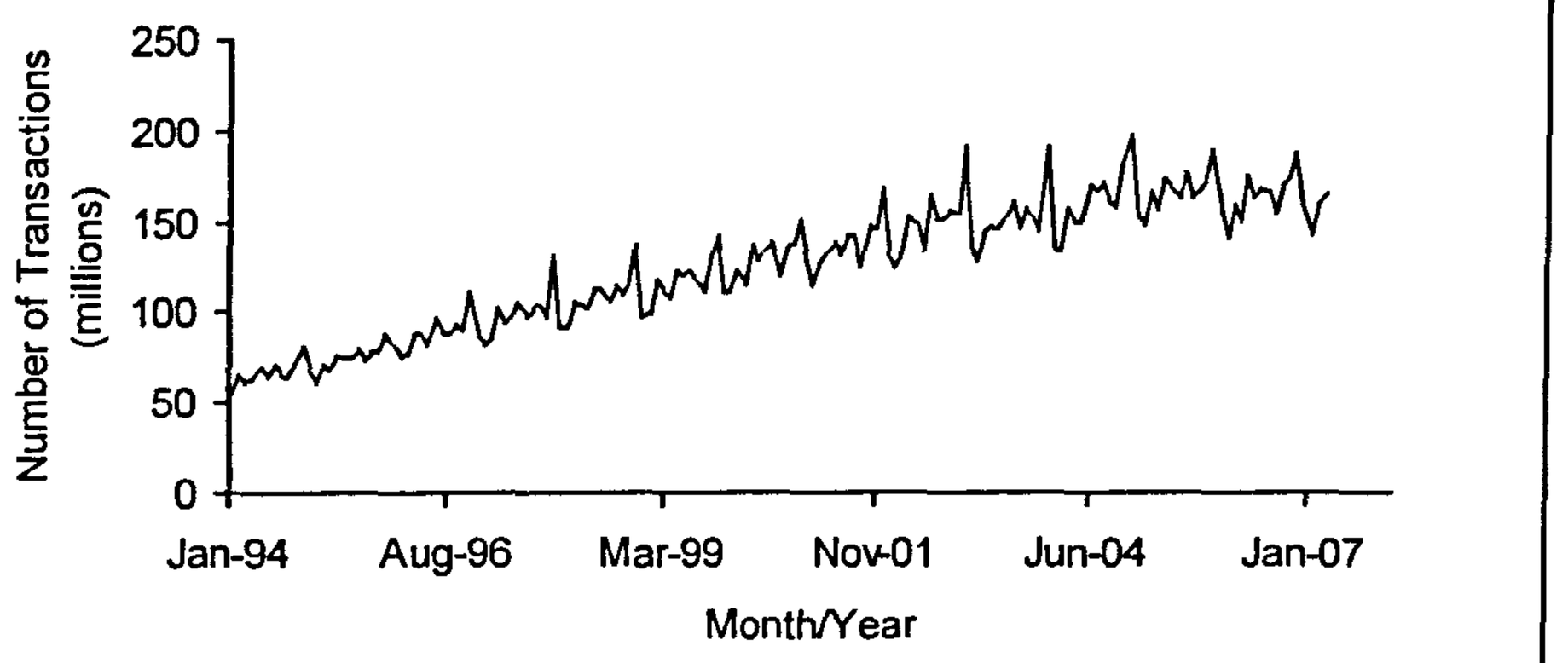


Figure 1.2: The Changing Nature of the UK Credit Card Market









Since the early 1990s the number of credit cards available in the UK has rapidly expanded and currently there are approximately 1,300 cards to choose from (DTI, 2003). Multiple card holding has also become increasingly popular. For instance, in 1995 there were 25.8 million credit cards in issue (Key Note, 1999); however in 2007 67.3 million credit cards were in issuer with the average consumer holding 2.4 credit cards (APACS, 2008). Likewise, in 1995, 888 million purchases were made using credit cards with an average transaction value of £48.05 (Key Note, 1999) compared to 1.9 billion purchases with an average transaction value of £63.22 in 2007 (APACS, 2008).

A detailed overview of the credit card market is given in Figure 1.2. Figure 1.2 illustrates monthly changes in the number of cards issued, the percentage of accounts which bear interest and the volume/value of transactions. The value of outstanding credit has risen from £9,072 million in 1994 to £63,773 million in May 2007. The percentage of credit card accounts which bear interest has been variable, in June 1995 70.4% of accounts bore interest whereas in May 2007, 74.7% of accounts did (BBA, 2009). This peaked at in October 2001 at 81.1%. In addition it can be seen that the number of inactive accounts has risen, which corresponds with the decline in accounts bearing interest between November 2001 and May 2007.

1.1.2.2 Credit Card Competition

Table 1.2 provides insight in to the market conditions observed in the UK credit card market. The largest issuers in the UK have witnessed a decline in their market share over recent years. Barclaycard, for example, enjoyed a market share of approximately 26.2 percent in 1997; however by 2001 this had fallen to 19.0 percent (Spencer, 1999). Lloyds TSB have also witnessed a decline in their market share with a fall from 16.1 percent to 11.5 percent. The market share of different providers is presented in Table 1.3. It is common for issuers to offer a range of credit cards under different provider brands. For example MBNA is responsible for issuing credit cards not only under its own brand but also for Alliance and Leicester and Abbey, while Barclaycard also issues credit cards under the brand name, Goldfish.

Table 1.2: Summary of the UK Credit Card Sector [5]

	Number	Sector Type	Dependency
Card Schemes	3	Oligopoly	None
Banks	15	Imperfect Competition	Card Schemes
Connectivity Solutions	60+	Perfect Competition	Banks
Merchants	2 million	N/A	N/A
Cards in Issue	69 million	N/A	N/A
Outstanding Balances	£65,302 million	N/A	N/A

Source: Stretch, C. 2006. "Credit Cards - How does it all Work? An Overview Paper." Complementary Solutions.; APACS. 2005. Annual Yearbook of Payment Statistics, APACS Administration.

The UK credit card market experienced high levels of competition in 1999, which led to UK issuers to introduce changes to their APRS, and to introduce new customer benefits (Key Note, 1999). The expansion of different methods to obtain financial services has opened up the sector to non-traditional providers and new channels (Martinelli and Sparks, 2003). From a bank-orientated financial system, there has been a shift towards a multi-channel system, with traditional barriers to entry which existed to separate sectors being eroded.

Consequently, many companies from different business sectors have entered the market, increasing the level and type of competition. Large food retailers appear to possess many of the special characteristics (Alexander and Colgate, 2000; Martinelli and Sparks, 1999), enabling them to successful role in the provision of financial services. Sainsbury's and Tesco moved into the retail banking sector in 1997.

[5] All figures are approximations.

Table 1.3: Estimated Market Share, by Brand, April 2008

Brand	Issuer	Market Share (%)
Barclaycard	Barclays	22
Lloyds TSB	Lloyds TSB	17
HSBC	HSBC	12
NatWest	RBS	12
Halifax	HBOS	11
MBNA	MBNA	8
Capital One	Capital One	8
M&S Money	HSBC	5
Tesco Personal Finance	RBS	5
Royal Bank of Scotland	RBS	5
Nationwide	Nationwide	5
Abbey	MBNA	4
Alliance and Leicester	MBNA	3
American Express	Amex	3
Egg	Egg	3
Mint	RBS	3
Co-operative	Co-operative	2
Bank of Scotland	HBOS	2
Goldfish	Barclaycard	2
First Direct	HSBC	2
Morgan Stanley	Morgan Stanley	1
Yorkshire Bank/Clydesdale Bank	National Bank of Australia	1
Sainsburys Bank	HBOS	1
Other	-	6
Don't Know	-	3

Source: Mintel, 2009

The high street banks eyed them nervously as they saw the potential for a very real competitive threat from trusted retail brands that were able to leverage their large and established customer bases (IBM, 2003). Examples of the types of new card providers who entered the market during the 1990s are given in Table 1.4. The majority of new issuers have waived the annual fee, and many have offered interest rates which were significantly lower than that of the traditional high street banks, for example, when Egg entered the market in 1999, they offered an APR of 9.9% on purchases (Moneyfacts, November 1999). The UK credit card market experienced an influx of new issuers from the US. MBNA and HFC, where joined by their fellow US counterparts, Capital One, Bank One and the Associates

Table 1.4: The Types of New Players in the UK Credit Card Market in the 1990s

Type of Player	Examples of New Players in the UK Market
Foreign Entrants	American Express, Citibank, MBNA, HFC, Capital One, BankOne, Peoples Bank, The Associates
Non-Financial Institutions	Virgin, Vauxhall or General Motors (GM), AT&T Universal
Travel and Entertainment	American Express, Diners Club
Specialist Credit Card Issuers	MBNA, Capital One, Household International
Retail and Store Cards	Tesco, Sainsbury's, Marks and Spencer
Internet Cards	Egg, Marbles, Smile, Cahoot

Source: Wonglimpiyarat, J. 2005. *Strategies of Competition in the Bank Card Business: Innovation Management in a Complex Economics Environment*. Brighton: Sussex Academic Press, page 30

In addition, American Express announced that after its success in the charge card sector that it aimed to become a major player in the credit card sector. It has made a major impact in the UK credit card market, which is possibly due to only a very limited number of merchants accepting Amex. MBNA have been the most successful entrant from the US, in 2004 it had a market share of 13% and 20% of the consumer base, placing it third behind Barclaycard and the Royal Bank of Scotland who have a market share and consumer base share of 16%/25% and 16%/24% respectively (Mintel, 2004).

In recent years, some European credit card issuers have attempted to enter into the UK sector such as the French bank Sygma Banque SA (Groupe Cofinoga), who trade under the name Laser UK (formally Creation Financial Services Ltd) and issue credit cards on behalf of Sheffield Wednesday Football Club and Derby County Football Club. However, issuers such as Laser UK have failed to make a huge impact on the market.

Competition not only came from the US but from the internet and the high street. Typically, the new entrants have targeted the most profitable customer segments in the most lucrative product ranges (Boss et al., 2000). The 1990s saw the emergence of

affinity cards and cards issued by non-financial institutions. Supermarket Banks such as Sainsbury's Bank and Tesco Personal Finance entered the market and began issuing credit cards through joint ventures with Halifax and Royal Bank of Scotland, respectively, in 1995. To enable financial services to be offered to customers, UK supermarkets have built alliances with financial institutions. Co-operation can be either through a joint venture or a tie-up (Martinelli and Sparks, 2003; Alexander and Pollard, 2000), see Table 1.5 for a summary of the methods used by different supermarkets to enter in the financial sector. Since entering into the retail banking sector supermarkets have continued to innovate and rapidly increased their product range to cover personal loans, mortgages and credit cards. They have been joined in recent years by other retailers such as Safeway[6], the Post Office and Asda. Marks and Spencer's have offered a range of financial services products and its charge card has been available since 1985. However it was not until October 2003 that Marks and Spencer entered into the credit card market. In the terms of pricing, supermarkets offer some of the most competitive interest rates in the marketplace (IBM, 2003).

The credit card market experienced dramatic change in 1999. Internet card issuers such as Egg, Smile and Marbles entered the market place offering lower interest rates than the traditional high street issuers. In 1999, annual fees disappeared and extras such as travel insurance and loyalty schemes began to be offered to attract new customers. It was observed that a greater number of customers were beginning to hold more than one credit card. The profitability of lending on credit cards has hardly changed at all between the 1993 and 2004. However since the market has become much more competitive, card companies have seen their margins squeezed. The majority of cashback deals have been withdrawn and charges are being imposed for balance transfers, in order to compensate for the decrease in margins and profit. Despite intensive competition from US issuers, such as MBNA, and new entrants, such as Egg, the big five banks[7] have retained their dominance of the UK credit card market (Datamonitor, 2003).

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[6] Safeway was subject to a takeover by Morrisons in 2004.

[7] The big five UK banks are; Barclays, HSBC, Lloyds TSB, HBOS and the Royal Bank of Scotland/NatWest.

Table 1.5: How Supermarkets Operate in the Financial Sector

Retailer	Bank	Arrangement	Date Established	Additional Information
Sainsbury's	Bank of Scotland	Joint Venture	February 1997	55% Sainsbury's 45% Bank of Scotland
Tesco	Royal Bank of Scotland	Joint Venture	February 1997	Previously a joint venture with the NatWest. NatWest incorporated in the Royal Bank of Scotland Group. 50:50 partnership.
Marks and Spencer	HSBC	Profit Sharing Partnership	November 2004	Marks and Spencer's Financial Services was established in 1985 to administrate the M&S Charge card. In 2004, this was sold to HSBC and a 50:50 profit sharing partnership was established. Marks and Spencer's Financial Services is wholly owned subsidiary of the HSBC group.
Safeway	Abbey National	Strategic Partnership	November 1996	Safeway was subject to a takeover by Morrisons in 2004.
Morrison	HSBC	Rental Agreement	May 1997	HSBC have branches inside selected stores.
Asda	Lloyds TSB	Rental Agreement	December 1997	Credit cards and store cards are provided by GM Money.

From Table 1.3 it can be seen that the big five banks accounted for around 60% of the market in 2004. Apart from Egg, which has approximately a 5% share of the consumer base (Mintel, 2004), supermarket and internet cards have not obtained a significant market share.

The rapid expansion of the UK credit card market in the 1990s was stimulated by an influx of card issuers from America. MBNA entered the market in 1993 and, along with other new entrants such as Morgan Stanley and Capital One, have been credited with rejuvenating the pricing structure of the UK credit card market.

1.1.2.3 Credit Card Products

Credit card issuers have been concerned with developing new services, mainly by exploiting now technology, and by attempting to distribute their products to a larger customer-base. During the 1990s, credit cards increased in sophistication with card issuers tailoring products to individual customer needs thus exploiting so-called niche markets. Through product innovation, customers are now able to choose from a wider range of products. Gold cards, which were first introduced around 1995, which had additional features, were marketed only to high-income customers and often by invitation only. Gold cards have become more common and in 2001 represented approximately 22% of all cards in issue (Kubos-Labiak, 2004); however the number of gold cards has declined due to the introduction of platinum cards. Table 1.6 provides some information on the growth of credit card products.

By the end of the 1990s annual fees began to disappear, and in bid to attract customers, credit card issuers offered extras such as loyalty schemes and travel insurance.

Table 1.6: Types of Credit Cards in Issue

Number of Credit Cards, 000s	1996	1997	1998	1999	2000	2001	2002
Total number of credit cards in issue	32,541	36,565	38,299	41,424	47,808	51,701	58,794
Gold	-	-	3,579	4,494	11,817	11,331	9,680
Platinum	-	-	389	1,845	2,864	4,431	7,675
Co-branded	-	-	1,821	2,024	1,952	1,141	1,454
Affinity	-	-	3,303	2,954	2,729	2,301	2,173

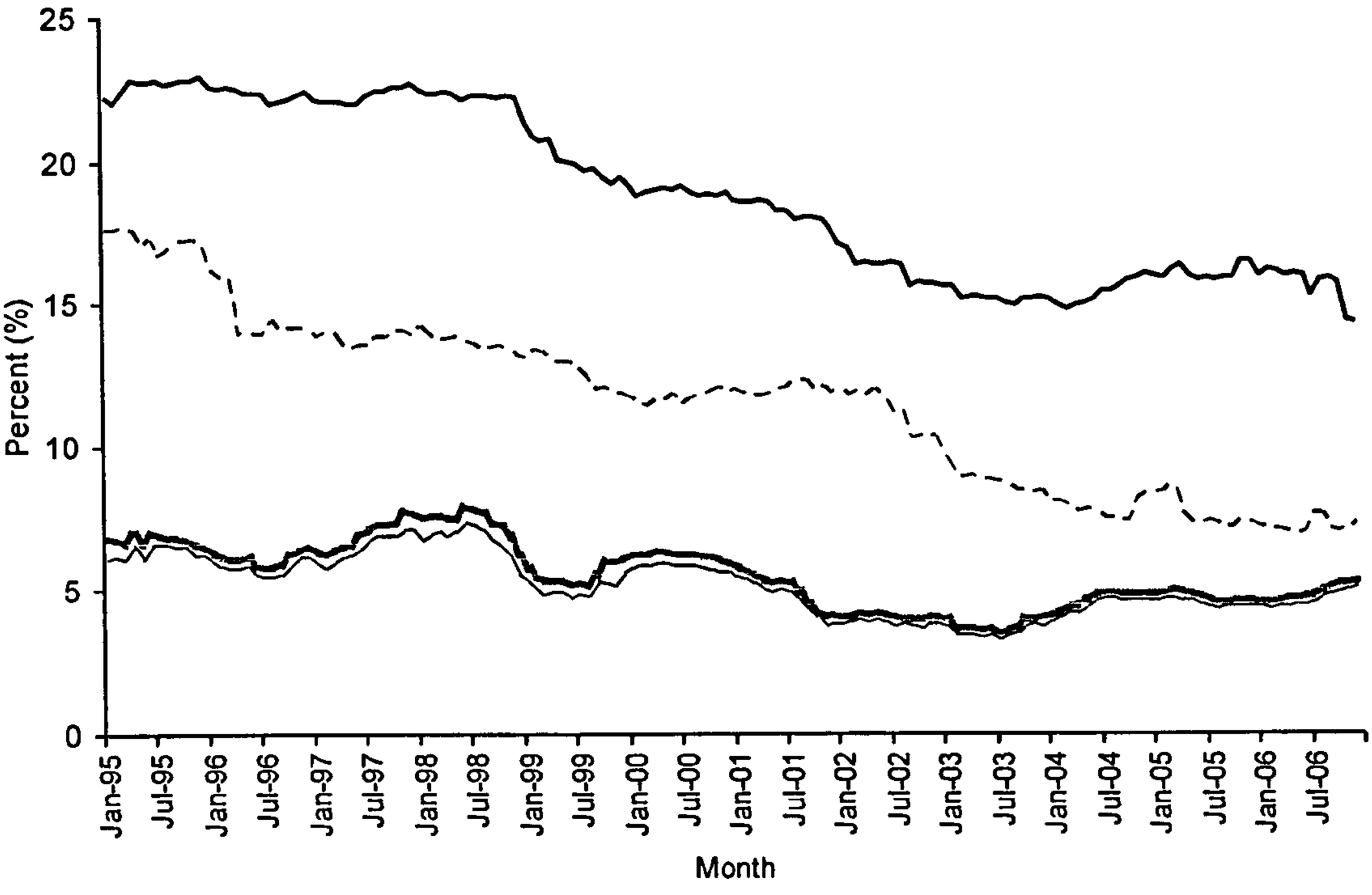
Source: Kubis-Labiak, B., 2004. *The UK Retail Banking Market Outlook*. Business Insights: London

1.1.2.4 Rates and Spreads

Interest rates on credit cards have declined substantially over the past decade, consistent with a general decline in market rates. The average credit card yield has declined steadily from 23.2% in the first month of 1995 to 14.34% in the last month of 2006, see Figure 1.3. It is tempting to conclude that this decline in credit card rates is due to increased competition from new entrants during the period. However, the behaviour of spread between credit card rates and other market rates does not necessarily indicate that pricing has become more competitive (Calem, Gordy and Mester, 2006).

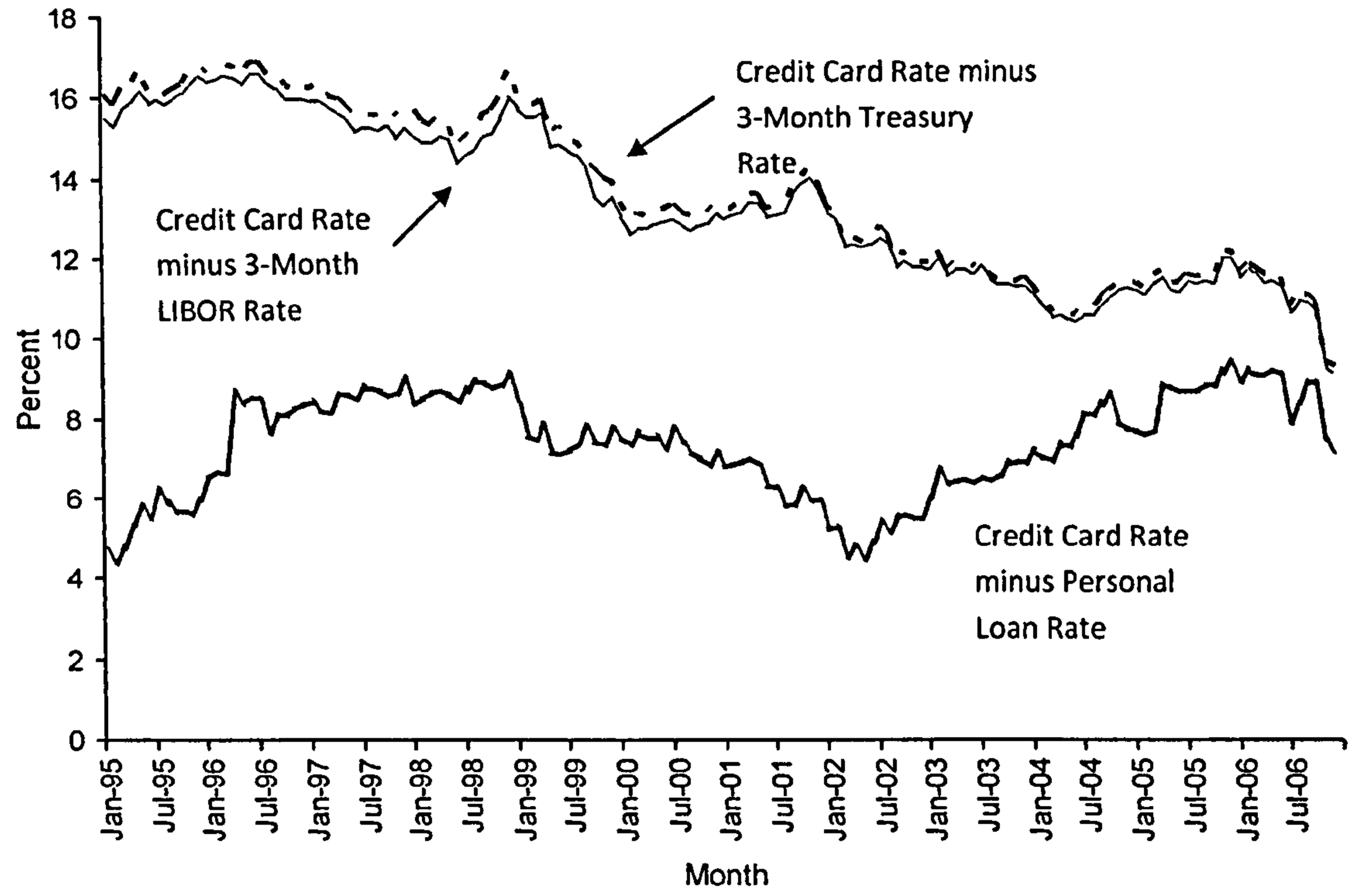
Credit card spreads reached their highest levels between 1996 and 1998, see Figure 1.4. Overall credit card rates have closely followed the trend of market rates. The pattern of rate movement suggests that credit card interest rates have become less sticky, although spreads continue to vary counter-cyclically.

Figure 1.2: Average Credit Card Yields



Source: Bank of England Statistical Database <www.bankofengland.co.uk>

Figure 1.3: Credit Card Spreads



Source: Bank of England Statistical Database <www.bankofengland.co.uk>

It is difficult to draw conclusions based on the behaviour of credit card spreads for two reasons. First, these observed spreads are affected by variation in expected credit losses, which are difficult to measure (Calem et al., 2006). Second, as document by Stango (2002), in recent years issuers have increasingly offered variable interest rates, which are likely to change in line with the dynamic behaviour of measured spreads.

1.1.2.5 Credit Card Marketing

Marketing innovation and expanded solicitation activity by card issuers is likely to have increased the willingness of consumers to shop around for lower rates (Crook, 2002; Kerr and Dunn, 2002). Issuers' aggressive mail marketing efforts have been amplified by telephone, event and internet campaigns, such behaviour has meant that the majority of consumers do not have to search hard to find a new credit card. According to Furletti (2003), the number of mailed credit card solicitations increased fivefold over a period of ten years from 1991 to 2001.

1.1.3 The Role of Regulation and Legalisation in the UK

The regulation of credit cards is currently provided by the Consumer Credit Act 1974, which was introduced on 1st July, and a small number of secondary legislations.[8] The Office of Fair Trading (OFT) is responsible for enforcing the Act along with local trading standard offices. The Department for Trade and Industry (DTI) is responsible for maintaining and improving consumer credit regulation. The Financial Services Association is responsible for payments after control was transferred from APACs in 2009.

The Consumer Credit Act 1974 consists of a number of clauses including Section 75 which provides protection to consumers buying goods costing between £30 and £10,000 on their credit cards. These values have subsequently increased to £100 and £30,000. Also under Section 75 of the Consumer Credit Act, credit card companies are jointly responsible, along with the supplier of the goods or services, for any breach of

[8] These secondary legislations include the Consumer Credit (Disclosure of Information) Regulation 2004, the Consumer Credit (Advertisements) Regulation 1989 and the Consumer Credit (Total Charge for Credit) Regulations 1980.

contract of misrepresentation by the supplier. In March 2006, the Court of Appeals ruled that Section 75 should apply to transactions made overseas on UK-issued credit cards, as well as to those transaction made in the UK, even if the transaction is made over the telephone or internet with an overseas company (BBC, 2008)[9]

The period of high credit card interest rates in the 1990s prompted some critics to call for government intervention. It is argued that regulatory efforts to reduce credit card interest rates could help revolving credit card users to decrease their debt repayment burden. Conversely, government intervention could produce inadvertent negative consequences for convenience users. The profits of credit card companies are likely to be weakened by lower interest rates. As a consequence, credit card companies are likely to impose other revenue-increasing actions such as the shortening the interest free "grace" period, reintroducing and/or raising annual fees and raising charges on cash withdrawals. By implementing such strategies they can attempt to maintain their existing profit levels. However these strategies are likely to raise the cost for convenience users of credit cards. Therefore any government intervention in the credit card market should be done with extreme caution.

On 26th July 2005, the OFT issued its provisional conclusions on its investigation into credit card default charges. The OFT stated that the charges, typically in the £20 to £25 range, were "disproportionate" and "unfair". The OFT confirmed these findings in April 2006. The OFT concluded that a fair default charge should not exceed the level of administrative costs usually associated with a default. Many lenders have argued that the fee is based on the additional costs which arise from customers making late payments. It should be noted that UK banks have successfully fought off a similar challenge from the OFT with respect to overdraft charges.

The OFT set a threshold for intervention at £13. Any default charge above this level would be presumed to be unfair, and would be challenged unless there were "exceptional business factors". Many issuers have publicly stated that they did not agree with the OFT's assessment, but they nevertheless agreed to reduce their charges. Default charges have generated large revenues for card providers and thus it

[9] OFT wins credit card cover appeal, < http://news.bbc.co.uk/1/hi/business/4832573.stm>

is not surprising that since the OFT ruling, 19 card providers have increased their interest rate charges (PWC, 2006).

In addition to the statutory regulation discussed above, the majority of credit card issuers subscribe to voluntary industry codes of practice. The Banking Code and the Finance and Leasing Association Code are the two main voluntary codes in the credit card industry. Since, the FSA overtook the supervision of the credit card market these codes of practice have been come compulsory.

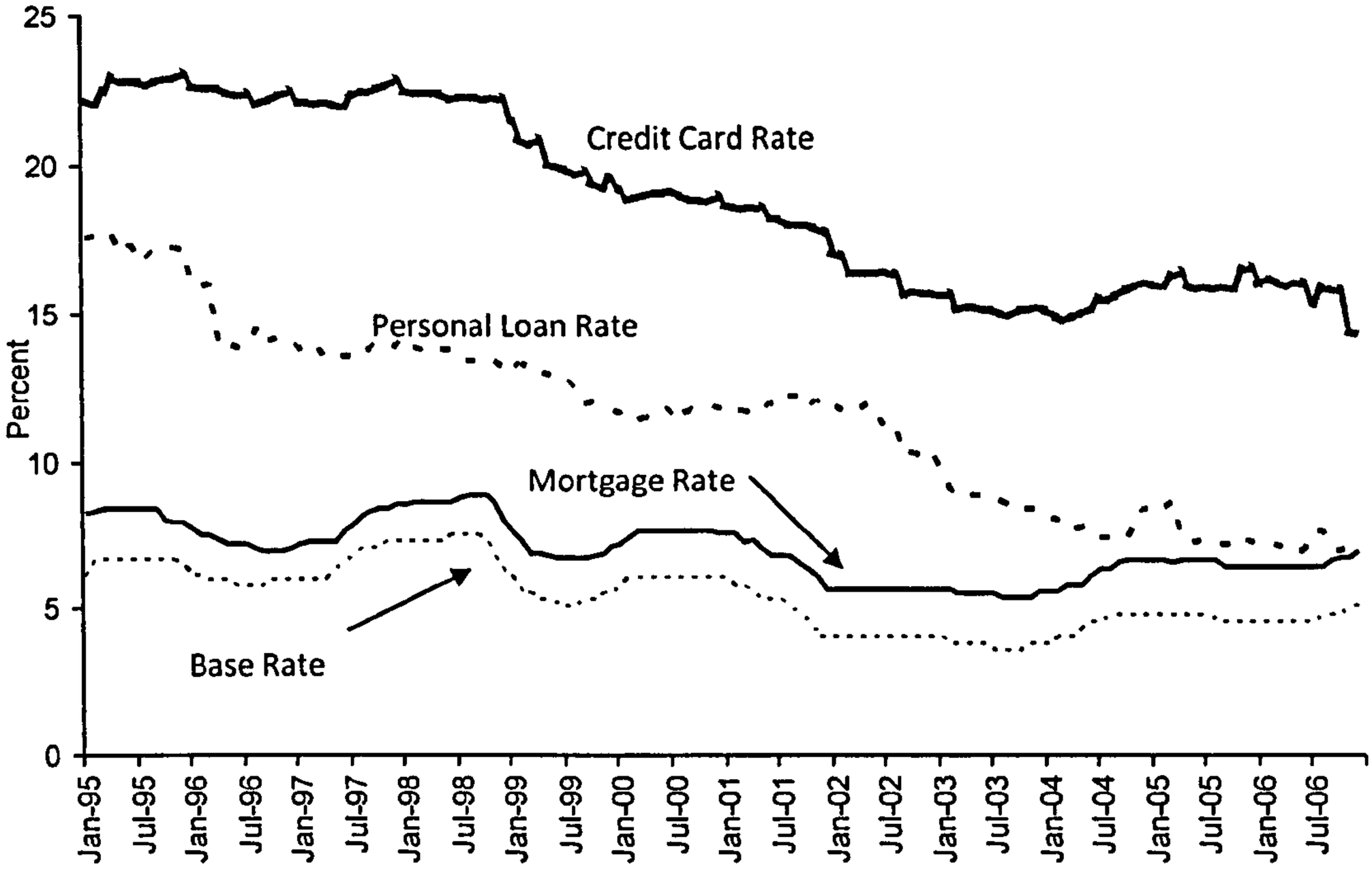
1.2 The Development of Pricing Strategies

Intense competition for new customers and the adoption of new technologies in the credit card industry has reduced the price of credit for the majority of consumers as measured by the nominal annual percentage rate (APR). Card issuers have had to surrender some of the net interest rate margin which they have been able to enjoy as a result of high APRs in the late 1980s and early 1990s. In addition they have adopted pricing strategies which consider an individual borrower's risk and behaviour profile. Declining APRs and the disappearance of annual fees have meant card issuers have come to rely on new pricing techniques to maintain or increase portfolio profitability. Techniques include new APR strategies and fee structures. This section outlines the history and dynamics of credit card pricing over the last twenty years.

Low rate credit cards are relatively new phenomenon in the UK card industry. Researchers studying the industry throughout the 1980s and early 1990s found that credit cards had substantially higher rates and returns than any other bank credit products (Ausubel, 1991). Further research has demonstrated that credit card rates have remained high when other interest rates have fallen, this led Calem and Mester (1995) to conclude that interest rates on credit cards are "sticky". Mester (1994) and Brito and Hartley (1995) provide theoretical explanations for interest rate stickiness based on asymmetric information and consumer transaction costs. Credit card issuers also appeared to earn super-normal profits during the same period. Figure 1.5 shows how credit card rates have tended to be more expensive than other types of lending. Since 2004, the typical APR on credit cards has been steadily increasing while interest rates on mortgages and personal loans have been declining in line with changes in the

base rate. It can be seen that changes in base rates, such as LIBOR are not immediately passed on to consumers and from Figure 1.5, there appears to be a lag of around 3 months for personal loans and mortgages, changes in base rates take a lot longer to impact on credit card rates. Borrowing has become cheaper over the last decade fuelling a credit boom.

Figure 1.4: Average Interest Rates on Secure and Unsecure Debt



Source: Bank of England Statistical Database <www.bankofengland.com>

Until the early 1990s, the best way to describe the pricing of credit cards was as high and rather simplistic. In general, card issuers offered only one or two card products to consumers. Each card had a single APR attached to it, typically around 20%. If an applicant was able to pass the risk threshold set by the issuer, they would receive a card. However, if the applicant failed to meet the requirements of the issuer, due to their credit behaviour being deemed too risky, the application would be declined. This resulted in credit card issuers having a portfolio of customers who were priced as if they had very similar probabilities of default (Furletti, 2003). This is known as flat rate pricing. By charging every customer the same rates, card issuers were able to make higher profits on individuals with very low default risk. These excess profits could be used to cover defaults generated by individuals whose risk over time, had increased.

The influx of new entrants into the market, led to issuers competing on APR. This meant that they were forced to eliminate this cross-subsidisation and assess APRs based on the analysis of individual borrower risk.

In the mid-1990s, interest rates in the credit card market began to decline and price dispersion has increased as price competition in the market has increased. Rationale for the increase in competition includes greater consumer sensitivity to credit card interest rates (Gross and Souleles, 2001) and an increase in interest-rate searches undertaken by debt-carrying credit card users (Kerr and Dunn, 2002; Kim, Dunn and Mumy, 2004). Gross and Souleles (2001) discover that credit card debt has become increasingly interest elastic, with approximately half of the effect resulting from balance switching.

Interest rates became much more flexible as credit card issuers switched to variable rates by the mid-1990s (Stango, 2000). Issuers had generally switched to using risk-based pricing techniques. Risk-based pricing is the practice of charging different interest rates on the same loan to different individuals, depending on their credit score and other factors which indicate that they have a higher probability of defaulting on the loan. Those customers who are deemed to be low credit risks benefit from lower interest rates. The introduction of risk-based strategies has enabled issuers to extend credit lines, at higher prices, to individuals such as students and those on low incomes, who under flat-rate pricing strategies would not receive access to credit. Between 1989 and 1998, the largest increase in credit card ownership was observed amongst customers with the lowest levels of income (Durkin, 2000).

Another prominent feature of the UK credit card market in the late 1990s/early 2000s was the increase in price dispersion. Interest rates of purchases range from zero percent (introductory offer) up to rates around 30 percent. Card issuers have made widespread use of introductory "teaser" rates to induce card users to switch banks (Zywicki, 2000). Teaser rates are very much a feature of the credit boom. "Teaser" rates are offered to new customers at a substantially lower rate than the prevailing APR for an introductory period of around 3 to 18 months, thus encouraging consumers to transfer balances to the new card with a lower interest rate. While convenience

users are unlikely to respond to these types of offers, large revolvers will follow them with interest.

1.2.1 The Unbundling of Fees and Costs

Furletti (2003) suggests that another way in which credit card pricing has developed is in the "unbundling" of costs in the form of fees. As previously mentioned, card pricing throughout the 1980s and the early 1990s, was comparatively simple. Typically, issuers charged a fairly high interest rate and an annual fee of around £30. [10] The rationale behind the annual fee was not only to promote consumer loyalty but to cover the majority of the expenses associated with card usage. Only a small number of issuers charged over-limit fees or late fees and when they did, these fees were relatively small. Competition for new accounts dramatically increased during the mid-1990s, and thus changed the way in which issuers priced their cards. Interest rates declined and the once universal fee was eliminated.

Issuers have unbundled the servicing costs (Furletti, 2003), by introducing charges for services and conveniences which were once paid for by all customers through the annual fee and interest revenues. Some of these fees, such as those, levied on cash advances, compensate issuers for the risk of fraud which is thought to be inherent in cash or cash-equivalent transactions. Charges are also levied on balance transfers and foreign currency transactions.

1.2.2 The Introduction of Risk-Related Fees

The decline in interest rates and the unpopularity of annual fees, has naturally led to a decline in revenue for card issuers. Thus in a bid to capture some of this revenue, issuers developed a more targeted fee structure. In place of charging every customer an annual fee to subsidise the costs associated with behaviour of a few, issuers instead imposed fees directly on to those customers whose card usage have driven costs higher. Credit card issuers impose a charge on customers who break the terms and conditions of their credit card agreement by either exceeding their credit limit, making late payments or for it a cheque or direct debit bounces.

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[10] The card issuer however had the option of waving the annual fee. The annual fee would often be wavered if a cardholder spent over a certain amount each year or had large outstanding balances.

Issuers have also significantly increased the use of risk-related fees, also referred to as default charges. Issuers typical charge a fixed rate penalty to customers who either make a late payment or exceed their credit limit. The impact of high default charges on issuers' revenues has been substantial. In the UK default charges on average have been around £20.

1.3 Other Aspects Relating to Pricing

Interchange fees are an integral part of the pricing structure of credit cards. Schmalensee (2002) argues that the main economic role of the interchange fee is not to exploit the system's market power, but instead to shift costs between issuers and acquirers and thus to transfer charges between merchants and consumers to increase the value of the payment system as a whole to its owners. The level of the interchange fee determines the relative fees faced by cardholders and merchants. Typically customers are rewarded for using their credit cards. This has led a number of policymakers to argue that merchants pay too much to accept credit cards and that these costs are covered by individuals who do not use credit cards, through higher retail prices. A higher interchange fee raises the costs of acquirers, who will charge merchants more and this lowers the effective costs of issuers, who in turn will charge cardholders less (Wright, 2003).

Baxter (1983) provides an early examination of interchange fees. Baxter (1983) argues that in the absence of interchange fees, each type of user will only face the private costs and benefits of using the card. A payment from the acquirer to the issuer via the interchange fee assists in aligning the private incentive to use a credit card with that of social incentives. His key finding was that it is efficiency which calls for card transactions whenever the joint benefit exceeds the joint cost of doing so. Baxter (1983) provides justification for the setting of interchange fees; however this does not mean that payment associations will succeed in setting the fee at the correct level. In the 2003, the Office of Fair Trading (OFT) began investigating MasterCard's credit card interchange fee agreements. The OFT is also reviewing Visa's credit card interchange fee agreements.

As a caveat it should be noted that a number of retailers have refused to accept credit cards issued by American Express (Amex) as the claim that the fees associated with accepting these cards are "too high".

1.4 Summary

The chapter has provided an insight into the credit card industry which exists in the United Kingdom. The history and dynamics of credit card pricing over the past forty years have been outlined. Figure 1.6 provides a summary of the milestones in the plastic card industry, in particularly highlighting key events which have occurred in the UK credit card market.

Substantial changes in the dynamics of credit card pricing have occurred over the last decade. The relatively straightforward pricing model of a single APR, an annual fee, and modest penalty charges have been replaced by a much more complex pricing model. The new model of credit card pricing consists of a complex set of APRs, new and increased fee structures, sophisticated finance charge computation techniques and a range f credit card "additions" such as loyalty schemes and cash withdrawals. According to Furtelli (2003), this "unbundled" pricing structure has created a card product for which consumers pay substantially different prices based upon their individual preferences and behaviour.

Figure 1.5: A Timeline of Events in the UK Credit Card Market

Time	Event
1880	The first credit voucher in the UK, introduced by the Provident Group. Customers are given vouchers which can be used in certain shops.
1950	Diners Club issues payment cards for restaurant goers in the US
1960	Bank of America launches Americard.
1960s	MasterCharge competes with Americard and gains many members. Americard becomes VISA and MasterCharge becomes MasterCard.
29th June 1966	UK's first credit card is issued by Barclays Bank
1966	Interbank Card Association (ICA) is formed, the forerunner to MasterCard International (MCI).

Figure 1.6: A Timeline of Events in the UK Credit Card Market Cont.

Time	Event
1972	National Westminster, Midland, Lloyds and Royal Bank of Scotland join together to issue the Access credit card under the Joint Credit Card Company (JCCC).
1st July 1977	Consumer Credit Act comes into force. Section 75 provides protection to consumers buying goods costing between £30 and £10,000 (increased to £100 and £30,000, subsequently) on their credit card.
1980s	The UK moves to "duality", i.e. banks begin to issue both Visa and Access cards. Subsequently, the Access consortium begins to break-up, and disappears as a brand as MasterCard gains recognition in the UK.
1990s	The early 1990s see increased competition, notably with an influx of card issuers from the USA. Cards begin to be increasingly sophisticated, tailored more to individual customer needs, and exploit the so-called niche markets.
1990s	Emergence of affinity cards and cards issued by non-financial institutions.
1990	Cashback offered at the point of sale.
1995	Product innovation leads to the issuing of gold cards and, eventually, other 'status symbol' cards with additional features marketed only to high-income customers.
1997	Supermarket banks (e.g. Sainsbury's Bank, Tesco Personal Finance) enter the market and issue credit cards. Chip and Pin trials begin in the UK.
1999	Half of all UK adults hold a credit card. The average value of a credit card purchase exceeds £50 for the first time.
1999	Internet card issuers (e.g. EGG, Smile, Marbles) join the market place.
1999	Annual fees disappear, extra such as travel insurance, loyalty schemes; begin to be offered to attract customers, who are beginning to hold more than one card.
2000s	Aggressive pricing (e.g. zero/low rate offers) position credit cards as a cheaper form of personal short-term borrowing than loans.
2001	More than half of retail spending is on plastic.
2001	Debit card expenditure exceeds credit card expenditure for the first time.
2002	Chip and PIN announced in the UK
2003	Average number of credit cards per adult exceeds two for the first time
2006	Default charges are capped at £12 by the OFT
2006	Issuers react to the OFT ruling by raising interest rates, removing introductory cards. Annual fees begin to reappear

Source: APACS/The UK Card Association

The adoption of new pricing structures by credit card issuers has meant that the cost of using credit cards has increased for some consumers, while for others it has deceased. The rapid expansion of the UK credit card market in the 1990s was stimulated by an influx of card issuers form America. MBNA entered the market in 1993 and, along with a number of other new entrants such as Morgan Stanley and Capital One, have been credited with rejuvenating the pricing structure of the UK credit card market.

CHAPTER 2
THE UNITED KINGDOM CREDIT CARD MARKET

2.1 Introduction

The rapid growth of the credit card industry over the last decade has attracted considerable attention amongst researchers and policymakers. A particularly important phenomenon in this market is that interest rates have become much more dispersed in recent years and since the late 1990s have ranged from 9 to 40 percent.[11] This dispersion of rates is largely due to card issuers moving towards risk-based pricing methods, which reflect the creditworthiness and risk characteristics of different consumers. Credit card usage grew rapidly throughout the 1980s, at pace not experienced in any other sector of the consumer credit market (Rowlingson and Kempson, 1992), thus making this an interesting and important sector to study.

For many customers worldwide, the credit card has become a practical and natural way of paying for goods and services. This is due to advantages such as the ease of use, convenience, and the option to revolve credit. Revolving credit allows an individual to buy now and pay later at a price. Credit card pricing, involves other elements, including annual fees, fees for cash advances, rebates, minimum finance charges, over-the-limit fees and late payment charges. In addition, the length of the "interest-free" grace period, if any, can have an important influence on the amount of interest consumers pay when they use credit cards to generate revolving credit. The pricing of credit cards has become more complex with a single credit card having multiple interest rates attached to it.

The objective of this chapter is to present a general overview of plastic payment cards which are available in the United Kingdom, along with a detailed discussion on credit cards. An introduction to plastic payment cards and an overview of the plastic card market is provided in the second section. The third section focuses of credit cards, outlining the product alongside the associated advantages and disadvantages. The final section will conclude this chapter.

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[11] The annual typical rate (APR) can be as high as 60%, when the associated annual fee is factored into the year cost.

2.2 An Introduction to Plastic Payment Cards

Transaction volumes of paper cheques are rapidly declining as both consumers and retailers become more familiar with the use and acceptance of a variety of plastic payment cards (Worthington, 1996). It is important to be able to distinguish between the different types of plastic payment cards available and understand the differences between them. The evolution of payment methods in the UK is illustrated in both Table 2.1 and Figure 2.1. Table 2.1 indicates that there has been a steady decline in the use of cash and cheques as a method of payment since 1965. In 2004, electronic payments[12] exceeded payments by cheque by 7.249 billion transactions.[13]

Table 2.1: The Evolution of Payment Methods in the UK

	1965	1975	1985	1995	2005	2015**
Cash	95%	93%	86%	78%	64%	49%
Cheques	5%	6%	10%	9%	5%	2%
Automated*	-	1%	3%	7%	14%	19%
Debit Cards	-	-	-	3%	11%	22%
Credit Cards	-	<1%	1%	3%	6%	8%

* Includes direct debits and salary payments

** Predicted values

Source: APACS. 2006a. "40th Birthday

Cash remains the preferred option to pay for goods and services; however this has also been in decline, falling from 95% in 1965 to 49% in 2005. Technological advances mean that businesses prefer to pay employees using automated payments while consumers have turned to payment cards and direct debits to pay for goods and services.

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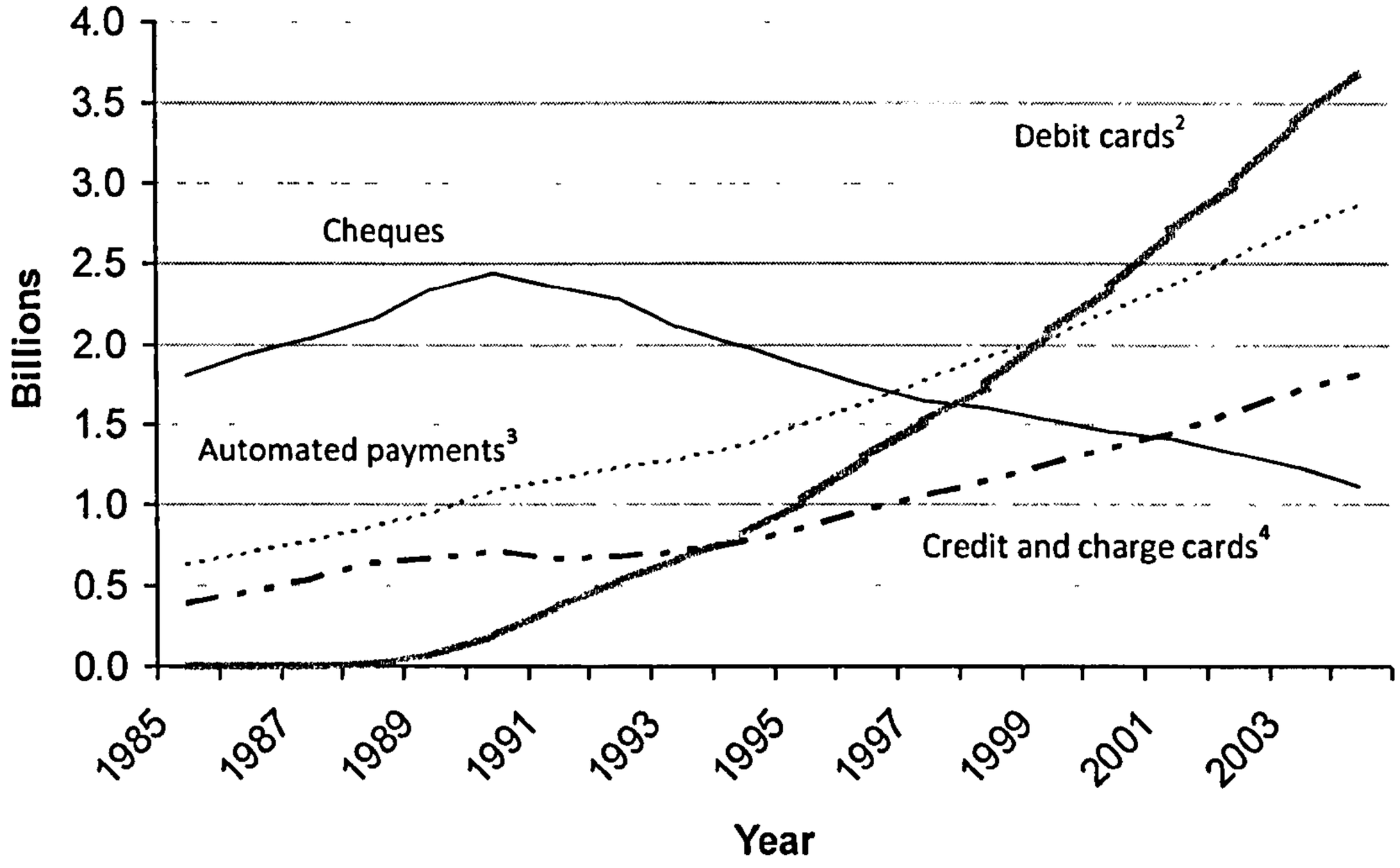
[12] Electronic payments includes payments by credit, charge and debit cards as well as payments made automotive payment systems (e.g. BACS)

[13] Social Trends 36, for data set see http://www.statistics.gov.uk/statbase/Product.asp?vlnk=5748&More=N (accessed 08/02/2007)

Figure 2.1: Non-Cash Transactions[1]: By Payment Method



[1]Figures are for payments only made by households or businesses. Cheque encashments and cash withdrawals from ATMs and branch counters using credit/charge and debit cards are not included.
[2] VISA Debit and Switch cards in all years; includes Electron cards from 1996 and Solo cards from 1997.
[3] Includes direct debits, standing orders, direct credits, inter-branch automated items.
[4] VISA, MasterCard, travel and entertainment cards and store cards.
Source: Social Trends 36, Figure 6.8 and Social Trends 32, Figure 6.13

While the growth of plastic payment cards continues, since 1994 the growth of debit cards has outstripped the growth of credit cards as the preferred method of payment. In 2009 the rise of the debit card can be partly attributed to the overall tightening of credit in the wake of the recent credit crunch (Pilion, 2009). However, the growth of debit cards has been outstripping that of credit since 1994/5. Debit cards were originally introduced in the mid 1980s in a bid to reduce the number of cheques being used at the point of sale. Through "The Credit Cards (Price Discrimination) Order of 1990", merchants won the right to charge customers different prices according to the chosen method of payment, a small number of merchants such as budget airlines (e.g. Ryanair), travel agents and most notably of all IKEA do choose to discriminate against customers according to their payment choice. In addition, a small minority of merchants, for cost reasons, accept debit cards and not credit cards, for example the Post Office. Both of these reasons may have contributed to the growth of debit cards

in the UK. Worthington (1995) suggests that the growth of debit cards has been driven largely by its use as a substitute for cheques.

The phase "plastic payment card" is a generic term which denotes any plastic card (credit, debit, charge, etc) which can be used to pay for goods and services (APACS, 2005a). Many authors have dealt with plastic payment cards, for example, Drury and Ferrier (1984) differentiate between the different types of plastic cards available in the United Kingdom, while Lindsey (1994) devotes a whole book to the study of credit cards. Worthington (1996) differentiated between three types of plastic payment cards: pay later cards (credit and charge cards), pay now cards (debit cards), and pay before cards (telephone cards).

The cards which come under the umbrella of each of the three types of plastic payment cards' are discussed below:

1. **Pay later cards**: The following are classified as pay later cards.

- **Bank-issued cards:** Bank-issued cards are usually linked to either the MasterCard or VISA organisations. These organisations are bank-owned payment organisations and facilitate the exchange and settlement of transactions, under a country's commercial banking laws (Mandell and Murphy, 1976; Lindsey, 1994).
- **Affinity cards:** The affinity credit card is a credit card offered by a financial institution to members or supporters of a specific organisation, such as football clubs, political parties and charities. Originally, these organisations, known as affinity partners, on whose behalf the card was to be issued on, could be classified by the three Cs of causes, charities and clubs (Worthington, 2001). Examples of affinity cards include the Manchester United Football Club credit card (MBNA) and the RSPB credit card (Co-operative Bank).[14]
- **Co-branded cards:** Co-branded cards represent a partnership between a credit card issuer and a commercial organisation, such as an airline or a retailer (Worthington, 2001). In this situation two different organisations join together to issue a co-branded card, the brand of the commercial partner will feature on the card as well as the brand of acceptance. An example of a co-branded card is the

[14]Card issuers are denoted in brackets.

Sainsbury Advantage Card. This card is jointly offer by Sainsbury Supermarket and the Bank of Scotland.

- **Charge cards:** Charge cards are often referred to as travel and entertainment cards. The two main charge cards are American Express which is issued by American Express Travel Related Services, and Diners Club. Charge cards are similar to bank-issued cards in that they are a means to pay for goods and services and can be used to obtain cash. However, charge cards differ from bank-issued cards as they do not offer a line of revolving credit (Worthington, 1997). Unlike bank-issued cards, charge card issuers such as American Express and Diners Club do not have interest rate income to rely on. Therefore, charge cards have substantial joining and annual fees. Charges to the card acceptor are also substantially higher. As a result, charge cards are only accepted by a small number of retailers, acceptance tends to be restricted to business and tourist areas (Mandell and Murphy, 1976; Drury and Ferrier, 1984; Lindsey, 1994; Meidan and Davos, 1994). It should be noted that many individuals use their credit cards like charge cards by paying the outstanding balance in full before the end of the billing cycle.
- **Store Cards:** These are financial transaction and credit cards which are associated with a retailer or a group of retail stores and can only be used to make purchases from the retailers concerned. A number of stores in the UK offer stores cards including Monsoon, Mothercare and Ikea.
- **Fuel Cards:** Fuel cards are issued by petrol companies. They allow cardholders access to credit to pay for petrol purchases (Mandell and Murphy, 1976; Drury and Ferrier, 1984).

2. **Pay now cards:** when a cardholder pays with a pay now card, the amount paid to the merchant is directly debited from the cardholder's account (Worthington, 1997).

- **Electronic debit cards:** A debit card is a payment card which is linked to either a bank or a building society account. In addition to being used to purchase goods and services, debit cards can be used to obtain cash from ATM machines and as cheque guarantee cards. The use of debit cards is free as long as the customer's account remains in credit; if the account becomes overdrawn interest will be payable on overdraft (Worthington, 1997). In addition, unlike with credit cards in which merchants must pay a fee which is equal to a percentage of the transaction

amount, the fee for accepting debit cards is much lower amount which is the same regardless of the transaction value. In 1990, cashback emerged as a means of acquiring cash. This facility means that a debit cardholder can ask for a cash sum when he/she purchases goods and services with the debit card, the amount is simply added to the debit card bill. Worthington (1996, 2000) indicates this facility is advantageous to both sides of the transaction. Consumers no longer need to spend time searching for ATM machines, while retailers benefit from reduced security, shrinkage, and banking costs associated with the handling of large amounts of cash. Although many debit cards are either VISA or MasterCard, there are many other types of debit card, which are accepted only within a particular region or country, for example, Switch (now Maestro) and Solo are only accepted in the UK.

3. **Pay before cards:** Value is stored on the card and when the card is activated the value is used up (Worthington, 1997).

- **Telephone cards:** With telephone cards the consumer adds value to the card prior to using it at the retailer's point of service (Lindsey, 1994; Worthington, 1994)
- **Smart cards:** Smart cards are a relatively new delivery system, which acts as a medium for many different services such as access keys, information managers, marketing tools, and customised delivery systems (Puri, 1997).
- **Electronic purse:** Which is also referred to as an e-purse is a type of smart card. An e-purse is a stored-value payment card which can be used to pay for goods and services. It is an alternative to cash. The card can either be disposed of or re-loadable when stored value becomes zero. The stored value is reduced as payments are made. The Mondex card is an example of a smart card. Holders of such a card are able to use it as an "electronic purse".
- **Travel cards:** The Oyster card is a form of electronic ticketing designed for use on London Transport and National Rail services with the Greater London area of the UK.[15]

[15] For more information on the Oyster Card see http://www.tfl.gov.uk/tfl/fares-tickets/oyster/general.asp (accessed 08/02/2007)

Table 2.2: Pre-Paid Cards

Issuer/Card	Application Fee	Monthly Fee	Withdrawal Fee		Reload Option
			UK	Aboard	
360money Premium	£0.00	£1.99	£1.50	£1.50	Internet Face to face
American Express Travellers Card	£20.00	£0.00	£1.50	£1.50	Internet Telephone
Cash 2 Go	£0.00	£0.00	£1.50	£1.75	Internet Face to face
Cashplus	£9.95	£4.95	£3.00	£3.00	Internet Telephone Face to face
Liquid	£9.95	£3.00	£1.00	£1.00	Internet Face to face
Post Office Travel Money Card	£10.00	£0.00	£1.50	£3.00	Telephone Face to Face
Speedcard VEC	£9.95	£3.45	£1.20	£1.20	Internet Face to Face
Travelex Cash Passport	£0.00	£0.00	£3.50	£3.50	Face to face
Western Union Travel Cash Card	£0.00	£0.00	£3.00	£3.00	Internet Telephone Face to face

Source: Moneysupermarket.com: the price comparison site http://www.moneysupermarket.com>
Notes: All information contained in this table was collected in February 2007

Pre-paid cards are well used in the USA; however they are a relatively new phenomenon in the UK. An increasing number of issuers are entering into the market; however the downside of these pre-pay cards is that they can be expensive. Table 3.2 provides some examples of pre-pay cards which are currently available in the UK.

This study focuses on pay later cards, in particular credit cards, to examine the factors which influence the "price" of a credit card. Much of the preceding literature on the credit card market has focused on the phenomena of interest rates in the 1980s which in general were high and sticky. The literature attributes this phenomenon to the failure of interest rate competition due to consumer insensitivity to interest rates (Ausubel, 1991) and the lack of search by consumers (Calem and Mester, 1995). Brito and Hartley (1995), while maintaining the assumptions of consumer rationality and competition among banks, introduced transaction costs on alternative forms of borrowing as an explanation for the high average interest rates charged on credit card borrowing. The next section provides a definition of credit cards and this is followed by discussion of the developments of the credit card market and the pricing strategies adopted.

2.3 Definition of a Credit Card

A credit card is a variable repayment card which offers line of credit to the cardholder, who is able to spend up to a pre-arranged ceiling level (Wonglimpiyarat, 2005). The outstanding balance must be settled within a given period, or else interest will be charged on the remaining balance (Paxson and Wood, 1998). Effectively a credit card provides a self-service loan through a non-bank service outlet (Wonglimpiyarat, 2005).

Lindsey (1994) defined credit cards as plastic payment cards which have access to a line of revolving credit and cash. Credit cards may be issued by financial institutions such as banks, building societies, personal loan specialists or by non-financial organisations, such as supermarkets and fuel companies. Correspondingly, a credit card could be used as an identification document to identify the holder as possessing a credit account, which then enables the holder to accumulate purchases and subsequently pay off the account either in full or part (Frazer, 1985). Additionally, there is usually a contract between the card issuer and the cardholder, which sets out the rules for using the card. With bank issued cards, there also exists an agreement between the bank and the card acceptor, agreeing the acceptance of the card as payment for goods and services (Lindsey, 1994).

Traditionally credit cardholders can choose between two credit card options:

- **A fee-free card:** This type of card must be paid off in full each month. It allows consumers to pay by credit card at no additional cost; this means that the cost of using the credit card is identical to using cash. Cardholders benefit from the interest free period as they have borrowed money at no cost (Worthington, 1996).
- **Annual fee card:** In return for paying an annual fee, cardholders are able to take revolving credit by carrying forward an outstanding balance, having paid off a fraction of the credit taken (Worthington and Edwards, 2000).

In the UK and the US, issuers seldom impose per transaction fees or charge annual membership fees. Issuers will impose annual fees if the card they are offering is loaded with additional enhancements. For example, the annual fee associated with the NatWest Black credit card is £250.[16] However the card has a number of benefits such as: a personal assistant service, family travel insurance, travel services (including hotel and flight booking service and priority pass to executive airport lounges), roadside assistance and the opportunity to obtain tickets to events such as the Ryder cup.[17]

2.3.1 The Functions of Credit Cards

Credit cards perform two important functions (Brito and Hartley, 1995). First, they can be used as a transactional medium that is a substitute for cash and cheques. Second, they can be used as a source of credit, as a substitute for other forms of short-term, small value credit, such as personal loans.

The primary use of credit cards today is as a transaction median, rather than as a source of credit. Zywicki (2000) argues that approximately half of credit card users should be considered as "convenience users," who use credit cards primarily as a transactional medium, thus paying their outstanding balances in full each month. Credit cards enable individuals to minimise their cash balances, thereby allowing them to shift their assets into higher-return investments (Zywicki, 2000).

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[16] <http://www.natwestblack.com/natwestblack/common/summarybox.asp> (accessed 10/10/2006)

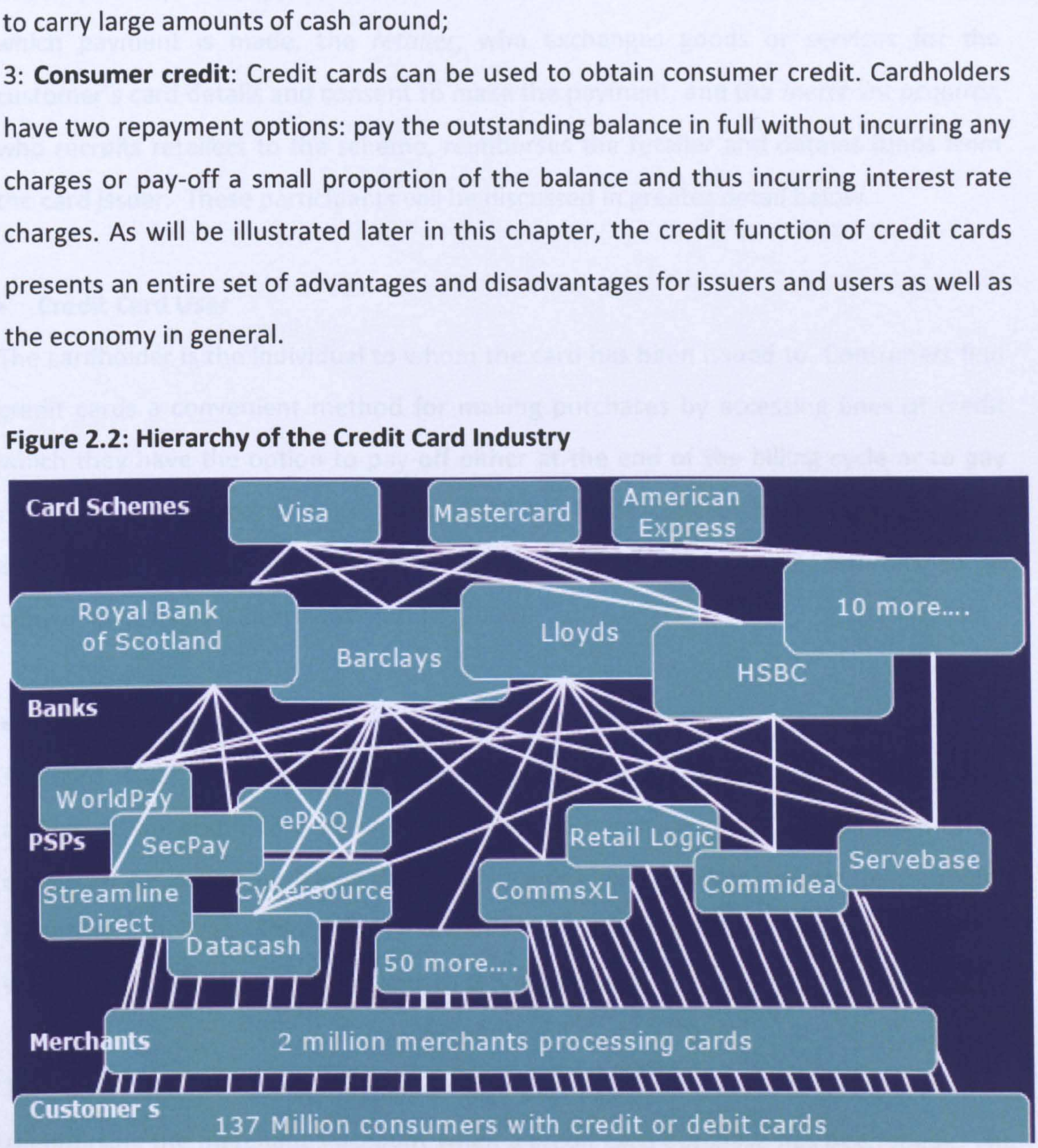
[17] For up to date information about the benefits associated with the NatWest Black credit card see http://www.natwestblack.com (accessed 10/10/2006). The black credit card is only available to individuals who meet the selection criteria; applicants must be over 25 years old and have an income of at least £70,000 a year.

Credit cards are also used by consumers as a borrowing median. Credit cards provide users with the opportunity to "revolve" debt from one month to the next; this requires the user to pay interest on the outstanding balance.

In summary, credit cards have three main functions and these functions were presented by Mandell and Murphy (1976):

1. **Identification**: The earliest function of credit cards was to identify the cardholder;
2. **Payment transfer**: Credit cards allow consumers to make purchases without having to carry large amounts of cash around;
3: **Consumer credit**: Credit cards can be used to obtain consumer credit. Cardholders have two repayment options: pay the outstanding balance in full without incurring any charges or pay-off a small proportion of the balance and thus incurring interest rate charges. As will be illustrated later in this chapter, the credit function of credit cards presents an entire set of advantages and disadvantages for issuers and users as well as the economy in general.

Figure 2.2: Hierarchy of the Credit Card Industry



Source: Stretch, C. 2006. "Credit Cards – How Does it all Work? An Overview Paper." Complementary Solutions

2.3.2 Industry Structure

The credit card industry includes a number of different levels or structures which will be introduced subsequently, Figure 2.2. There are a number of different parties who participate within the credit card market, and each is involved in a series of inter-related bilateral transactions.

Figure 2.3, shows the main parties involved in a credit card transaction. This includes: the *card issuer*, who supplies the card to the customer and operates the account from which payment is made, the *retailer*, who exchanges goods or services for the customer's card details and consent to make the payment, and the *merchant acquirer*, who recruits retailers to the scheme, reimburses the retailer and obtains funds from the card issuer. These participants will be discussed in greater detail below.

- **Credit Card User**

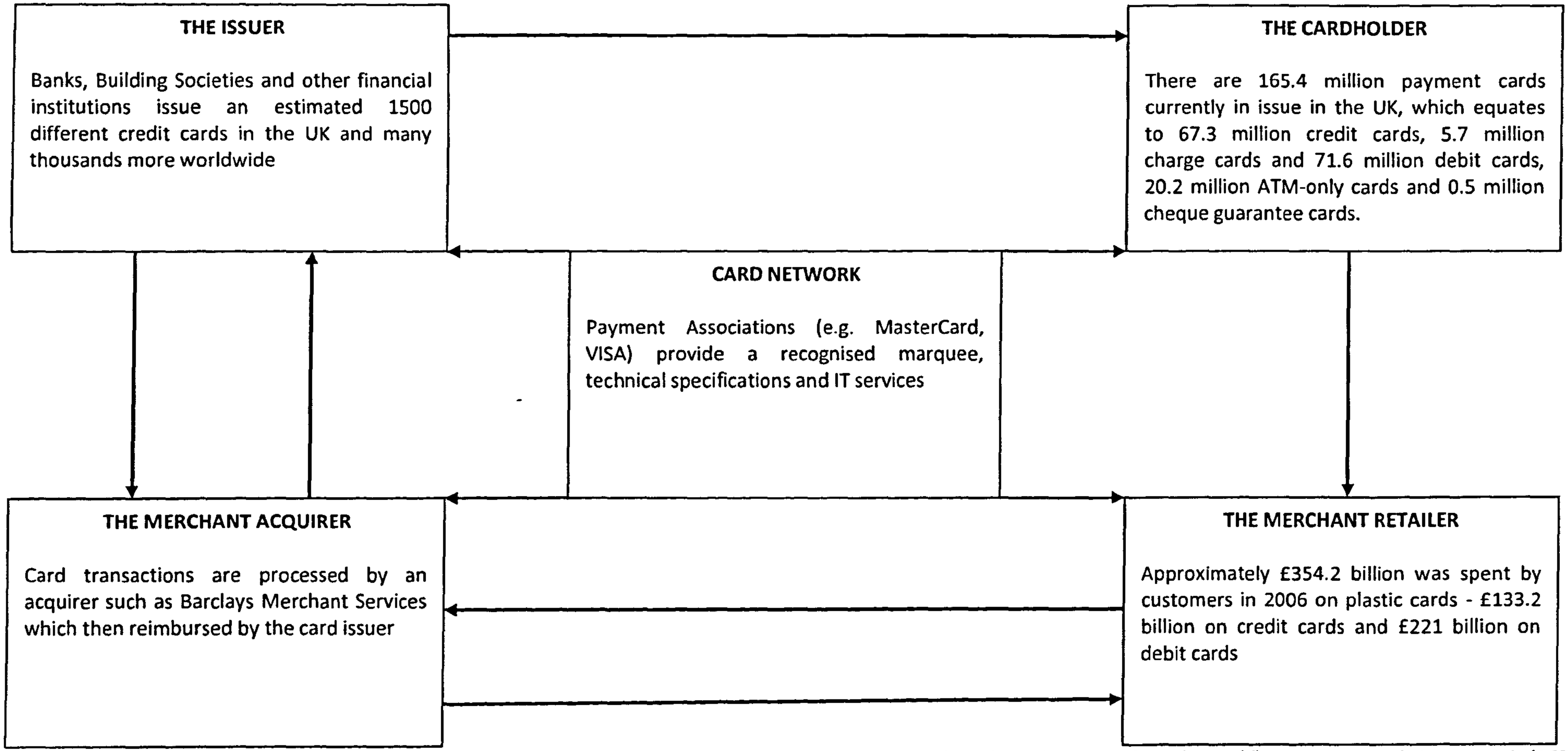
The cardholder is the individual to whom the card has been issued to. Consumers find credit cards a convenient method for making purchases by accessing lines of credit which they have the option to pay-off either at the end of the billing cycle or to pay over a longer period of time. Around 30 to 40 percent of consumers pay their outstanding balance in full every month; such consumers are referred to as convenience users (Chakravorti and To, 2006).

- **Credit Card Issuer**

The card issuer is the institution which established a line of credit with a cardholder and issues the credit card which is then used to purchase goods and services. Credit cards can be issued by banks, building societies and retailers. Issuers may provide incentives such as frequent-use awards, dispute resolution services, extended warranties and low-price guarantees to promote usage.

The issuing bank which maintains the consumer's credit card account is responsible for reimbursing the merchant's account when a credit card purchase has been made. The issuing bank then bills the customer for the debt.

Figure 2.3: The Five Players in the Credit Card Market



Source: Batiz-Lazo, B., Wonglimpiyarat, J., and Wood, D., 2001. "Corporate Strategy in the UK Credit Card Market: The Case of Barclaycard." Accounting and Finance Unit (AFRU), APACS, 2007. "Plastic Cards in the UK and how we used them in 2007." < *http://www.apacs.org.uk/resources_publications/card_facts_and_figures.html*>

According to Hamilton and Khan (2001) all major credit card issuers, to a greater or lesser extent, hold a portfolio which consists of three types of credit cardholders:

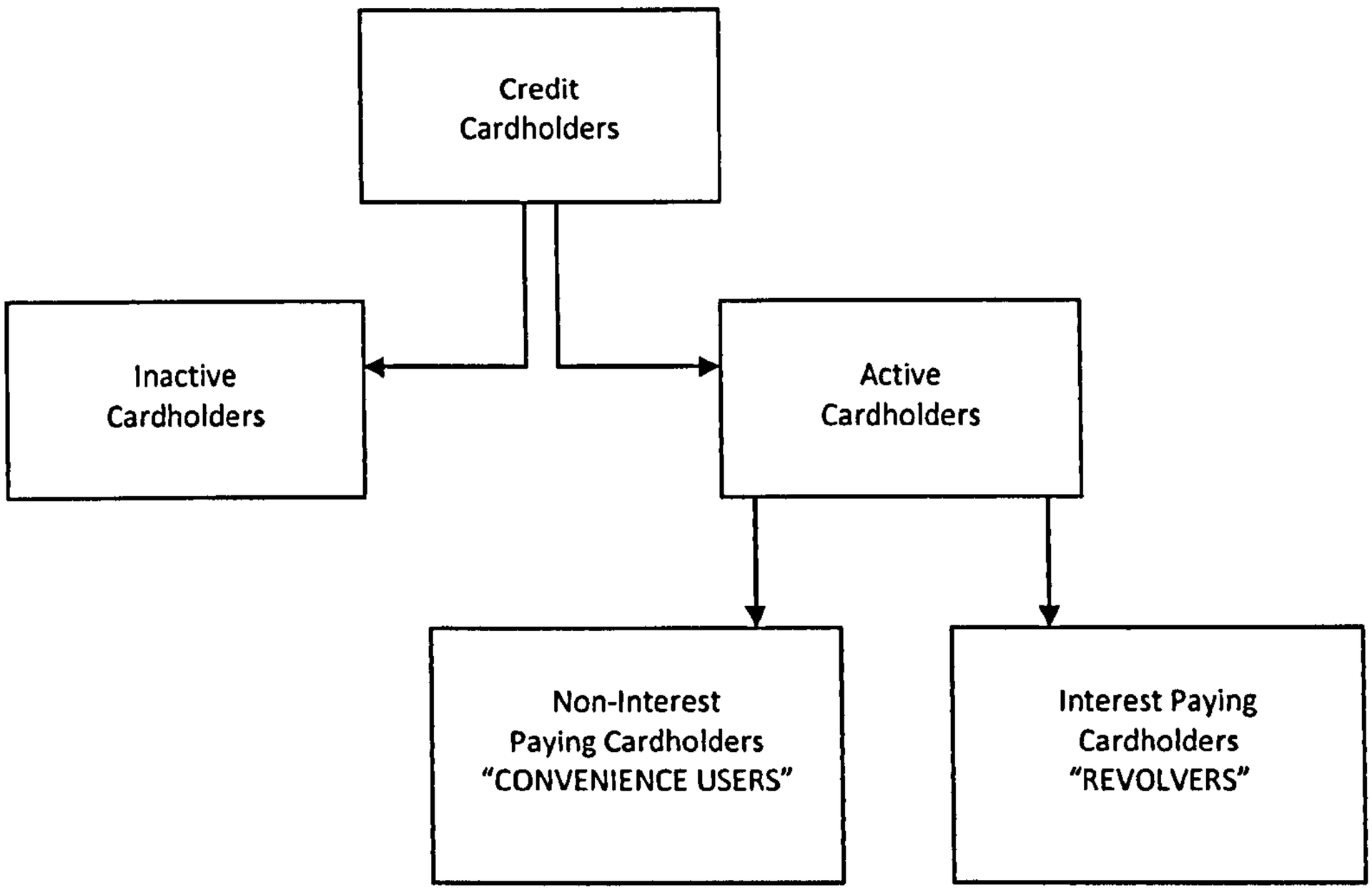
(i) Non-active cardholders;

(ii) Non-interest paying active cardholders; and

(iii) Interest paying credit cardholders.

This is illustrated in Figure 2.4. Active credit cardholders with the greatest propensity to revolve are the most profitable. Credit card issuers are most likely to target these customers for additional interest-charging services. Credit cardholders who are less likely to revolve credit and thus pay interest, are more likely to be targeted by credit card issuers with alternative or differentiated products which would be more profitable or less costly for the card issuer. Many individuals simple accumulate debt, rather than revolve it.

Figure 2.4: Credit Card Issuer's Portfolio



Source: Hamilton, R., and Khan, M., 2001. "Revolving Credit Card Holders: Who are they and how can they be Identified." *The Service Industries Journal*, 21(3), 37-48.

- **Merchant**

A merchant is a retailer, or any other person, firm, or corporation that (pursuant to a merchant agreement) agrees to accept credit cards, debit cards, or both, when properly presented.

- **Merchant Acquirers**

Merchant acquiring banks are central to the UK credit card system. On one side of the system, they reimburse the merchants for the value of the goods charged by cardholders, and on the other side they collect the cardholder payments from the issuing bank. A merchant acquirer is a bank or other financial institution that have a business relationship with merchants, retailers and other service providers to process their plastic card transactions (APACS, 2006a). For each type of transaction, the merchant acquirer collects a fee. From the merchant they collect a merchant service charge; this is usually a fixed percentage of the merchant's monthly transaction value, which they pass on to the issuing bank. From the issuing bank they collect a domestic interchange fee.

- **Network Operators**

The credit card market is an example of a two-sided market. A two-sided market is characterised by two sets of end users, each of whom needs the other in order for the market to operate. The fundamental characteristic of a payment card system is that every card transaction involves two users: a cardholder and a merchant (Rochet and Tirole, 2003).

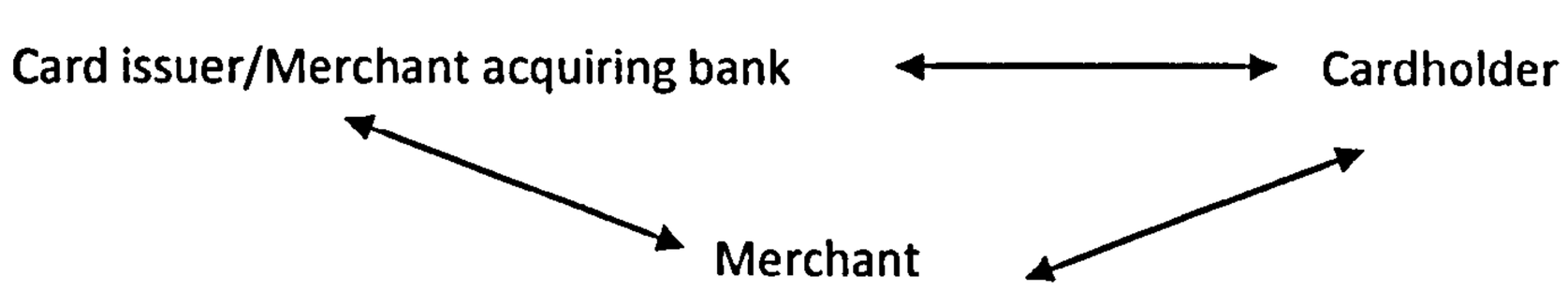
Payment systems can take on one of two principal forms, depending upon the number of parties who participate; these arrangements are illustrated in Figure 2.5, for completeness the two party agreements is also illustrated. A store card, like the one operated by Debenhams, where the card issuer supplies the goods and services and also supplies the finance, is an example of a two party system. Credit card payments systems are typically made up of either three or four parties. A three party system consists of credit cardholders, merchants and a single financial institution who offers the proprietary network service, for example, American Express. A four party system is similar to that of a three party system in that it consists of credit cardholders and merchants; however it differs by having card-issuing banks and merchant acquiring banks, which use the services of a multi-party network such as MasterCard or Visa. When the issuer and acquirer are different, the acquirer must pay the issuer an

interchange fee.[18] The interchange fee is set collectively by the banks which belong to a particular payment system.

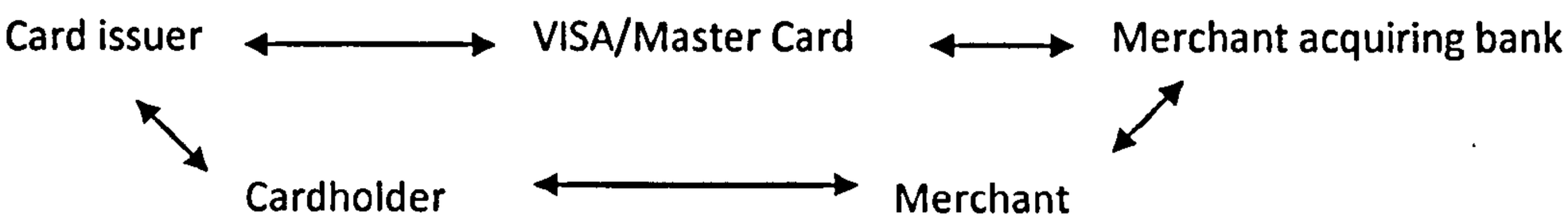
Figure 2.5: Credit Card Agreements

a) **A two-party agreement**

b) **A three-party agreement**



c) **A four-party agreement**



Source: Lindsey, I. 1994. *Credit Card: The Authoritative Guide to Credit and Payment Cards*, Rushmere Wynne Ltd., p. 82

Lindsey (1994) stated that VISA is a non-profit making organisation, which is registered in the USA; however card issuers in the UK are affiliated to Visa Europe. Visa does not have a role in determining cardholder or merchant rates; this is all done by their member banks. The role of Visa is to provide the products and services which make transactions fast, secure and convenient by connecting the four groups of business and individuals who participate in the transaction process.

The Bank of America provided the foundations of the VISA network when it issued the BankAmericard in 1959. During the 1960s the Bank of America licensed the BankAmericard program to several other countries. The Bank of America gave up control of the BankAmericard program in 1970. The various BankAmericard issuers took control of the program, creating the National BankAmerica Inc. (NBI), which was responsible for promoting and developing the BankAmericard system. In 1974,

[18] Interchange fees are discussed in greater detail in section 6 of this chapter.

IBANCO, a multinational member corporation was founded to manage the international BankAmericard program, this was renamed VISA in 1976. VISA is owned and controlled by its members, through six elected regional boards, which are: the USA, Canada, Latin America, Europe, Middle East and Africa, and Asia Pacific. The VISA organisation has three main functions:

1. To promote and protect the VISA name as an international brand;
2. To authorise and transmit financial transactions on a national and international basis;
3. To settle transactions, meaning that settlement will usually be made in the host country's currency.

MasterCard (originally called the Inter-bank Card Association) was established in 1967, as a rival to VISA. The structure of MasterCard has several similarities to that of VISA. Card associations such as Visa and MasterCard do not issue credit cards themselves. Both Visa and MasterCard operate along very similar lines. According

2.3.3 Advantages of Credit Cards

Significant changes have occurred in the credit card industry as well as in the payment system such as cash, personal cheques, store cards, credit cards, travel and entertainment cards and debit cards (Delner and Katzenstein, 1994). The acceptance of credit cards and plastic payment cards has advantages not only for the participants who take part but for the economy as a whole.

At the societal level, the main advantage of credit cards is that they permit individuals to smooth their consumption in the face of irregular incomes. Therefore credit cards allow the economy to function at a much higher and faster level than it could if it relied solely on cash and cash-based instruments (Ritzer, 1995).

Credit cards offer two transactional advantages over cash and cheques (Zywicki, 2000). First, credit cards offer a number of ancillary benefits which are unavailable with cash and cheques. Debit cards also offer this benefit to consumers. Second, unlike cash, cheques and debit cards, credit cards remove the need to maintain sufficient cash reserves to cover current expenditures (Brito and Hartley, 1995). Banknote and coins are clumsy and expensive to handle, particularly if travelling aboard and a different

currency is requires. Plastic payment cards have facilitated international travel and purchases of goods and services (Worthington, 1997). Therefore, the acceptance of plastic payment cards has increased all over the world.

In view of the costs associated with the processing of cheques, banks are particularly looking forward to a paperless banking system in the future. Volumes of paper cheque transactions are already in long-term decline (see Figure 3.1 and Table 3.1) as both consumers and retailers become more familiar with the use and acceptance of a variety of plastic payment cards (Mandell and Murphy, 1976).

Individuals with high incomes and are time constrained consider plastic payment cards to be a convenient and time saving alternative to cash, which has lead to a boom in the demand for payment cards (Prideaux, 1999). Debit cards, for example provide instant access to funds in a current account. Furthermore, using a debit card or a credit card at the point of sale saves time that would be spent queuing for cash at a bank branch, and it is also faster than writing a cheque. Credit card and bank statements make it quick and easy to check what has been spent and where.

Credit cards provide flexibility for consumers in matching their income and expenditure streams by alleviating the need to maintain sufficient funds at all times to cover current expenditure (Zywicki, 2000). This is linked to the fundamental problem of cheques. By writing a cheque, an individual is indicating that they have sufficient funds to cover the cheque when it is drawn. Therefore an associated problem with cheques is that they force merchants to bear the risk of non-payment. Merchants are unlikely to be in a position to optimally bear this risk (Zywicki, 2000). Thus, credit cards enable the merchant to shift the risk of non-payment to the credit card issuer, who will have superior risk-bearing and monitoring capacity.

The ability to shift the risk of non-payment is particularly important for small businesses, which will be at a comparative disadvantage in bearing non-payment risk relative to larger businesses.

Table 2.3: The Advantages of Credit Cards

	ADVANTAGES
The card user (Cardholder)	1. **Flexibility and convenience at home and aboard:** Credit cards can be used 24 hours a day to make purchases using the internet, mail or telephone. Credit cards are particularly useful for individuals who travel aboard as they can be used to make purchases without the need for foreign currency. 3. **Less time consuming:** Credit card transactions take less time than writing a cheque. Credit cards can be used aboard; they are more convenient and offer better value than traveller's cheques. Traveller's cheques must be ordered a few days before travelling, a decision on the amount required and payment must be made in advance. 3. **Automatic and instant cash:** Credit cards are an automatic source of credit. Cardholders can use credit cards to smooth out consumption; this means that even when income is low the cardholder can continue to have the same spending power. Credit cards allow emergency purchases to be made. 4. **Consumer Protection:** Credit card payment allows the cardholder to claim compensation from the card provider if the goods they have bought using the card turn out to be sub-standard or fail to be delivered. 5. **Discounts and bonuses:** Cardholders may receive discounts or extra bonuses on a wide range of services, thus saving the cardholder money. 6. **Free insurance cover:** A number of credit cards include purchase insurance. This insurance covers the replacement of goods, travel accident insurance and travel delay insurance. 7. **Access to cash:** Credit cardholders have instant access to cash anytime and anywhere in the world. 8. **Payment options:** Cardholders have the option to pay the outstanding balance in full every month or to spread repayment over a period of time. 9. **Safety:** Credit cards are safer to carry around than cash.

Table 2.3: Advantages of Credit Cards Cont.

	ADVANTAGES
The card acceptor (Merchant)	1. **Guaranteed payment:** The card issuer commits to pay the merchant the moment the transaction has been verified. Therefore credit card transactions are often more secure than other forms of payments, such as cheques. 3. **Increased sales:** Credit cards allow individuals to make purchases even if they do not have the cash to do so. Merchants who do not accept credit cards are likely to lose sales. The cardholder may "trade up" in that he may spend more due to the availability of credit. 3. **Greater security:** Security is improved as less cash is held on the premises. 4. **Speed of transactions at the point of sale:** Credit card transactions are generally quicker than cash and cheque transactions.
The issuer	1. **Profit:** The card issuer is able to generate income from the interest paid by cardholders on outstanding balances, the annual fee associated with the card and the merchant service fee. 3. **Efficiency:** The daily information supplied by the card 3. **Cross-selling opportunities:** Issuers have the opportunity to promote other products/services with the statements which they send to their customers every month. 4. **Cross-subsidisation:** Issuers can use the profits made on credit card products to subsidise other, less lucrative areas of business, such as current accounts.

Sources: Drury, A.C., Ferrier, C.W. 1984. *Credit Cards*, London: Butterworths., 14_15; Lindsey, I. 1994. *Credit Card: The Authoritative Guide to Credit and Payment Cards*, Rushmere Wynne Ltd., pp.19-25; Ritzer, G. 1995. *Expressing America*, California: Pine Forge Press, pp. 3-4;

Evans and Schmalensee (1993) summarised the mutual benefits of credit cards, stating: "The transaction features of payment cards provide real economic benefits. Consumers gain from increased convenience. Businesses gain from reduced risk. Both gain from transactions that are made easier to consummate."

DeMuth (1986) argues that shifting the risk of non-payment to low-cost risk bearers will encourage entrepreneurial growth, making it easier for smaller companies to compete with larger retailers who dominate the retail credit market. Chakravorti and To (2006) point out that merchants benefit from the acceptance of credit cards. Merchants benefit from sales to illiquid consumers who would otherwise would be unable to make purchases. Table 2.3 summarises the main advantages of payment cards.

2.3.4 Disadvantages of Credit Cards

Research by uSwitch[19] undertaken in 2006, has found that 3.4 million credit cardholders in the UK regularly make only the minimum repayment on their credit card. Credit card arrears have risen consistently throughout 2005. The proportion of balances which are more than three months in arrears has increased to 8.5%. Therefore, it can be seen that credit cards have significantly contributed to rising levels of personal debt in the UK. Rowlingson and Kempson (1994) examine how individuals use their credit card and the reasons for credit card default. Credit card default can be for a number of reasons including loss of income, low priority to paying credit card bills and misunderstanding the system of payment. The growth of personal debt[20] in the UK is illustrated in Figure 2.6.

The advantages associated with credit cards come at a cost to the cardholder. Card issuers, traditionally charged an annual fee; however annual fees were typically phased out during the 1990s. Credit cards can be costless to use if the cardholder pays the outstanding balance in full at the end of each month. However, consumers are charged extremely high rates of interest on outstanding balances if they are not paid in full at the end of the billing cycle. In 2005, 59% of credit cardholders repaid the outstanding balance in full at the end of each month.

The main disadvantage for merchants is that they must pay a fee every time a transaction is completed. With respect to credit cards the fee is a percentage of the

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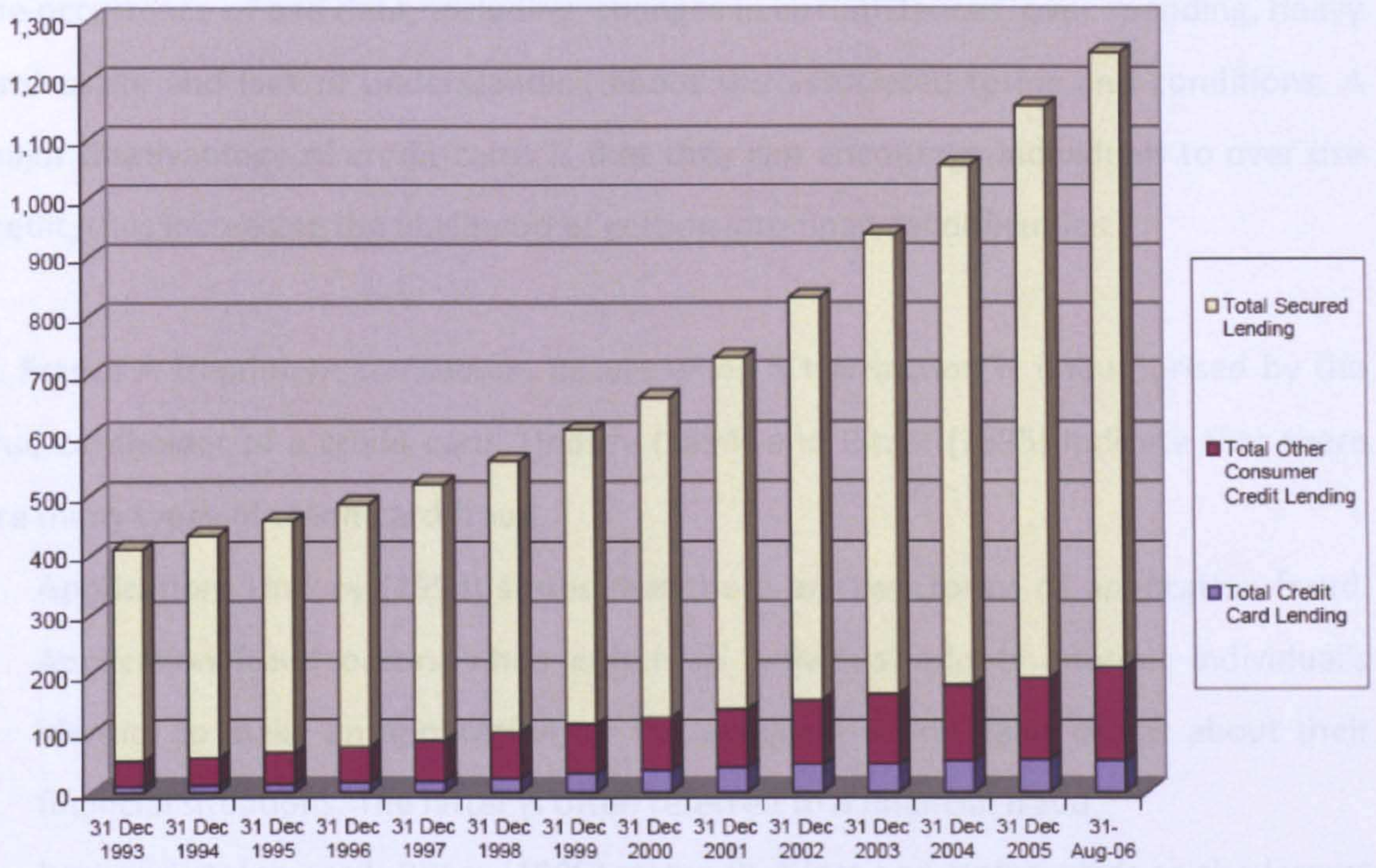
[19] http://www.uswitch.com (accessed on 01/09/2006)

[20] Personal debt includes total credit card lending, total secured lending (e.g. mortgages) and total other consumer credit lending (e.g. unsecured personal loans, motor and retail finance, overdrafts)

transaction value, while the fee associated with debit cards is a fixed value which does not vary with transaction value.

Figure 2.6: UK Personal Debt



Source: Credit Action. 2006. "Debt Facts and Figures – Compiled 2nd October 2006." *<http://www.creditaction.org.uk/debtstats.htm>*.

For example, in the UK a merchant would be charged £0.77 for a £100 credit card transaction, but only £0.08 for a similar transaction made using a debit card.[21] Contention exists between merchants and card issuers over costs because the majority of retailers object to paying a merchant service fee for each transaction.

The three most important disadvantages associated with credit cards are discussed below:

1. **High Risk:** Credit risk is the risk that an asset or loan becomes irrecoverable in the case of outright default, or the risk of delay in the servicing of the loan (Heffernan, 1998). Credit cards become particularly high risk when cardholders, who not have enough information or understand the information they have about credit card risk or the interest rate they are paying (Berthoud and Kempson, 1992).

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[21] Figures worked out using Visa Domestic Interchange Reimbursement Fees for the UK, available from www.visaeurope.com. Interchange fee values set July 2009.

2. **Bad Debts:** Bad debts occur when cardholders are unable to repay their outstanding balances (Lindsey, 1994; Ritzer, 1995). Rowlingson and Kempson (1994) carried out an investigation into the causes of credit card debt. They found a number of reasons for the occurrence of bad debt, including, changes in circumstances, over spending, heavy card usage and lack of understanding about the associated terms and conditions. A major disadvantage of credit cards is that they can encourage individuals to over use credit, thus increasing the likelihood of getting into financial difficulties.

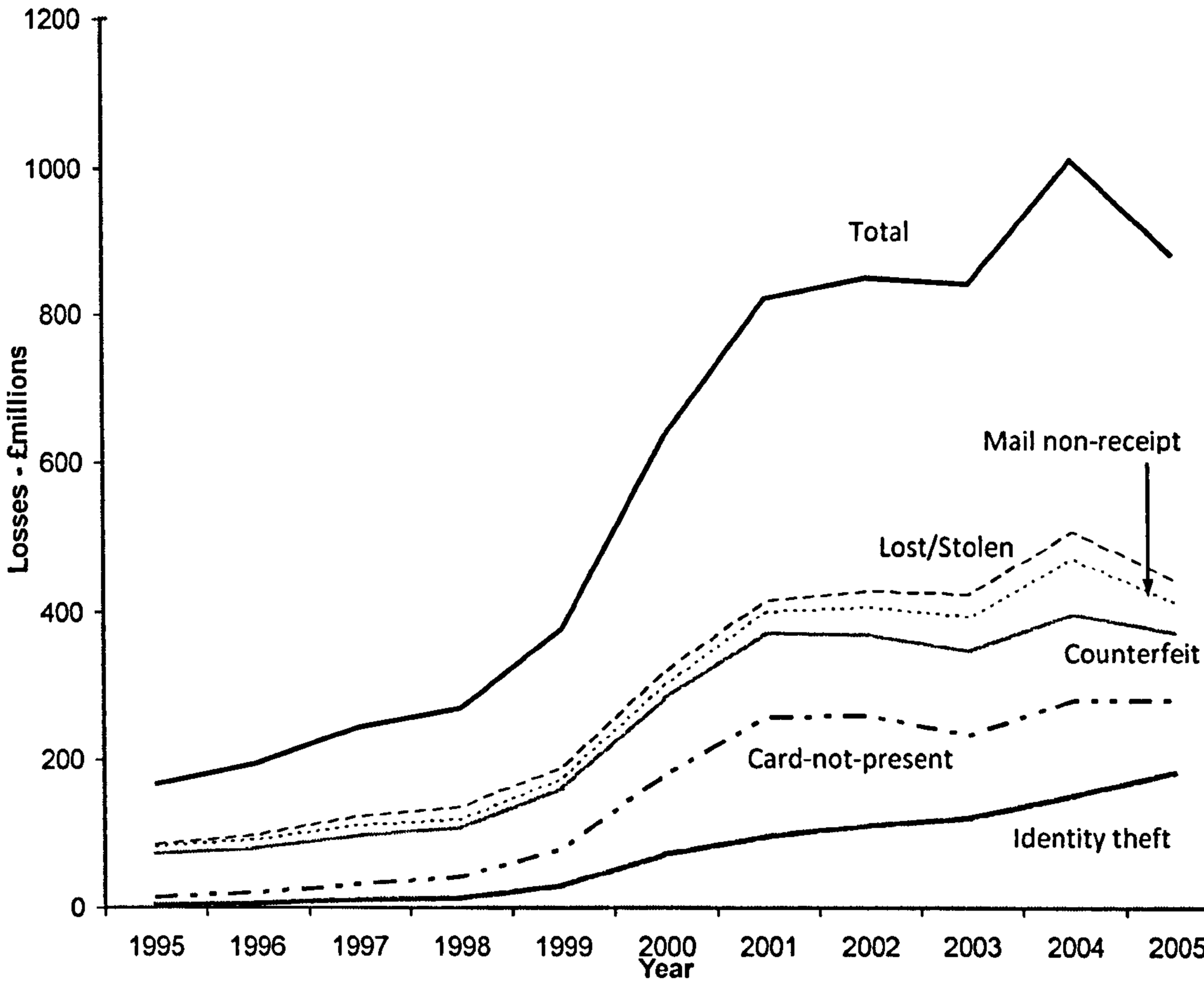
3. **Fraud:** A fraudulent transaction occurs when a transaction is unauthorised by the true cardholder of a credit card. Lindsey (1994) and Ritzer (1995) indicate that there are many types of credit card fraud.

- **Application:** Lindsey (1994) states that there are two forms of application fraud. Application fraud occurs when either an individual adopts another individual's identity to make an application, or the applicant makes false claims about their financial situations. The latter is often referred to a financial fraud.
- **Lost and stolen card:** Ritzer (1995) states that lost and stolen cards as the largest source of credit card fraud; in this case cards are stolen from the holders themselves. According to APACS (2006b) this type of credit card fraud has remained relatively static for the past five years.
- **Counterfeit card fraud (Skimming):** The majority of counterfeit fraud cases involve skimming, a process in which genuine data on a card's magnetic stripe is electronically copied on to another card, without the legitimate cardholder's knowledge.
- **Card not present (CNP):** This type of fraud is perpetrated through the theft of card details for use in non face-to-face transactions. In the UK, CNP fraud is the most common type of fraud experienced (APACS, 2006b)
- **Mail non-receipt:** In this case, cards are stolen in transit, that is after the card companies have sent the card out and before the genuine cardholder receives them.

Figure 2.7 illustrates the cost of plastic card fraud in the UK over the last decade. The introduction of chip and PIN in 2005 has led to a decrease in plastic card fraud losses.

Before the introduction of these anti-fraud methods, card fraud losses had been steadily increasing since 1995. Fraud losses peaked in 2004, as organised criminal groups responsible for recent increases in card fraud realised that the implementation of chip and PIN in the UK would severely curtail their ability to commit the types of crimes discussed above and, therefore, they increased their activity accordingly (APACS, 2005c). While the introduction of chip and PIN has provided successful in cutting losses associated with lost/stolen cards, counterfeit cards and mail non-receipt, identity theft and card-not-present fraud is continuing to rise.

Figure 2.7: Annual Plastic Card Fraud Losses on UK-Issued Cards: 1995-2005



Sources: APACS. 2006b. "Fraud: The Facts 2006" *<http://www.cardwatch.org.uk>*; APACS. 2005c. "Fraud: The Facts 2005." *<http://www.cardwatch.org.uk>*

2.4 Summary

Plastic cards have a significant impact on the way that individuals both in the UK, but also worldwide, pay for goods and services. In the UK today, the majority of consumers pay for at least half of their purchases using a plastic card. Most large retailers,

supermarkets and online shops accept plastic payment cards as do an increasing number of professional service providers. The forerunners of plastic payment cards are a distant memory from the sophisticated and widely accepted payments cards that individuals have become accustomed to. Nevertheless, these very simple cards laid the foundations for what is observed today.

A credit card is a payment tool which allows an individual to access a flexible source of credit. Credit cards can be used by consumers as a borrowing medium. In this case individuals repay the outstanding balance in full and on time, thus avoiding incurring any interest or charges on their purchases. Credit cards also provide the users with the opportunity to "revolve" debt from one month to the next; however this requires the cardholder to pay interest and sometimes other fees.[22] There are a number of advantages and disadvantages for both consumers and merchants in using credit cards, however these advantages and to some extent the disadvantages have been eroded by the rise in popularity of debit cards.

The next chapter provides a critical survey of the literature associated with credit cards. The literature is not only large and growing but also remarkably diffused. Credit cards have been examined in the context of a large variety of sub-disciplines. This literature review will provide a survey of some of the major questions, puzzles and issues associated with credit cards.

[22] Credit card issuers often allow customers to transfer outstanding balances from other credit cards, this often incurs a fee. Fees can also be charged if a late payment is made or if the cardholder goes over their credit limit.

CHAPTER 3

LITERATURE REVIEW

3.1 Introduction

Since their introduction after the Second World War, credit cards have evolved into highly complex financial instruments. Their usage reflects a large number of different motivations (transactions, debt and consumer benefits), involves a significant number of prices (interest rates, teaser rates, grace periods, penalty fees, etc.) and quantity constraints (credit limits, minimum payments, etc.). These characteristics and their associated services are supplied by a large variety of different card providers such as banks, building societies and personal loan specialists. In addition, issues of consumer behaviour and consumer rationality play a far more significant role in the credit card market relative to other financial markets because credit card markets involve decisions by consumers rather than corporations or markets.

The credit card market has drawn a significant amount of attention from researchers since the late 1980s, largely because the market appears to be non-competitive. This is despite a market structure in which, *prima facie* terms, fits the competitive paradigm remarkably well. Despite this observation, the literature on credit cards is remarkably diverse. Researchers have examined these products in the context of a large variety of sub-disciplines including: financial economics, banking, monetary economics, industrial organisation, regulatory economics, consumer behaviour and network economics (Scholnock *et al.*, 2008). It has been argued that there are still many outstanding issues and questions about the pricing, use and suitability of credit cards as a payment mechanism; this indicates that there are significant opportunities for further research in the area of credit cards. Therefore the aim of this chapter is to provide a survey of some of the major questions and puzzles of this literature.

The remainder of this chapter provides a critical survey of the large and diffuse literature on credit cards and is organised as follows. Section two reviews the literature surrounding pricing and competition within the credit card market. Many of the existing studies focus on the failure of competition and asymmetric behaviour of credit cards. This includes a discussion on issues such as credit card ownership and usage,

debt and the relationship between banks and credit cardholders, and consumer behaviour. Studies related to credit card networks are outlined in section four. Section five discusses why studying the UK credit market is important, as well as outlining the practical and academic contributions of the subsequent research undertaken. Section four concludes and outlines the research agenda.

3.2 Credit Card Pricing Puzzles

The credit card market has drawn a significant amount of attention from researchers since the later 1980s. This is because it appears to be non-competitive despite a market structure which in, *prima facie* terms, fits the competitive paradigm remarkably well. This section provides a detailed examination of the various hypotheses relating to credit card pricing and a summary of the empirical evidence to date. A number of alternative hypotheses have been proposed to explain credit card pricing, however little consensus has emerged as to which hypothesis best explains credit card pricing.

3.2.1 Adverse Selection, Search Costs and Switching Costs

Ausubel (1991) was the first to examine the significant pricing distortions inherent in the market for credit cards, and proposes a number of possible explanations for these distortions. Ausubel (1991) finds that while the market for credit cards resembles a competitive market, the actual interest rate charged by issuers is both high and sticky downwards. A variety of explanations are offered based around asymmetric information and consumer behaviour. It is highlighted that there are two possible costs to consumers who are seeking to change their credit card; search costs and switching costs.

In addition, Ausubel (1991) proposes a theory related to adverse selection, in which banks are reluctant to cut interest rates, because this action will attract high risk borrowers. This argument is based on the assumption that high risk borrowers are more likely to search for low interest rate cards because they assume that they are extremely likely to be using this debt in the future. Thus, according to Ausubel (1991) the pricing puzzle associated with credit cards can be explained by a combination of

search costs, switching costs, adverse selection, and an element of consumer rationality.

Calem and Mester (1995) build on the work undertaken by Ausubel (1991). They argue that issuers may interpret large outstanding card balances as a signal of credit risk. This is because they are unable to distinguish between card borrowers who intend to use the new card to increase their total outstanding debt and those borrower's who are simply planning to switch their current balance to the new card. This creates a switching cost as borrowers with high levels of debt are more likely to face rejection when they apply for another card. In other words, customers tend to become "locked-in" to their current issuer once they accumulate a sizable outstanding balance. Calem and Mester (1995) tested this informational-based switching cost hypothesis using data from the 1989 Survey of Consumer Finance. They found that households who had large outstanding balances were more likely to be rejected or offered cards with lower than desired credit limits. These cardholders were also more likely to have experienced payment problems. These findings are consistent with informational-based switching costs and the adverse selection problem.

Crook (2002) and Kerr and Dunn (2002) used data from the 1998 Survey of Consumer Finances to revisit Calem and Mester's (1995) analysis. Using the later data, they found no relationship between search behaviour and outstanding credit card balances. This finding is consistent with a more competitive market structure, in which barrier to searching and switching has been reduced. This finding also coincides with issuers using balance transfers in order to gain market share from their rivals.

Calem *et al.* (2006) argue that consumers who have higher outstanding balances on their cards also face higher search costs, as they have higher disutility from searching. For this reason it is possible that issuers unilaterally lower their credit card interest rates to attract those consumers who have lower balances. Alternatively, consumers who have larger outstanding balances may have more difficulty in switching to a new issuer compared to other consumers. This is because such consumers have a higher probability of having their application rejected.

Stango (2002) presents a new empirical test of the switching cost explanation presented by Ausubel (1991) and Calem and Mester (1995). Outstanding balances of individuals' credit card borrowers serve as a switching cost, thus borrowers with high outstanding balances will find it harder to switch to alternative cards. Like Calem and Mester (1995), Stango (2002) argues that higher card balances are correlated with consumer characteristics which make consumers reluctant to switch. In addition, lenders are less likely to provide new credit cards to potential borrowers with high balances, thus exaggerating switching costs. Switching costs will be positively related to the levels of indebtedness at competitor banks, as this will reduce the ability of borrowers to switch banks. Stango (2002) regresses the interest rates of different users against the outstanding balances of cardholders at these issuers. His results show that the higher the outstanding balances of a provider, and the higher outstanding balances of competitor banks, the higher the interest rate charged.

Berlin and Mester (2004) found that consumer search costs were likely to be an inadequate explanation as to why imperfect competition is observed in the credit card sector. The distribution of credit card rates during the 1980s, a period when search costs were considered to be significant, were found to be inconsistent with those derived from many models of search. Berlin and Mester (2004) find that their data is not consistent with any of these possible search/non-search equilibriums.

Despite many changes taking place in the credit card market; Calem, Gorby and Mester (2005) find that information based barriers to switching have remained relevant in the credit card market. Substantial growth in credit card borrowing since 1989, suggest that informational barriers to competition persist. However, the level of credit card balances at which they become effective may have increased. This is possibly in part due to technological improvements.

According to Bertaut and Haliassos (2006), in the presence of search and switching costs. Credit card issuers would find that lowering the interest rates does not attract many consumers whom revolve credit and are good credit risks. Hence this could contribute to the stickiness of interest rates. Cargill and Wendell (1996) suggest that,

due to the high presence of convenience users, even modest search costs could keep the majority of consumers from seeking our lower interest rates.

3.2.2 Rational or Irrational Consumers

The economic behaviour of individuals using credit cards has challenged the rationality of consumer behaviour (Andreou and Ktoris, 2006). Britio and Hartley (1995) propose an alternative explanation to that of Ausubel (1991) and Calem and Mester (1995). Their explanation is based on completely rational individuals. According to Britio and Hartley (1995), consumers will continue to use the credit function and accumulate credit card debt even though the associated interest rate is significantly higher than interest rates associated with other forms of bank debt. Essentially, the use of credit cards by consumers is an attempt to smooth their income and consumption streams over time. In addition, consumers face extremely high transaction costs when accessing non-credit card bank credit for short periods of time.

Britio and Hartley (1995) provide an explanation for the significant spread between credit card rates and bank loan rates. They argue that credit cards enable individuals to borrow if and when the period for which credit is required is relatively short or unpredictable. Given the advantages which credit card borrowing has over other forms of borrowing, it is argued that the significant spread which is observed between credit card and bank loan interest rates is consistent with an equilibrium model.

Further studies by, Della Vigna and Malmendier (2004) and Eliaz and Spiegler (2006) consider consumers who are time inconsistent. Eliaz and Spiegler (2006) investigate optimal contracting with dynamically inconsistent agents under adverse selection. Della Vigna and Malmendier (2004) provide a further explanation, based on the assumption that firms are rational, but consumers are to some extent biased and irrational. More specifically, they attempt to model how rational firms price products such as credit cards, by assuming that consumers have time inconsistent preferences.

The main theoretical prediction of Della Vigna and Malmendier (2004) is that for products such as credit cards where there are immediate benefits from consumption and delayed payments. The time inconsistency of borrowers implies that firms should

charge below marginal cost in the short-run, but above marginal cost in the long-run. This enables issuers to exploit the fact that consumers may have lower discount rates in the future, which implies that naïve consumers will underestimate their usage of future credit lines. In addition, Della Vigna and Malmendier (2004) extend their model to incorporate switching costs. Using a three-period model, they show that firms have an incentive to impose switching costs on consumers because of the time inconsistency of consumers.

3.2.3 Fixed and Variable Interest Rates

A further explanation to the credit card pricing puzzle is offered by Stango (2000). His explanation is based around the stylised fact that credit card issuers can choose to charge either fixed or variable rates of interest. Fixed rates remain unchanged for long periods, typically for around five years, while variable rates in theory should move simultaneously with market interest rates. Stango (2000) investigates whether it is this pricing structure which impacts on the competitive structure of the market. Using a simple game theory model, he is able to demonstrate that firm size will have a strong impact on the pricing structure chosen. Small firms will choose to price more aggressively than their larger counterparts, as they are attempting to capture market share. Large firms choose to price less aggressively as they try to exploit their existing market share. In addition, Stango (2000) finds that the increase in competition for new customers during the 1990s is related to the stronger presence of variable rate cards in the market.

3.2.4 Price Discrimination

Murphy and Ott (1977) study credit cards from the economic theory perspective and used microeconomic theory of price discrimination to analyse the discrimination between customers who have differing income elasticities. Massoud *et al.* (2007) are the first paper to model banking competition in the credit card market in which banks price discriminate when consumers face stochastic shocks to their income which then impacts on their repayment choice.

It should be noted that firms which offer both fixed and variable rate credit cards, typically extend only one type of card to the consumer, this suggests that they are using different rate types as a means of price discrimination (Stango, 2002).

3.2.5 Tacit Collusion

A fifth explanation for the determination of interest rates has been derived by Knittel and Stango (2003). During the 1980s, state level price ceilings based on Usury Law, were imposed by many States in the US. However, in some states, there were no binding ceilings. Using this institutional detail, Knittel and Stango (2003) examine whether credit card providers resort to tacit collusion by using the interest rate level of the binding ceiling in some states as the focal point for interest rates in those states that did not have a binding ceiling. The empirical results generated by Knittel and Stango (2003) are consistent with their hypothesis that the reason for clustering and stickiness of credit card interest rates is due to tacit collusion between card providers, however, this empirical evidence is only based on pre-1989 data.

3.2.6 Option Values

In an attempt to explain high credit card interest rates, Park (2004) focused on the option value of credit card lines which, arise from changing default probabilities of cardholders. Park's (2004) main argument is that there is an option value inherent with open credit lines of credit card borrowers, as individuals can continue to borrow on their existing card even as their degree of risk alters. Adverse selection will occur because cardholders will become riskier as their borrowing increases. It is for this reason that credit card interest rates are much higher than the zero profit interest rate.

A variety of pricing strategies are available to issuers, to enable them to offset the option value. Park (2004) argues that if an issuer unilaterally lowers their interest rate then they will attract risky borrowers who are likely to become even riskier. Moreover, the adverse selection problem of borrowers who become riskier will also occur if an issuer charges an upfront fee at the initiation of the credit contract. According to Park (2004) when card issuers are well informed about current but not future risk levels, the use of introductory offers will serve to mitigate the adverse selection problem. Hence,

Park (2004) argues that the option value of open credit lines also explains the increased popularity of introductory offers in the credit card market.

3.2.7 Credit Card Fees and Risk

While the majority of the credit card literature has focused on the determinants of interest rates, Massoud *et al.* (2007) examine the determinants of credit card penalty fees. Currently, this is the only paper which theoretically and empirically examines the issuer of penalty fees, despite default charges being commonly debated by consumer bodies and government regulatory bodies. For example, in the USA, former presidential candidate John Kerry has called for credit card fees to be regulated, while in the UK, the OFT have been investigating credit card fees. Furletti and Ody (2006) showed that late fees and over limit fees, as a proportion of total credit card loans, more than doubled from 0.7 percent in 1990 to 1.6 percent in 2004.

In order to examine the impact of risk on credit card penalty fees, Massoud *et al.* (2009) examine the bank level risk of credit defaults as measured by the charge-off ration from each bank's balance sheet and find an exogenous measure of default risk as measured by bankruptcies per capita in the specific states in which each card is marketed. Penalty fees are negatively related to card interest rated and do not reflect the risk of consumer default. In addition, it was found that issuers with large market share charge higher penalty fees than those who have a small market share.

Laderman (1996) concludes that although cyclical factors in the economy affect charge-offs by banks, the aggressive marketing of card issuers since the mid-1980s has deteriorated the quality of the cardholder pool and contributed to the high rate of charge-offs seen in the 1990s.

3.3 Consumer Behaviour Puzzles

Credit cards are one of the most popular payment instruments in the world having achieved recognisable success in both the USA and the UK. While credit cards have been widely accepted, large differences exist between countries in the terms of holding and usage (Worthington, 1995). Section 2.2, reviewed the credit card literature relating to issues surrounding credit card pricing, such as interest rates and penalty

fees. A number of studies have been concerned with predicting consumer demand using a number of economic parameters such as competition patterns (Batra, 1975; Garcia, 1980; McAlister and de Spain, 1975; Russell, 1975).

The literature related to the economic behaviour of households using credit cards has identified three puzzles that challenge the rationality of consumer behaviour (Andreou and Ktoris, 2006). The first puzzle relates to the observation that the majority of individuals choose to borrow through high interest rate bearing credit card loans rather than low cost personal loans. Brito and Hartley (1995) argue that individuals choose to borrow using credit cards instead of using personal loans, is simply down to the bureaucracy and collateral required to secure such a loan. They go on to argue that credit card borrowing is considered by individuals to be an easier form of borrowing; hence individuals are willing to accept the higher costs associated with credit card borrowing simply to avoid the extra time and effort required in order to borrow through lower interest bearing loans.

The second puzzle involves the simultaneous borrowing through credit cards while accumulating liquid assets. One would expect individuals to use a proportion of their liquid assets, which will yield a lower interest to repay the higher interest bearing credit card loan.

The final puzzle considers why households borrow through credit cards at the same time as they save for retirement, in the literature this is known as the debt puzzle. Bertaut and Haliassos (2001) have shown that it is not optimal for a household to revolve debt on a credit card and at the same time possess liquid assets. Rational behaviour would imply that as long as the interest rate charged on outstanding balances exceeds the interest rate received by the individual on liquid assets, the individual should liquefy their assets and pay-off all outstanding balances.

3.3.1 The Adoption of Credit Cards

A credit card is both a payment tool and a convenient source of credit. The costs and benefits of account or credit card ownership and optimal balances depend on transaction costs, interest rates and institutional restrictions.

3.3.1.1 Classification of Credit Card Users

Matthews and Slocum (1969, 1970) classify cardholders into two categories, which are based on an individual's "use" of credit cards. The first group is labelled "instalment users" because they choose to pay less than the full outstanding monthly balance and roll over part of the debt, as a consequence these cardholders must pay interest charges on their outstanding debt. The second group is labelled as "convenience users". Individuals classed as this type of user, view credit as a substitute for cash and they pay the outstanding balance in full within the billing cycle. Worthington (2005) refers to the first group as "revolvers" and the second groups as "transactors". In these studies cardholders are compared on their social class. These studies find that individuals who are considered to be upper class are more likely to be convenience users and pay the outstanding balance in full each month. Typically, revolvers are from lower social classes.

A cardholders' age, marital status, and household size may impact on whether an individual is a credit card revolver or not. A consistent finding in previous studies is the negative relationship between age and being a credit card revolver (Bei, 1993; Canner and Cyrnak, 1985; Choi and DeVaney, 1995; Stiedle, 1994; Wasberg, Hira and Fanslow, 1992). This suggests that households headed by younger individuals are more likely to use credit cards as a borrowing instrument than those headed by older individuals.

3.3.1.2 Factors Affecting Usage

Credit card usage and ownership are phenomenon usually associated with developed countries. Several studies have found that age, sex and marital status are significant determinants of credit card selection and usage (Kinsey, 1981; Slocum and Matthews, 1970). Frank *et al.* (1965) found that occupation, education and income are generally accepted as being significant correlates of usage. Hirschman (1970) indicates that credit card possession and use is positively correlated with the anticipation and actualisation of further use. Mandel (1972) found that the primary determinants of credit card usage were family income and education. Higher income and better educated families were found to be more likely to use credit cards than low income families. Previous literature on credit cards has indicated that there is a close

relationship between credit card usage and the level of economic development in a country.

In a cross-national study undertaken by Kaynak and Yucelt (1984), it was discovered that there were similar patterns between ownership and use in Canadian and the USA. While individuals in the USA tended to relay more on bank credit cards than Canadian individuals, the most popular cards used in both countries, were found to be MasterCard, Visa and Sears. Credit cards were found to be used for purchasing goods and services as well as for identification purposes. The majority of respondents did not use their credit cards to their maximum potential.

Hawes (1988) established the demographic characteristics of cardholders, the type of cards which they posses, the frequency of usage as well as the main advantages and disadvantages of card ownership. Black and Morgan (1999) demonstrate that between 1989 and 1996, the proportion of credit cards held by individual on low incomes, working in blue collar occupations and by those under the age of 25 have increased.

The relationship between the financial and demographic characteristics of households and the number of credit card accounts which they maintained was examined by Kinsey (1981). Households with extremely high incomes were found to hold the largest number of credit cards. Other important characteristics, which significantly impact on the number of cards held by a household included place of residence, use of current and saving accounts and an individual's attitude to credit.

Devlin, Worthington and Gerrard (2007) examine whether multiple credit cardholders have a "main" credit card and other "subsidiary" cards. The main card is the card which an individual uses in a frequent basis, while subsidiary cards are cards which are used on an infrequent basis or only in an emergency.

3.3.2 Personal Bankruptcy

The credit card industry has attracted a lot of attention from policymakers particularly as credit card borrowing has become the fastest growing component of the consumer loan market (Kerr, 2003). Therefore, more recent studies corroborate the view that the

size of credit card debt influences the probability of declaring bankruptcy and delinquency (Bertaut and Haliassos, 2006). However, researchers disagree on whether, and to what extent, credit card borrowing leads to bankruptcy (Starvins, 2000). Gross and Souleles (2002a) have examined the issue of credit card delinquency and personal bankruptcy. Gross and Souleles (2002a) examined why personal bankruptcy filing in the USA increased by around 75% during the period 1994 and 1997. They find two possible effects, the "risk effect" and the "demand effect". The "risk effect" occurs because the risk of borrowers may have deteriorated. For example, due to the increased availability of credit cards, cards are now available to individuals with no or extremely poor credit ratings. The "demand effect" is based on the social stigma which is associated with declaring bankruptcy. Thus, the rise in bankruptcy filing maybe explained by the decline in associated costs.

Following a lull in credit card defaults in the early 1990s, default and personal bankruptcy began to increase sharply after 1995; and this phenomenon has become a serious issue for banks and policymakers (Domowitz and Eovaldi, 1993). Ausubel (1997) and Starvins (1999) both find a strong correlation between credit card debt and personal bankruptcy filings. Domowitz and Sartain (1999) found that households with more credit card debt are more likely to file for bankruptcy. Ausubel (1997) also found that there is a strong correlation between credit card debt and bankruptcy. Gross and Souleles (2002b) found that accounts which are characterised by large balances or small repayments are more likely to default. Based on these empirical findings, credit card issuers are justified in regarding high balances as bad signals even after taking credit scores into account.

Empirical results by Lopes (2008) reinforce the findings of Gross and Souleles (2002a). Lopes (2008) investigated credit card debt and default using a parameterised model of optimal consumption, which allows for borrowing and default. She states that there are a number of reasons for the observed increase in bankruptcy; these include macro factors, current bankruptcy laws and a decrease in the stigma associated with filing for bankruptcy.

Black and Morgan (1999) and Yoo (1998) focused on the alarming rise in credit card debt in the USA over the last two decades. These studies reveal that democratisation of credit was the principal factor in the growth of debt in the 1980s and early 1990s. Furthermore, Black and Morgan (1999) have demonstrated that between 1989 and 1995, the number of credit cards held by young people, individuals on low incomes and those working in blue-collar occupations in the US has significantly increased. They argue that these factors may explain the subsequent increase in credit card delinquency and the increase in the overall debt burden.

Dunn and Kim (1999) examine credit card default using an ordered probit model. They find that the percentage of open credit line a consumer has used and the number of credit cards on which the individual has outstanding balances to; have a significant effect on the likelihood of default. Starvins (1996) found that defaulters had higher interest elasticities, and this could induce banks to keep their interest rates higher. Lehnert and Maki (2002) examine whether households are more likely to borrow than to save if they live in sates with higher bankruptcy exemptions

3.3.3 Credit Cards and the Permanent Incomes Hypothesis

Gross and Souleles (2002b) examine how increases in supply of credit impact on consumer borrowing behaviour. The permanent income hypothesis predicts that; if an individual receives an increase in the supply of credit, that is their credit limit increases, then they will not increase their demand for credit. However, if a consumer increases their credit card debt after they have received an increase in their borrowing limit, then it can be assumed that they have been liquidity constrained, and thus the predictions of the permanent income hypothesis are violated.

Gross and Souleles (2002b) find that after one year, for every $1000 increase in available credit, borrowing increases by approximately $130. This result is highly significant and has been subjected to a variety of tests to ensure that causality runs from credit supply to credit demand, and not vice versa. Furthermore, the interest elasticity of debt is found to be highly significant. This finding suggests that a 1% increase in the interest rate results in a $110 deduction in debt.

Bertaut and Haliassos (2001) have shown that it is not optimal for a household to revolve debt on a credit card and at the same time possess liquid assets. Rational behaviour would imply that as long as the interest rate charged on outstanding balances exceeds the interest rate received by the individual on liquid assets, the individual should liquefy assets and pay-off outstanding balances. Hoch and Loewenstein (1991) modelled self-control as a conflict between the two psychological forces desire and willpower. They state that a self-control problem arises when there is a time lag between the consumption of a commodity and the payment for consuming it. Laibson, Repetto and Tobacman (2000), by incorporating hyperbolic discounting in their model, attempt to explain the coexistence of credit card borrowing and saving for retirement and conclude that the coexistence of illiquid asset accumulation and credit card debt is plausible.

3.3.4 The Bank-Borrower Relationship

Some banks have access only to publicly available credit histories, while others have access to additional information such as borrower's private financial accounts. Kerr (2002) investigates information asymmetries which occur between banks and borrowers. Kerr (2002) argues that, in equilibrium, the average rate of interest charged by an "external" bank would be higher than that charged by the "home" bank, because the borrower would be assumed by the external bank to be much riskier. Berger and Udell (1995) demonstrate that borrowers with longer relationships are rewarded with lower interest rates.

3.4 The Pricing of the Network Interchange Fee

While a significant amount of the existing credit card literature has focused on examining pricing strategies and consumer behaviour, another key element of the credit card literature is the determination of network interchange fees. In any card transaction, the institution which issued the card to the consumer is referred to as the issuer, while the bank which processes the transaction on behalf of the merchant is the acquirer. When these two banks differ, the acquirer must pay the issuer an interchange fee. Baxter (1983) concludes that the interchange fee is necessary to balance the demand of consumers and merchants for credit card services and costs among issuers and acquirers. He argues that the total demand for credit card services

is determined jointly by the demands of the consumers and merchants and total cost for credit cards services include both issuer and acquirer costs.

Schmalensee (2002) analyses the issue of whether the credit card interchange fee should be considered as anti-competitive price fixing. Schmalensee (2002) model predicts that under most assumptions, the interchange fee actually maximises output in order to maximise the systems benefits to the banks (its owners).

Rochet and Tirole (2002) provide a theoretical examination of interchange fees. This model finds that an increase in the interchange fee increases the consumers' use of credit cards, providing that the interchange fee does not rise above a certain level. Once the threshold is reached, merchants no longer have an incentive to accept credit cards as the cost to the merchant is equal or greater than the benefits to the consumer.

The models of Schmalensee (2002) and Rochet and Tirole (2002) have been extended by Wright (2003) who examines the optimal interchange fee under a range of different assumptions. Wright (2003) concludes that the socially optimal interchange fee occur when the interchange fee equals the average transactions benefits obtained by the merchants that accept the credit cards. While this fee structure favours cardholders over merchants, this optimal fee structure does not distort retail prices.

Frankel (1988) and more recently policymakers such as the Office of Fair Trading and the European Commission have argued that card associates, in particular Visa and MasterCard, have set interchange fees too high. This result on merchants paying too much for accepting card transactions, a cost which is ultimately passed on to customers who wish to pay with cash (Wright, 2003).

3.5 Why Study the UK Credit Card Market?

Consumer credit is central to the UK economy. For the majority of individuals in the UK, credit cards and other secured and unsecured lending provide people with greater control and flexibility when managing their finances, which benefits the economy as a whole (DTI, 2003).

The UK credit card industry consists of a large number of cards, which are usually issued under the international acceptance marquees of MasterCard or Visa. These cards are issued by a significant number of issuers, who independently set card terms. In addition, the card industry is not subjected to any notable regulation which may impede competition. Until the mid-1990s, card issuers mainly competed through annual-waivers and other enhancement features, such as loyalty schemes, while charging interest rates, which were significantly higher than their cost of funds (Park, 2004). However, since the mid-1990s, many card issuers have begun to offer low introductory rates, but regular interest rates have not been substantially reduced. In January 1995, the average credit card rate was 22.2 percent, while the base rate was 6.13 percent, while in May 2007; the corresponding average rate of interest on a credit card was 15.04 percent and the base rate 5.5 percent (Bank of England, 2009).

The UK credit card market has attracted a significant amount of interest from policymakers and consumer bodies over the last decade. This increased interest is partly because of the strong growth the market has enjoyed and partly because of the aggressive behaviour of a number of new entrants. Interestingly, however academically, the UK credit card market has largely been ignored, with the majority of academic studies focusing on issues related to the US credit card market. While there are some similarities between the US and UK credit card markets, there are also some significant differences.

US issuers tend to focus on price competition, whereas emphasis in the UK has traditionally been on non-price competition. A number of US issuers have entered into the market during the late 1990s and have undercut the prices of established UK issuers. Many of the academic studies related to the UK card market focus on product innovation. Particular interest has been in the development of affinity card products, for example, Worthington and Horne (1992, 1993, 1994 and 1998). With the exception of Heffernan (2002), there have been virtually no studies which focus on the pricing elements of credit cards.

3.5.1 Academic Significance of Investigating the UK Credit Card Market

The majority of the research undertaken on credit card pricing has focused primarily on industry characteristics, with the annual fee being the only card characteristic to have been researched in any detail (for example, Ausubel, 1991; Stango 2002; Heffernan 2002). Credit card issuers can charge either a fixed or variable rate of interest, Stango (2000) investigated whether the pricing structure of credit cards impacts on the competitive structure of the market. Consumer characteristics, with respect to relationship lending, has been explored by Kerr, Cosslett and Dunn (2004). However, this paper fails to show the overall impact of consumer characteristics on pricing.

In summary, there is a paucity of research examining the relationship between credit card prices and their characteristics. This empirical research will contribute to the existing literature by being the first empirical study to combine card, issuer and consumer characteristics, by uniquely including the annual fee, introductory offers, loyalty schemes, affinity, co-branding, payment networks, minimum monthly payments, default charges, interest-free period, charity donations, type of card provider, minimum age and minimum income.

In addition, the majority of the previous research undertaken with respect to credit cards has focused on the phenomena of high and sticky interest rates which were prevalent throughout the 1980s. One area of study attributes this phenomenon to the failure of interest rate competition due to consumer insensitivity to the interest rate (Ausubel, 1991) and the lack of search (Calem and Mester, 1995). Britio and Hartley (1995), suggest that transaction costs associated with alternative forms of borrowing as an explanation as to why high interest rates were observed on credit cards.

With the exception of Heffernan (2002), there are no existing studies which concentrate on the factors which influence and determine the price of credit cards. Thus a detailed investigation into the determinants of interest rates would help to fill in a gap in the existing knowledge which surrounds credit cards.

A significant number of studies such as de Haan and Sterken (2005, 2006), Hassink and van Leuvesteijn (2003), Gary-Bobo and Larribeau (2002), Crawford and Rosenblatt (1999) and Gropp *et al.* (1997) have all successfully investigated the factors which influence the price of mortgages. It is envisaged that the research undertaken within the subsequent empirical chapters will enable the credit card literature to be expanded to match the type of detailed studies observed in the mortgage market.

3.5.2 Practical Significance of Investigating the UK Credit Card Market

The UK credit card market is highly contested, with consumers being able to choose from approximately 1500 different credit cards (House of Commons, 2002)[23]. Over the last five, the consumer credit industry has fallen under increased scrutiny over certain practices and issues related to pricing. This scrutiny can be very useful if the end product results in greater transparency, thus allowing consumers to compare and understand different credit card products with ease, and ultimately enables them to manage their money more efficiently. A report conducted in 2003, by the House of Commons Treasury Committee; concluded that consumers are unable to properly compare products adequately and that levels of competition in the credit card industry are sufficient. It could be argued that the credit card industry can be made more competitive by providing consumers with clearer information, enabling them to choose more efficiently between credit cards. It is already easier for consumers to compare credit cards as consumers are able to use comparison websites such as www.moneyfacts.co.uk, www.moneysupermarket.com, www.moneyexpert.com and www.comparethemarket.com. However, to enable credit card issuers to compete effectively with on price, it is important that consumers have reliable and clear information to enable them to compare the true cost of a range of credit card products.

The development of "summary boxes", a code of banking practice overseen by the FSA and the standardisation of the calculation of annual percentage rates (APRs) on credit cards have, along with the tightening of the definition of the "typical" rate, has led to the UK credit card market becoming more transparent. Unfortunately, these reforms

[23] This estimate is for credit cards only and does not include alternative options such as charge cards and store cards.

have not been enough to enable consumers to make informed choices about the credit cards that they wish to apply for. Unless consumers understand the way in which interest rates are calculated on different credit cards, then they are unable to assess the true cost, even if the APR on offer is the same.

Typically, consumers will use the APR to compare credit cards offered by different providers. A survey carried out by the OFT, found that "the APR is certainly the key item (consumers) look at when making comparisons. Even though they may not fully understand what this means, they know to look for a low figure."[24] An online survey undertaken in March 2007, by the consumer body "Which?" found that 51% of consumers believed that comparing the APRs of different credit cards was the best method of determining which is the cheapest card (Which?, 2007). Unfortunately, for the consumer the advertised APR does not reflect the way in which interest charges are supplied.

3.5.3 Research Questions

Based on the literature review presented above, it is apparent from the existing research that there are still many issues and puzzles which remain unresolved. For example, the issue of credit card interest rates has generated a large number of hypotheses, with very little convergence towards a commonly accepted conclusion. Given the complexities which are inherent with this product, the credit card market is an interesting and complex market to study. Schnolick *et al.*, (2008) argue that; given the array of alternative explanations for credit card pricing, it is clear that further empirical research is required in order to provide a more robust understanding of credit card pricing.

With the exception of Heffernan (2002), there have been virtually no studies conducted which specifically focus on the pricing elements of credit cards. Therefore, encouraged by the limited availability of literature in this area, the growing academic interest in the size and the dispersion of mark-ups amongst credit card providers, particularly in the USA as well as a general increase in worldwide policy issues, the first

[24] OFT, 2004, paragraph 1.11

issue to be addressed is the impact of different card characteristics on the overall "price" of a credit card. The value of attributes and characteristics are unobserved as they are not separately tradable in any market, only the overall price of the credit card, including the particular combinations of the attributes, is observed.

From the literature review, it is apparent that there is a lack of studies focusing on competition in the UK credit card market. Therefore an objective of the research to be undertaken is to provide a comprehensive review of competition in the UK credit card market, by studying the issues from three distinct perspectives: price leadership, pricing asymmetries, and the long-run pass-through of capital market rates. Each of these measures will provide some insight into how credit card issuers in the UK set their prices.

The second issue to be addressed is the issue of "pass-through". Official interest rate changes are intended to influence short rates on money market instruments and retail products. The pass-through from money market to bank interest rates has attracted particular attention in the light of increased competition in the banking sector over the past decade (Weth, 2002). Pass-through has been discussed, in particular, in the context of monetary policy since the transmission of market rates to bank retail rates is an important element in the monetary transmission process (Weth, 2002). Complete pass-through is often taken for granted; however, a common finding of the empirical literature is that changes in market conditions are not immediately passed on to retail interest rates. Paisley (1994) and Heffernan (1997) use conventional linear methods to investigate the relationship between official interest rates and retail rates in the UK; however these studies have found mixed evidence for pass-through and did not consider the credit card market. Mizen and Hoffman (2003) investigate base rate pass-through, using monthly data from the UK deposit and mortgage. In addition, the question of whether changes in credit card rates are asymmetric will be addressed. In other words, are cost increases passed through more quickly than cost decreased and do issuers adjust their interest rates upwards more quickly than they do downwards to reach equilibrium.

The final question to be addressed in this body of research is whether there is any evidence of price leadership, or whether some issuers systematically reach to movements in input costs more quickly than their rivals.

3.6 Conclusion and Research Agenda

This chapter provides a summary of the theoretical and empirical literature related to credit cards. Moreover it outlines the existing literature and any potential gaps in knowledge and understanding. A notable feature of the existing literature is that the majority of empirical studies focus on the credit card industry in the US. Therefore, a novel contribution of this research is that it focuses on the UK and provides a detailed study of the pricing arrangements of credit cards in the UK. However, the main conclusion of this survey is that while a large amount of research has been undertaken on credit cards there are still a great many issues and puzzles that remain to be resolved.

The diverse fields of finance and economics form a basis for much of the research on credit cards. In the papers described above, the relevant economic sub-fields include financial economics, banking, macroeconomics, industrial organisation, regulatory economics, consumer behaviour, and network economics. This list illustrates the complexity of what seem like simple product to research, however in some case unresolved issues, such as pricing. A number of theoretical explanations have been put forward in the literature in an attempt to explain the pricing behaviour of credit card issuers. These explanations include; (1) adverse selection, (2) search costs, (3) switching costs, (4) rational consumers, (5) time inconsistency on the part of consumers, (6) fixed and variable interest rates, (7) tacit collusion, (8) the option value of card debt, and (9) risk and return. This list indicates that no single paradigm has emerged and that clearly there is significant potential for further research.

Currently, the main constraint for additional research progress in the payment area is the availability of useful data. However it seems evident that researchers who have access to detailed data can make significant progress in furthering the understanding of credit cards. Of particular importance will be large and detailed datasets at either the individual consumer level or, alternatively, at the individual bank level. Two key

elements in much of the theoretical literature discussed above are decision making by individual consumers and decision making by individual banks.

Thus to summarise, the aims of the research undertaken in subsequent in this work is to provide a comprehensive study of pricing and competition in the UK credit card market by:

- Determining and quantifying the factors which influence the interest rate that credit card issuers charge consumers on outstanding balances (Chapter Four);
- Revisiting the issue of switching costs and paying consumers to switch (Chapter Four);
- Analysing how official changes in the base rate are passed on to retail credit card rates (Chapter Five);
- Analysing issuer interaction within the market as a whole and within sub-markets of the sector (Chapter Five);
- Determining and quantifying, if any of the top ten issuers in the market act as a price leader (Chapter Six).

CHAPTER 4

PRICE DISPERSION: WHAT DETERMINES THE PRICE OF CREDIT CARDS IN THE UK?

4.1 Introduction

Plastic cards are an integral feature of the modern economy. In 2008, there was a total of 168.7 million cards in issue – 66.1 million credit cards, 6.4 million charge cards, 76.3 million debit cards, 19.4 million ATM-only cards and 0.4 million cheque guarantee cards (The UK Card Association, 2010). The UK is one of the most credit-card-intensive countries in the world; fifth only to the USA, Canada, Japan and Singapore, with 69.9 million credit cards in circulation for a population of 59 million people (APACS, 2008). Furthermore, the UK credit card market accounts for about one third of all EU transactions (Cruickshank, 2002). As previously discussed in Chapter Three, the UK credit card market has dramatically changed over the last decade. At the beginning of the 1990s, the majority of credit cards offered interest rates in the region of 25 percent. Increased competition from new entrants (e.g. US financial institutions, affiliated providers, supermarkets, and mutuals) has led to a reduction in interest rates and the introduction of differentiating product characteristics. Thus, providers can compete not only on price but also on product characteristics. Whilst the range of product characteristics improves the choice available to consumers, the price comparison of products with different characteristics is problematic for consumers who pay for a bundle of characteristics rather than individual characteristics.

The majority of research on credit card pricing focuses on industry characteristics with the annual fee being the only card characteristic to receive significant attention (e.g. Ausubel, 1991; Stango, 2002, Heffernan, 2002). There is a shortage of research examining the relationship between credit card prices and their characteristics. Thus, this chapter aims to make a significant contribution to the literature on credit card pricing by considering a comprehensive range of card characteristics which have not been consider in any previous studies. The product characteristics under consideration include: annual fee, introductory offers, loyalty schemes, affinity, co-branding, payment network, minimum monthly payment, default charges, interest free period and charity donations.

The effects of product attributes/characteristics on price can be analysed under different pricing models. The value of attributes and characteristics are unobserved as they cannot be separately traded in any market. Only the overall price of a good, including the particular combinations of attributes, are observed. The analysis in this chapter draws on the hedonic price tradition of fitting statistical models to estimate the effects of credit card characteristics on the observed interest rate. Prices are examined from the supply-side perspective, under the assumption, that the credit card market operates monopolistically and that credit card issuers are able to differentiate their products.

This chapter is organised in the following way. Section Two reviews existing pricing studies within the retail banking sector. This section indicates that there has been a lack of studies relating to the pricing of credit cards. Heffernan's (2002) model of credit card pricing is reviewed in detail in Section Three. Section Four introduces the hedonic methodology, which provides the foundations of the empirical models used in this chapter. Section Five builds a hedonic pricing model for investigating credit cards. The data is introduced in Section Six. Section Seven analyses the card, consumer and supplier attributes using OLS. Section Eight uses a nested multi-level model to investigate how particular credit card attributes can act as switching costs and whether credit card issuers use particular characteristics of the credit card to pay consumers to switch. Conclusions are drawn in Section Nine.

4.2 A Review of Pricing Studies in the Retail Banking Sector

Although there is a substantial amount of literature on credit cards, very little research has been undertaken to allow factors which influence the price which a cardholder pays on their outstanding balances to be fully understood. As discussed in chapter two, the majority of studies have focused on the factors which influence credit card adoption and usage, price competition and interchange fees. The aim of this section is to provide a brief insight into the existing literature which relates to how financial products are priced.

Heffernan (1993, 2002) examines deposit rate, loan rate, mortgage rate and credit rate setting behaviour of individual banks and building societies using monthly panel data.[25,26] The results indicate an increase in competition in the mortgage market and low interest checking accounts, but indicate price discrimination behaviour exists in other product markets. Heffernan (1993, 2002) suggest that the British retail banking sector is best described as being monopolistic with a high degree of imperfect information, particularly in the cases of unsecured loans and credit card rate setting.

The Building Society Act, 1986, allowed British building societies to convert from mutual to plc bank status.[27] Heffernan (2005) compares the pricing behaviour of building societies and their counterparts who have chosen to convert to plc bank status. The purpose of this empirical study was to test the hypothesis that the price setting behaviour of converted and mutual financial institutions differ due to their respective managers having different maximisation objectives. The former chooses to maximise profits, while the latter chooses to maximise consumer utility. Deposit rates were found to be permanently lower while mortgage rates were higher, post-conversion. Converted mutuals were found to respond more quickly to changes in the market rate of interest. The remaining building societies offered proportionately more bargains than their counterparts who had converted to plc status. The majority of literature in this area however focuses on the expense behaviour and/or the relative performance of the two groups, mutuals and plc banks.[28]

Price-setting in the mortgage markets have been studied mainly from the demand perspective. These studies have found that lending rates are dispersed across households, due to differences in the value of collateral, risk and price discrimination (Gary-Bobo and Larribeau, 2002; Crawford and Rosenblatt, 1999; Gropp et al. 1997).

The Dutch mortgage market has been investigated extensively investigated over the last decade (Hassink and van Leuvensteijn, 2003; de Haan and Sterken, 2005, 2006). De Haan and Sterken (2006) using daily observations on advertised 5- and 10-year

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[25] Credit cards were only included in the 2002 study.
[26] Heffernan's (2002) model of credit card pricing is replicated in section 4.3.
[27] Eight building societies converted from mutual to plc status during the period 1995-2000.
[28] Examples of work in this area include Valnek (1999),

mortgage interest rates for a sample of the four largest Dutch Banks. They examine competition in the Dutch mortgage market by analysing how the four banks respond to each other when setting their mortgage rates.

De Haan and Sterken (2006) present three types of tests of pricing behaviour in Dutch mortgage market, using daily observations on 5- and 10- year mortgage interest rates as well as monthly observations on the quantities loans outstanding. Their sample consists of the four largest banks that have a combined market share of around 80 percent. The three different models estimated are a VECM, an ordered probit and a structural conjectural variation model. De Haan and Sterken (2006) find that the first two tests indicate that one of the banks within the sample behaves like a price leader, while the third test indicates that all four banks set prices in a competitive manner, despite one of the banks being a price leader.

In the UK deposit account market, while products remain predominately distributed through bank branches and other depository institutions, an increasing number of deposit accounts are being distributed remotely, either jointly or solely, through alternative remote distribution channels, such as the internet, post or telephone. Ashton (2002) examines pricing behaviour of depository institutions in the UK.

Gondat-Larralde and Nier (2006, 2004) analyses the competitive process in the UK market for personal current accounts. Examining the speed with which the distribution of market share changes in response to price differentials, they find that a positive relationship exists between market share and price. They argue that this indicates that switching costs are prevalent in the personal loan market. This study builds directly on the work of Heffernan (2002), who analyses the pricing behaviour of British banks in UK retail markets, while distinguishing between different types of imperfect competition.

4.3 Heffernan's Model of Credit Card Pricing

Using a generalized pricing model, Heffernan (2002) analysed the pricing behaviour of UK financial firms offering credit card products, covering the period 1993-1999.[29] Heffernan's study included all financial institutions offering Visa and/or MasterCard to their clients. The "price" of the credit card is the interest rate charged on outstanding balances at the end of each month. Heffernan acknowledges in her study that a small number of credit card issuer charge annual fees and she incorporates this into her model.

To enable the degree of competition in the bank market to be tested, a benchmark for a perfectly competitive rate is required. Heffernan (2002) chooses the London Interbank Offered Rate (LIBOR). LIBOR is the rate which banks quote each other for overnight deposits and loans. LIBOR represents the opportunity cost of all of a bank's assets; for a bank that aims to maximise expected profit, it is the basis for determining the marginal revenue for all assets, and the marginal cost of all liabilities. LIBOR is an international rate, to which all banks have access to, thus represents a perfectly competitive rate of interest.

4.3.1 Heffernan's Model

Using a generalised pricing model, Heffernan is able to test for the degree of competition in the credit card market, differences in behaviour amongst individual firms, and for differences in behaviour amongst individual card issuers and for the type of imperfect competition prevalent in the credit card market. Heffernan's generalised pricing model is specified as:

$$Rl_{it} = \alpha_0 + \sum_j \beta_j Libor_{t-j} + \gamma t + \delta_i D_i + \varsigma n_t + \eta_i f_{it} + \varepsilon_{it} \qquad (4.1)$$

where Rl_{it} is the credit card annual percentage rate charged by firm i at time t, j = 0,1,2,3 the monthly lags used on LIBOR, f_{it} is the fee for credit cards charged by firm i at time t, n the number of firms offering the product, γt the time trend and D_i the dummy

[29] In addition to credit cards, Heffernan also analyses the pricing behaviour of UK financial firms offering savings accounts, high interest cheque accounts, mortgages and personal loans, however these products are not interest in the context of this research.

variable for each financial firm *i*; unity for firm *i*; 0 otherwise. Heffernan estimates this equation using ordinary least squares.

The variable *n* allows a test for Cournot behaviour, which is present if the coefficient on credit card issuers is significantly negative. The dummy variable for each firm allows a direct test of Salop and Stiglitz's (1977) theoretical model of monopolistic competition with bargains and rip-offs. In the model specified by Heffernan, consumer inertia, incomplete information, or a fall in fixed costs will attract more firms, and as a consequence greater competition will be generated. When there are a large number of players in a market, firms are able to offer relatively good or bad buys to the consumer.

In the Salop-Stigitz model, consumers face unanticipated costs. While some consumers know the distribution of prices, others do not. Thus, the former will only choose bargains, while the latter will buy randomly. A firm is able to survive by charging either a low price, hence a bargain, or a high price, thus being a rip-off. Firms, which offer rip-offs, are able to stay in business as long as inert consumers continue to make purchases. Firms which offer bargains will profit from a higher volume of sales, as well-informed customers will purchases these relatively cheaper products. As relative bargains and rip-offs are able to co-exist within the marketplace, a twin peak price distribution will be observed.

In retail banking, some consumers are well informed, while others are not; therefore it is possible to test the Salop-Stiglitz theory of monopolistic competition. The dummy variable captures the competitive behaviour of each of the individual firms, relative to the default bank. The Royal Bank of Scotland (RBS) is chosen by Heffernan as the benchmark to which the competitive behaviour of other firms is compared against. Heffernan choose RBS as the default bank as it enables her to examine the pricing behaviour of both the top four banks and new entrants into the market. Thus, a negative coefficient on the firm issuing the credit card indicates that issuer is offering a bargain or good buy relative to the default issuer. A positive coefficient confirms the presence of a relative rip-off or bad buy.

4.3.2 Heffernan's Findings

Heffernan's findings are presented in Table 4.1. The adjusted R^2 for the model is 0.831, suggesting that the overall model is a good fit. The trend coefficient is significant and negative, which suggests that credit card rates are declining through the estimation period, 1993-1999. The constant term is significant and the coefficient is large and positive, which indicates substantial smoothing with discrete price mark-ups.

It takes three months for credit card rates to respond to changes in the LIBOR. Credit card rates are found to respond to 75% of the LIBOR change in the first three months. Heffernan concludes that, together with the large mark-up shown by the constant term, that credit card products have large spreads and respond to changes in the competitive market rate of interest extremely slowly.

The firm coefficient is negative and significant; this suggests that as the number of firms' increases, the APR declines. This suggests the presence of a Cournot model of oligopoly.

Table 4.1: Heffernan's Findings

Explanatory Variable	Coefficient	T-Ratio
CONSTANT	**19.516**	43.89
TREND	**-0.011**	-2.15
FIRM	**-0.143**	-5.40
FEE	**0.166**	10.09
LIBOR t	-	-
LIBOR t-1	-	-
LIBOR t-2	-	-
LIBOR t-3	**0.715**	11.15
R^2	0.831	
Heteroskedasticity	34.49	

Source: Heffernan, S.A., 2002, "How do UK Financial Institutions Really Price their Banking Products?", *Journal of Banking and Finance*, 26, 1997-2016
Notes: This table only shows the key variables, for more detailed results see Heffernan, S.A., 2000. "Competition in British Retail Banking, 1993-1999." Department of Banking and Finance Working Paper: City University Business School
Values in bold are significant at the 5 percent significance level

The coefficient on FEE was found to be strongly significant and positive. As the annual fee rises, so does the credit card rate charged. Heffernan argues that financial firms charging annual fees are engaging in price discrimination, as other credit cards are

available with similar features without the annual fee. This finding suggests that there is a lack of competition in the credit card market. Credit card issuers who are charging an annual fee to cardholders, are unquestionably selling rip-offs in during the period investigated.

4.3.2.1 Relative Bargains and Rip-offs

To investigate the relative bargain/rip-off model, Heffernan ranks the financial institutions according to their relatively good and bad bargains. The significant t-ratios testify to the persistence of a financial institution's position over time. Four out of the 27 sampled firms have insignificant t-ratios, 19 firms offer relative bargains while four firms are classed as bad buys. Table 4.2 shows a large dispersion of bargains and rip-offs relative to the Royal Bank of Scotland, which is the default bank. Heffernan finds that there is a difference of 16.5% between the relative worst and best buy in the credit card market. She finds Standard Charter to be the worst buy, charging 9.1% more than RBS and the best buy, Save and Proper to be 7.4% cheaper. These results clearly show that the majority of consumers are getting a bargain relative to the default bank; however those who are choosing a relative rip-off are pay dearly for this choice.

Table 4.2: Heffernan's Findings - Bargains and Rip-Offs

Top Five "Best Buys"		Top Five "Worst Buys"	
Firm	**Deviation from Default Provider**	**Firm**	**Deviation from Default Provider**
Robert Fleming S&P	-7.4	Standard Charter	9.1
Coutts	-7.0	Capital	4.2
Frizzell	-5.9	Allied Irish	3.51
People's Bank	-4.6	Yorkshire	2.23
Nationwide	-3.6	Beneficial	0.82

SOURCE: Heffernan, S.A., 2002, "How do UK Financial Institutions Really Price their Banking Products?", *Journal of Banking and Finance*, 26:1997-2016

The majority of credit card issuers, charge different risk premiums, depending on the type of customer; this may partially explain why such a large margin exists between the relative good and bad buys in the credit card market. New entrants into the UK credit card market have in the main priced below traditional issuers, which has been supported by Heffernan's findings. If this was the only explanation for the large

margins experienced in the credit card market, then new entrants would be expected to charge higher rates of interest than has been observed. This is because riskier borrowers, who have been refused credit by traditional issuers, would be attracted to these issuers. Evidence from both the credit card market and Heffernan's paper demonstrates that this is not the case.

4.3.2.2 Competition in the Credit Card Market

Heffernan concludes that the Salop-Stiglitz model of monopolistic competition with bargains and rip-offs best describes the UK credit card market. In addition the credit card market appears to display Cournot like behaviour that is as the number of entrant's increases, the interest rate falls.

4.3.4 Heffernan's Model Revisited

The work undertaken by Heffernan in 2002, analysed competition and price setting in the credit card market between 1993 and 1999. Heffernan's model is re-estimated over the period 1992-2007. Competition and pricing is analysed at both the provider and card level, as well as on a year by year basis at the firm level, to investigate whether pricing and competition has evolved. As the empirical results are extremely similar to that of Heffernan, the results are not presented here but instead can be found in Appendix A which accompanies this chapter. A summary of the findings are presented below. What is clear from this simple study is that as the UK credit card market has become more competitive, as well as new products being developed and the overall price of a credit card declining, interest rates have become more dispersed.

4.3.5 Summary

In summary, this simple analysis provides an insight into the type of competition in the UK credit card market. What is clear from the analysis undertaken by Heffernan and the empirical results presented in Appendix A is that no two credit cards are identical and that price dispersion is a prominent feature of the UK credit card market. Credit cards are characterised by different features. It is therefore important that the actual features of credit cards are analysed. It is impossible for an individual to make an informed decision based on whether a card is a good or bad buy, instead they need to take into account their own needs and circumstances.

Whilst the range of product characteristics improves the choice available to consumers, the price comparison of products with different characteristics is problematic for consumers that pay for a bundle of characteristics rather than individual characteristics. Indeed, there is concern from the UK Office of Fair Trading that the increased number of product characteristics makes it hard for consumers to make informed choices and to understand the relationship between product characteristics and pricing.[30] This concern might explain the UK Department for Trade and Industry's finding that consumers could save £1.9bn a year in interest payments by switching to cheaper credit cards (DTI, 2003). It is therefore important to understand the relationship between individual credit card characteristics and the price of those characteristics, which is the central purpose of the analysis in this chapter.

4.4 Hedonic Price Theory

Hedonic pricing models provide an empirical summary of the relationship between the price and the attributes of products sold within a differentiated product market. Hedonic pricing models can be traced back approximately 80 years ago to the papers of Waugh (1928, 1929). Beginning with a study on quality-adjusted prices for automobiles, Zvi Grilliches (1961) was able to revive interest in the hedonic pricing technique. Since then, this technique has been applied to a multitude of products, with computers being the most prominent and arguably the most studied products.

Hedonic pricing can be summarised as follows: it assumes that each product is made up of a multitude of definable characteristics, for each characteristic a price can be estimated and quality changes in a product can be viewed as adding a new characteristic to the product. The resulting price change can then be divided between the change resulting from adding the better quality characteristic and from a more general price increase (decrease). As such, a quality-adjusted or "pure" price can be calculated.

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[30] John Fingleton, Chief Executive, Office of Fair Trading. http://www.oft.gov.uk/news/press/2007/91-07

There are two fundamental approaches in the literature to understand the characteristics of price. One tradition relates price to a consumer's willingness to pay for a particular characteristic. This utility-based interpretation is reflected in the use of the term "hedonic" to portray this approach. This view was adopted by Court (1928) and other early practitioners. Lancaster (1966) proposed a theory of consumer utility based on characteristics rather than goods. The rather restrictive conditions under which the hedonic function can be derived from an underlying utility function have been described by Diewert (2001).

The second approach and the generally accept paradigm of the hedonic approach was developed in 1974 by Sherwin Rosen. Rosen (1974) related the hedonic function to the supply and demand for individual characteristics. This view has been advanced by a number of authors including Triplett (1983), Epple (1987), Feenstra (1996) and Pakes (2002).

4.4.1 Theoretical Background of Hedonic Pricing Models

The foundations of hedonic pricing theory is built on the hypothesis that a good or service is characterised by the set of all of its attributes/characteristics. For any given good, let the set of characteristics be ordered and denoted by $x=(x_1, \dots, x_k)$. It is assumed that the preference of the economic actors with respect to any good is solely determined by its corresponding characteristics vector.

In addition, it is assumed that, for any good, a functional relationship f exists between the price p of the good and the characteristics vector x, in other words:

$$p = f(x) \tag{4.2}$$

It is the function specified by equation (4.2) which defines the basic hedonic regression model or hedonic relationship for any given good or service. The idea of hedonic regression stems back to Lancaster (1966) and was advanced by Rosen (1974).

However, the structure of the relationship between prices and characteristics depends on the appropriate equilibrium assumptions. Following, Pakes (2003), let (x_i, p_i)

denote the characteristics and the price of good *i* and (*x-j*, *p-j*) denote the characteristics and prices of the other market goods, the demand schedule for good *i* is:

$$D_t(\cdot) = D(x_i, p_i, x_j, p_j, A) \tag{4.3}$$

Where *A* indexes the distribution of consumer attributes which determines consumers' preferences over characteristics.

If all firms are single product firms and marginal costs are given by *mc*(·), then prices are defined as:

$$p_t = mc(\cdot) + \frac{D_i(\cdot)}{|\delta D_i/\delta p|} \tag{4.4}$$

The second term of equation (4.4) is the mark-up which varies inversely with the elasticity of demand at this point. The hedonic function, *h*(*x*), is the expectation of price conditional product characteristics, thus using equation (4.4):

$$h(x_i) \equiv E[p_i|x_i] = E(mc(\cdot)|x_i) + \left(\frac{D_i(\cdot)}{|\delta D_i(\cdot)/\delta p|}|x_i\right) \tag{4.5}$$

here the expectation integrates over randomness in the process which generates the characteristics of competing products, input prices and productivity.

The hedonic function is simply the expectation of marginal costs plus a mark-up conditional on "own-product" characteristics. Furthermore, since marginal cost depends on the price of purchased inputs, are conditional expectations, which will depend on the expected mark-up of input prices. From equation (4.5) it can be seen that mark-ups are a complex function of the characteristics of competing product, the distribution of consumer preferences. The model can be extended to include multi-product firms. If the model is extended to include multiple product firms then the mark-up will also include ownership structure. Thus, if the mark-up in the product of interest is significant then it should be expected that the hedonic function will change

when the number, the characteristics, or ownership pattern of competing products (or inputs) change.

4.4.2 Advantages and Limitations

The hedonic approach has many merits. Its main advantage is that the approach requires the researcher to have access only to certain information, such as the price, the composition of attributes, and a proper specification of functional relationships. The hedonic method allows a large number of characteristics to be included in a transparent manner. The hedonic pricing model can be used to estimate values based on actual choices.[31] Hedonic pricing theory implies that an attribute should be included in the analysis if it influences consumer and producer behaviour (Hulten, 2002). The theory implicitly implies that consumers and producers have the same "list" of attributes; however this is not always the case (Pakes, 2003).

Rosen (1974) acknowledges that there is an identification problem for supply and demand functions which have been derived from hedonic price functions, as implicit prices are equilibrium prices which have been jointly determined by supply and demand conditions. Therefore, implicit prices not only reflect consumer preferences, but also determine factors of production. Solving this identification problem requires the supply and demand conditions to be separated. Arguea and Hsiao (1993) argue that the identification problem is effectively a data issue that can be avoided by pooling cross-sectional and time series data specific to a particular side of the market in question. However, according to Freeman (1992), the equilibrium assumption implies that an implicit process may be specified without separately modelling supply conditions.

4.4.3 Extensions to Hedonic Pricing Theory

According to Rosen (1974), in a perfectly competitive market in which all consumers and producers have complete information about product quality and price, it must follow that if two brands with identical combinations of attributes/product features exist within the same market, then they must be priced identically. However, this

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[31] The literature on the hedonic method, as well as limitations and advantages of the method are summarised in Palmquist (1991).

assumption of perfect competition has been relaxed to include buyer characteristics (Lucas, 1997) and firm effects (Berndt *et al.*, 1995). Some studies such as Robust (2002) have relaxed the assumption of perfect competition to include both buyer and firm characteristics simultaneously. Palmquist (1989) extended the basic hedonic pricing model to incorporate differentiated factors of production, such as labour and land. Bresnahan (1981, 1987) extended the basic framework proposed by Rosen (1974) to allow for price-making behaviour on the part of firms, thus showing how the model could be used to study the characteristics of industry competition.

Delgardo and Waterson (2002) extended the basic hedonic model to include organisational characteristics. By developing a hedonic model to investigate price dispersion in the UK tyre market, they discovered that chains owned by manufacturers sold tyres of other manufacturers on average at price 20 percent higher than that charged by an independent firm and 11 percent higher than their own branded products.

Shapiro (1983) presented a theoretical framework to examine the impact of reputation on price. He developed an equilibrium price-quality schedule for high quality products in perfectly competitive markets, however consumer information is imperfect. Shapiro (1983) is able to demonstrate that reputation allows producers to retail their high quality items above the cost of production. This premium can be construed as the payback for the producer's investment in reputation. On the demand side of this market, consumers are assumed to face information costs. Although an improvement in market transparency will lead to increased consumer welfare, perfect information is shown not to be optimal as long as information is costly to obtain. The concept of reputation as a quality indicator is only realistic in a market with imperfect information. Reputation effects have been included in hedonic price models for wine (Landon and Smith, 1997, 1998).

4.4.4 Estimation Issues

A major empirical concern relating to hedonic pricing models is the choice of functional form. There are several basic functional forms which a researcher can adopt such as linear, semi-log, and log-log forms. Bloomquist and Worley (1981) and

Goodman (1978) argue that an incorrect choice of functional form can lead to inconsistent coefficient estimates. The theory of hedonic pricing provides little guidance on the choice of functional form (Halvorsen and Pollakowski, 1981; Butler, 1982). Halstead *et al.* (1997) argue that the misspecification of the equation's functional form may result in over- or under-estimation.

A second issue which is frequently associated with hedonic pricing models is the misspecification of variables. Misspecification occurs when an irrelevant independent variable is included (over-specification), or where a relevant independent variable is omitted (under-specification). As hedonic pricing models deal with the implicit prices of characteristics of a product, the problem of misspecification of variables is inevitable. An over-specified model will provide estimates which are both unbiased and consistent, but inefficient because of the inclusion of variables which are irrelevant. In comparison, an under-specified model will result in estimated coefficients which are both biased and inconsistent. Butler (1982) states as all estimated hedonic pricing models are to some extent misspecified, it is generally sufficient to estimate models which contain a small number of key variables. It is suggested by Butler (1982) that only attributes which are costly to produce and yield utility should be considered in the regression equation.

Many of the problems with hedonic pricing models, such as issues surrounding misspecification and functional form, are generic to many econometric applications and can be addressed by employing alternative econometric techniques. In a recent paper by Ariel Pakes (2003), it was suggested that a number of the associated problems were not really problems at all.

4.4.5 Interpreting Coefficients

The regression coefficients value the characteristics as they indicate the prices charged and paid for an increment of one unit of attribute A, attribute B and so on. Implicit prices are much like other prices, in the way in which they are influenced by supply and demand. In the standard interpretation of hedonic functions, as proposed by Rosen (1974), the price of each characteristic is equal to its marginal cost. Pakes (2003) observes that this interpretation assumes that producers have no market power over

the package of characteristics that they offer and argues that this is a poor assumption to impose in a world of product differentiation.

However, it is wise to engage caution when interpreting the results obtained from hedonic regression models, as the estimated coefficients reflect various factors which can influence prices. The standard hedonic pricing equation, as outlined by Rosen (1972) is a reduced form equation in which attribute coefficients can be interpreted under competitive conditions as the marginal cost. According to Pakes (2003), a hedonic function is always driven by marginal cost as well as mark-up. Mark-ups are thus a complex function of the characteristics of competing products, the distribution of consumer preferences and in the case of multi-product firms, the structure of ownership (Häring, 2003; Pakes 2003). Pakes (2003) argues that the associated with any characteristic may be negative, simply because the price of a product can go down when more of that characteristic is obtained.

4.4.6 The Residuals

Residuals from hedonic regression models have not only a statistical interpretation but also an economic one (Triplett, 2004). If the prices are transaction prices, then negative residuals will indicate that a particular product is a "bargain" or a "good buy". A bargain is a product which costs less than expected given the quantities of the characteristics of the product. Conversely, positive residuals indicate that a product is a "rip-off" or a "bad buy" as the price of this product is considered to be expensive given the composite of characteristics.

Griliches (1961) argued that if the hedonic function is correctly specified, then the residuals should predict changes in market share. Bargains or good buys should experience increases in market share at the expense of bad buys. Cowling and Cubbin (1971) explored this suggestion for the UK car market, while Waugh (1928) analysed the residuals from his hedonic function for vegetables. It is possible for "good buys" to exist alongside overpriced products because consumers are not perfectly efficient shoppers.

4.4.7 Summary

Given the well established literature on hedonic regressions (e.g. Oczkowski, 2001; Harchaoui and Hamdad, 2000; Combris *et al.*, 1997; Arguea and Hsiao, 1994) and the extension of this literature to include firm characteristics (Berndt *et al.*, 1995), buyer characteristics (Lucas, 1977), production and organisational characteristics (Delgardo and Waterson, 2003), there is clear scope for further analysis of the determinants of product pricing and the impact of completion and deregulation on the behaviour of firms providing financial products

4.5 An Application to the UK Credit Card Market

In this section, a simple theoretical model for the credit card market is developed. A credit card offered by issuer, *I*, can be regarded as a set of attributes, which may consist of services (such as balance transfers, credit card cheques), characteristics (the type of credit card, the relationship between the card issuer and provider, etc) or customer requirements (minimum age, minimum income, etc):

$$I_i = (x_{i1}, x_{i2}, x_{i3}, \ldots, x_{ik}, \ldots, x_{im}) \tag{4.6}$$

Where $i = 1, 2, \ldots, n$ represents the credit card and x_{ik} ($k = 1, \ldots, m$) each of its attributes. According to hedonic price theory, the relationship between the price of the i^{th} credit card and its characteristics can be expressed as:

$$P_i = P(x_{i1}, x_{i2}, x_{i3}, \ldots, x_{ik}, \ldots, x_{im}) \tag{4.7}$$

Where the functional form of P is assumed to be constant in time and across credit cards, though the weight or contribution of each attribute may change. By calculating the partial derivative of this equation with each card characteristic variable, it is possible to obtain the corresponding implicit price of each characteristic. Thus:

$$\frac{\delta p}{\delta x_i} = p_{x_i}(x_{i1}, x_{i2}, x_{i3}, \ldots, x_{ik}, \ldots, x_{im}) \tag{4.8}$$

The partial derivative indicates that the marginal increase of the price of the credit card is due to the marginal increase in attribute x_i. In market equilibrium the marginal implicit price of an attribute is equal to the marginal willingness to pay for this characteristic and therefore the implicit price function is tangential to the individuals' willingness to pay. The hedonic price function reflects consumer preferences on the one hand and marginal costs of producers on the other.

The application of the hedonic pricing model to the credit card market rests on several key assumptions. First, heterogeneity of the credit card market is assumed (Zywicki, 2000; Ausubel, 1991). A second assumption underpinning the model outlined above, is that the credit card market is monopolistic.

As discussed previously, Rosen (1974) estimated hedonic pricing models to examine how product attributes affect price in a perfectly competitive market. The assumption of perfect competition has been relaxed to include buyer characteristics (Lucas, 1977) and firm effects (Berndt et al., 1995). Hence, the assumption of perfect competition is relaxed and the empirical model outlined in this chapter incorporates buyer characteristics such as age, income and employment status. It is also recognised that firm effects may also be important determinants of price due to market power or brand recognition.

This approach can be justified on the basis of previous research undertaken by Heffernan (1993) and (2002), which examined competition in the UK retail bank sector during the 1980s and 1990s. Heffernan (2002) examines the deposit rate, loan rate, mortgage rate and credit card rate setting behaviour of individual banks and building societies, from econometric models of interest rate equations using monthly panel data. The results indicate that credit card rate setting in the UK takes place in highly monopolistic markets based on imperfect information. As previously mentioned, Heffernan (2002) is the only study which empirically investigates price dispersion among credit card issuers. She is unable to demonstrate that this dispersion is caused by differences in the underlying characteristics of the borrowers; however, as she uses firm level data. Heffernan (2002) fails to consider firm, buyer and relationship attributes concentrating on market attributes such as the cost of funds and number of

competitors. She does however include one card attribute, the annual fee. These various aspects of credit card attributes are discussed further in the next sections.

4.5.1 Credit Card Attributes/ Product Characteristics

Originally many banks charged an annual fee as well as levying interest on the balance outstanding on the account. Competition has forced the majority of banks to drop the annual fee and only to apply charges to cards which have very low usage. There is a very small number of cards contained in this sample who still charge an annual fee.[32]

Credit cards can be issued under the card acceptance marquees of American Express, MasterCard or Visa. These are global companies who manage credit cards, co-ordinate payment systems and keep track of transactions. Within the UK credit card market there are numerous suppliers offering MasterCard or Visa credit cards, although a small number of American Express credit cards are now available.

Credit card suppliers typically offer at least three different credit card types: usually standard (classic), gold and platinum. A small number of suppliers offer student cards, which are aimed at individuals aged between 18 and 21 who attend university. Standard credit cards are usually available to any individual over 18 subject to the application being accepted. In addition to the offer of standard cards, most issuers offer premium cards, which usually offer higher credit limits and lower interest rates. Many cards offer additional benefits such as travel insurance, product guarantees and preferential loan rates. Credit card companies offer premium cards to individuals who are considered to be better credit risks. Therefore to qualify for premium cards applicants must meet the higher age and minimum income requirements. Gold and platinum cards were the original premium cards; however they have now become more common and easier to apply for as minimum age and income requirements have decreased. The more exclusive cards tend to have annual fees attached to them. Black

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[32] It was announced on 13th November 2006, that many credit cards are considering reintroducing annual fees on their credit cards. The average revenue per card has halved over the last five years and the clamp down on default charges by the OFT has undermined profits. It has been predicted by Pricewaterhouse Cooper that card issuers will seek ways to recover £1bn a year. It is argued that card issuers will have to levy annual fees costing the average credit card user £35 a year to recover the potential £1bn loss. If lenders attempt to recoup losses through interest rates alone, it is predicted that APRs would increase on average by 2 percentage points.
(Source:http://www.thisismoney.co.uk/creditanloans/article.html?in_article_id=414603&in_page_id=9)

credit cards are the ultimate premium card, however application is usually through invitation only, therefore obtaining data on these types of card is extremely difficult and hence they are not represented in the data set.

Customer loyalty which was originally ensured by an annual fee and a revolving balance built through years or months of purchases, can now be easily captured by competitors with no-fee, low-rate offer to transfer balances. Card issuers have had to develop new ways of maintaining consumer loyalty through reward schemes such as discounts on selected products or point schemers. Often credit cards issuers provide benefits such as free travel insurance and holiday discounts to encourage cardholders to use their card. However, card issuers have struggled to maintain customer loyalty through reward programs, affinity/co-branded relationships and enhanced customer services (Furletti, 2003).

4.5.2 Relationships between Card Issuers and Other Organisations

The affinity credit card is a credit card offered by a financial institution to members or supporters of specific organisations, such as football clubs, political parties and charities. Originally, the organisations, know as affinity partners, on whose behalf the card was to be issued on, could be classified by the three Cs of causes, charities and clubs (Worthington, 2001). Affinity cards which traditionally fit into these categories include the Labour Party (Co-operative Bank), Cancer Research UK (Halifax) and Chelsea Football Club (MBNA).[33] Recently, the explosion of affinity cards has produced examples of "affinities" which are not based on the support or membership of one of the three Cs defined previously, but instead is based on loosely defined affiliations whose image are portrayed by the card's name and design (Worthington, 2001). There are many examples of loosely defined affinity cards in the UK; examples include the Classical Arts card (MBNA), aimed at individuals who have an appreciation of the arts, the Mini card (Amex) for those who drive a mini, and the Garfield card (MBNA) for fans of the cartoon character.

The key distinction between affinity cards and generic cards is that on the take up of the card by the member or supporter of the affinity organisation, a payment is made

[33] Credit card issuer/merchant acquirer is denoted in bracket.

by the card issuer, to the affinity partner. The majority of affinity card agreements include both an initial donation by the card issuer and an ongoing turnover-related payment; this is usually a small percentage of the total spent on the card (Worthington, 2001; Varadarajan and Menon, 1988). For example, the Halifax bank issues an affinity card on behalf of the NSPCC, an initial donation of £20 is made and subsequently 25p is donated for every £100 spent or transferred on to the card. This suggests that affinity cards are more expensive than other types of cards such as co-branded cards and issuer own brand cards. Credit card issuers claim that money is donated to charity at no extra cost to the cardholder.

Co-branded cards represent a partnership between a credit card issuer and a commercial organisation, such as an airline or a retailer (Worthington, 2001). In this situation two different organisations join together to issue a co-branded card, the brand of the commercial partner will feature on the card and the brand of acceptance. MasterCard has been more willing than Visa, to encourage members to co-brand, this has enabled MasterCard to regain market share, as these co-branded cards are often very attractive to cardholders. This is because instead of the usage incentive going to the an affinity partner in the form of donations, the usage incentive connected with co-branded cards, is returned to the cardholder, in the form of discounts on the goods and services offered by the co-brand partner. For example, Sainsbury's Bank and the Halifax issue a co-branded credit card; the cardholder is rewarded for using the card with discount vouchers that can be used at any Sainsbury's store in the UK.

4.5.3 Buyer Characteristics

When an individual applies for a credit card they must meet the requirements outlined by the card provider. These requirements are defined as buyer characteristics. Buyer characteristics include employment status, age, income level and citizenship. The available data allows the minimum requirements of applicants for a particular card to be included, although individual applicant characteristics are not available.

Credit card issuers can suffer large losses when cardholders do not pay back the borrowed money as agreed. Cardholder's credit risk is crucial in determining the card issuer's profitability. Conventional credit scoring systems use borrowers' personal

characteristics to determine the risk of default. These characteristics include age, occupation, place of residence, declared income and credit history (Allen, DeLong and Saunders, 2004). Interest rates are expected to be lower on credit cards which have higher age and income requirements.

4.5.4 Firm Effects

Within the credit card market, mutual and stock organisations coexist and compete for the same customers. Fama and Jensen (1983a, b) describe the different incentive structures within mutual and stock organisations, which originate from the different residual claims issued by each type of organisation.

Building societies are mutual organisations rather than public limited companies (plc). This means that they are owned and operated for the benefits of their members, therefore any profit is returned to members through cheaper loans, better returns on their savings and better service. Typically there are two types of society members investing members and borrowing members. Investing members are individuals who hold a current or savings account, while borrowing members are individuals who have a society mortgage. It is possible for individuals to be both investing and borrowing members at the same time. Since the introduction of the Building Societies Act 1986, building societies have been offering a wider range of financial products such as personal loans, credit cards and insurance products, however these products do not carry membership rights.[34] As credit cards issued by building societies do not entire the holder to be a member of the building society is possible that building societies will choose to charge a higher price for these products and thus use the income to subsidise member products such as mortgages and saving accounts.

New entrants are threatening existing banks by offering customers better price and greater choices. Typically new entrants target the most profitable segments of customers in the most lucrative product ranges (Boss et al., 2000). New entrants over the last decade include issuers from the US, internet banks and supermarket banks.

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[34] The Nationwide Building Society <http://www.nationwide.co.uk>

The internet has not only allowed banks to serve existing customers more cheaply and conveniently, but also acquire new customers in previously unreachable markets (Li, 2002). The internet has lowered barriers to entry in the banking industry, enabling new players, who are often equipped with new technologies and new business models, to enter the market (Dannenberg and Kellner, 1998).

According to Li (2002) the main rationales for launching baby e-banks include acquiring new customers, exploring the cost advantageous of being "internet only", creating a new brand to break away from the constraints of the parent's main brand, and exploiting the opportunity of a new technological platform to offer existing and new services.

In the UK, it is not just traditional financial institutions such as banks and building societies who offer financial services. Both Tesco and Sainsbury's, two of the largest supermarkets in the UK, have been offering financial services for over a decade.

4.6 Data

The dataset used in this chapter, contains 1926 individual credit card observations, made up from credit cards provided by banks, building societies, internet banks, personal loan specialists (e.g. MBNA) and non-banking firms, such as supermarkets and football clubs. The 297 cards included in the sample were chosen to represent the current climate in the UK credit card market. By the end of 2005, the top five credit card issuers in the UK accounted for 65 percent of all credit cards in issue (APACS, 2006a), the top twenty issuers currently represent approximately 90 percent of the credit card market (Which?, 2007). The sample covers a seven month period between April 2006 and October 2006. Each credit card is observed for a minimum of one month and a maximum of seven months.

The dataset was derived from individual credit card issuers and provider's websites and summary boxes (an example of a summary box is provided in the Appendix A).[35] The summary box provides consumers with consistent and succinct summaries of the

[35] A complete list of the credit cards used in this study can also be found in Appendix A

key features of a credit card, thus enabling consumers to compare different credit card products with greater ease (APACS, 2006b). All integral features of the credit card product, such as the interest rate free period and introductory rates are included in the summary box. Pre-contract, the summary box should appear prominently on or within any application form or promotional material with the exception of television or radio promotional campaigns. With respect to the internet, a "click-through" to a page containing the summary box should always be available. Information on free-standing or optional product features such as loyalty programmes and payment protection insurance are not shown in the summary box and were sourced from card providers' websites. In the next section, the card provider classification and issuers will be briefly introduced and an overview of all the variables used will be provided in section 4.6.2.

4.6.1 Card Issuers and Card Providers

While there are large numbers of card providers in the UK credit card market, not all of these providers are issuers of credit card. This section briefly describes the types of card providers and those firms which issue credit cards in the UK. The data sample used in this chapter contains 297 different credit cards, which are provided by 188 different organisations, and issued by 15 different card issuers.

Table 4.3: Characteristics of Credit Card Issuers in the UK

Issuer	Origin	Market Share[1]	Share of Consumer Base[2]
American Express	US	1.5	3
Bank of Ireland	UK	>1.5	>1
Barclaycard	UK	16	25
Capital One	UK	6	7
Clydesdale Bank	UK	>1.5	1
Co-operative Bank	UK	1.7	4
Egg	UK	2.8	5
GE Capital	US	>1.5	>1
HBOS	UK	12	17
HSBC	UK	10	20
Lloyds TSB	UK	12	16
MBNA	US	13	20
Morgan Stanley	US	>1.5	2
Nationwide Building Society	UK	1.6	3
Royal Bank of Scotland Group	UK	16	24

Notes: (1) Estimated volume of share of the credit card market by the main card issuer groups (Mintel, 2004)
(2) Estimated volume share of customer base (Mintel, 2004)

This thesis adopts the credit card issuer definition used by Schmalensee (2002) and Rochet and Tirole (2002), that a credit card issuer is defined as the issuing bank. A summary of the characteristics of the 15 issuers are given in Table 4.3.

A list of card providers can be found in the Appendix A. Issues connected to degrees of freedom mean that it is not possible to include a dummy variable for each and every card provider. Therefore to enable the effects of organisational structure on the price of the credit card, the card providers have been separated into 10 different classifications, which will be briefly discussed below and examples of issuers in each classification are given in Table 4.4:

Generic Cards

- **Bank:** A bank is a financial institution whose primary activity is to act as a payment agent got customers and to borrow and lend money. Examples include Barclaycard (Barclays), Lloyds TSB and the Royal Bank of Scotland. Banks are the traditional providers of credit cards in the UK. In 1994, the major clearing banks in the UK issued 88.5 percent of all credit cards in circulation; however by 1998 this had declined to around 77.5 percent (Key Note, 1999).

- **Building Society:** A building society is a mutual organisation which owned by its members and not shareholders. Members are those individuals who save with and borrow from the society. Building societies do not pay dividends to shareholders so they can pass this savings on to members. Credit cardholders are not classed as members. Nationwide is an example of a building society which issues its own credit cards. MBNA issue credit cards on behalf of a number of building societies including the Barnsley, the Cheshire and the Newcastle.

- **Converted Mutual:** The Building Society Act 1896, allowed British Building Societies to convert from mutual to plc status. Eight mutuals converted in the period 1995-2000. Examples include the Halifax and Abbey National.

- **Personal Loan Specialist:** MBNA, Capital One and Morgan Stanley are all examples of personal loan specialists who issue credit cards in the UK market. A personal

loan specialist is a financial institution which does not offer a full range of banking services in the UK; instead these institutions offer credit cards and personal loan products. The parent company of these card providers are typical retail banks in the US.

- **Internet Bank:** A number of internet banks are subsidies of high-street banks, for example, the parent company of Mint is the Royal Bank of Scotland. Examples include Egg, First Direct and Marbles. It is argued that internet banks have cost advantages over the traditional bricks and mortar institutions (Li, 2002).

Affinity Cards

- **Charity:** MBNA issue credit cards on behalf of Breakthrough Cancer, while the Co-operative Bank issues credit cards on the behalf of Amnesty International, Children Aid and the RSPB to name a few.

- **Not-for-Profit Organisation:** This includes cards which have been issued on behalf of trade unions and professional bodies. For example, MBNA issues cards on behalf of CIMA (Charted Institute of Management Accountants) and NFU (National Farmers Union). While the Co-operative Bank issues credit cards on behalf of the Liberal Democrats and the Bank of Scotland. The Bank of Scotland issues cards for UNISON and NUT (National Union of Teachers).

- **Sports/Football Club:** Manchester United, Chelsea and Rangers are a few examples of football clubs in the UK who have their name affiliated with a credit card offered by MBNA.

Co-Branded Cards

- **Commercial Partner:** Commercial partners are card providers who form a partnership with a card issuer. The card features the name of the commercial partner; however the card is managed by the issuer. Examples include Marks and Spencer (HSBC), Mini (Amex) and (MBNA).[36] This variable captures non-equity

[36] Financial partners in brackets

strategic alliances. A non-equity strategic alliance occurs when two or more firms develop a contractual relationship to share some of their unique resources and capabilities to create a competitive advantage (Hitt *et al.*, 2005).

- **Supermarket Bank:** Sainsbury's Bank (HBOS) and Tesco Personal Finance (RBS)

Table 4.4: Examples of Credit Card Providers

General Classification	Card Provider	Examples	
Generic	Bank	Barclaycard	HBOS
		Lloyds TSB	
	Building Society	Britannia	Nationwide
		Newcastle	
	Converted Mutual	Alliance and Leicester	Abbey
		Halifax	
	Internet Bank	Egg	Mint
		Intelligent Finance	Smile
	Personal Loan Specialist	Capital One	MBNA
		Morgan Stanley	
Affinity	Charity	Breakthrough Cancer	PDSA
		National Trust	RSPB
	Non-Profit Making Organisation	CIMA	NFU
		Pass	
	Sports/Football Club	British Athletics	Chelsea
		Manchester United	Jordan
Co-branded	Commercial Partner	Asda	BMW
		Garfield	Virgin
	Supermarket Bank	Sainsbury's Bank	M&S Money
		Tesco Personal Finance	

4.6.2 Other Variables

The annual percentage rate (APR) is used as a proxy for the price of a credit card and thus is the dependent variable. There are 48 explanatory variables, of which five variables are continuous, 25 variables are categorical and the other 18 are binary. Binary values measure whether or not a certain attribute/characteristic is present; a value of 1 is assigned if the characteristic is present, zero if not. In addition these variables can be separated into card, firm and borrower characteristics. A full list of the attributes can be found in Appendix A. Clearly, this list is far too large for a manageable statistical model. However, little research using hedonic pricing models has been undertaken in the credit card field. Therefore, there is little guidance with respect to

the characteristics that should be included in the model, therefore it is possible that some important variables are excluded, while less important ones included.

- **Dependent Variable**

The dependent variable is the "price" of the credit card, which is the annual percentage rate (APR) charged on purchases. The APR, according to the Consumer Credit Act, is a measure of the overall cost of credit. Credit card marketing prominently displays the APR, with the implication that the lower the APR, the cheaper the card will be for customers (HM Treasury, 2003). Following observations in the 2003 report by the Treasury Committee that credit card issuers were able to use more than one method to calculate APRs, regulations ensuring that all credit card issuers used a single method for calculating APRs was introducing in October 2004.

Under risk-based pricing consumers are offered varying interest rates based on the perceived risk to the lender of default. Individuals with bad or non-existent credit histories will typically be charged higher interest rates than those individuals with good records of using credit. Cards using risk-based pricing will normally advertise the lowest rate available, followed by the "typical rate". In the UK, credit card issuers are required to advertise the typical APR.[37] The typical APR is the rate at which is offered to at least two-thirds of applicants.

- **Explanatory Variables**

The explanatory variables can be classified into three group; card attributes, consumer attributes and firm attributes. A description of the explanatory variables is provided in Table 4.5. These attributes are discussed in greater detail in the methodology section.

[37] The typical rate is defined as the rate which is offered to 2/3 of customers, who apply for that particular card. Pre-2005 the typical rate was applied to the rate which 50% of customers received.

Table 4.5: A Summary of the Explanatory Variables

Attribute	Variable	Definition	Mean	Standard Deviation	Minimum Value	Maximum Value
-	PRICE	The price of the credit card defined by the typical APR	15.45	3.17	5.9	35.4
Card	FV	Interest rate type (0 if variable, 1 if fixed)	0.06	0.24	0	1
	TYP1	Initial credit card dummy	0.01	0.08	0	1
	TYP2	Gold credit card dummy	0.06	0.23	0	1
	TYP3	Platinum credit card dummy	0.22	0.42	0	1
	TYP4	Standard/classic credit card dummy	0.70	0.46	0	1
	TYP5	Student credit card dummy	0.01	0.11	0	1
	PAY1	AMEX payment network dummy	0.04	0.20	0	1
	PAY2	MasterCard payment network dummy	0.31	0.46	0	1
	PAY3	MasterCard or Visa payment network dummy	0.02	0.15	0	1
	PAY4	Visa payment network dummy	0.62	0.49	0	1
	LENPUR	Length of introductory offer on purchases (month)	2.89	3.08	0	12
	LENBAL	Length of introductory off on balance transfers (month)	6.90	3.84	0	18
	MINPAY	Minimum monthly payment (%)	2.25	0.35	2	5
	FEEPA	Annual fee (£)	1.65	12.60	0	120
	INTFREE	Interest free period (days)	54.34	6.33	0	59
	DEFAULT	Average default charge (£)	16.32	6.08	8	25
	POINTS	Points scheme dummy	0.10	0.30	0	1
	CASHBACK	Annual cashback received on purchases (%)	0.04	0.27	0	3
	DISCOUNTS	Discount Scheme Dummy	0.12	0.32	0	1
	AIRMILES	Airmiles Dummy	0.04	0.19	0	1
	DONOPEN	Amount given to affinity partner when account opened (£)	3.18	6.22	0	40
	DONPUR	Amount given to affinity partner per £100 spend on card (£)	0.06	0.13	0	1.25
Supplier	BANK	Bank dummy	0.13	0.34	0	1
	CHARITY	Charity dummy	0.20	0.40	0	1
	COMMERCIAL	Commercial partner dummy	0.18	0.38	0	1

Table 4.5: A Summary of the Explanatory Variables Cont.

Attribute	Variable	Definition	Mean	Standard Deviation	Minimum Value	Maximum Value
Supplier	CONVERTED	Converted mutual dummy	0.03	0.16	0	1
	INTERNET	Internet bank dummy	0.05	0.21	0	1
	MUTUAL	Mutual dummy	0.09	0.29	0	1
	NONPROF	Non-profit making organisational dummy	0.05	0.23	0	1
	PERSONAL	Personal loan specialist dummy	0.05	0.23	0	1
	SPORTS	Sports Club dummy	0.20	0.40	0	1
	SUPERMARKET	Non-Commercial dummy	0.02	0.14	0	1
Consumer	MINAGE	Minimum age requirement (years)	19.14	2.43	18	25
	MININC	Minimum income requirement (£)	5075.81	9350.74	0	25000
Issuer	ISS1	American Express dummy	0.03	0.18	0	1
	ISS2	Bank of Ireland dummy	0.01	0.10	0	1
	ISS3	Barclaycard dummy	0.03	0.16	0	1
	ISS4	Capital One dummy	0.01	0.09	0	1
	ISS5	Clydesdale Bank dummy	0.004	0.06	0	1
	ISS6	Co-operative Bank dummy	0.25	0.43	0	1
	ISS7	Egg dummy	0.003	0.06	0	1
	ISS8	GE Capital dummy	0.01	0.10	0	1
	ISS9	HBOS dummy	0.10	0.30	0	1
	ISS10	HSBC dummy	0.03	0.17	0	1
	ISS11	Lloyds TSB dummy	0.01	0.12	0	1
	ISS12	MNBA dummy	0.43	0.50	0	1
	ISS13	Morgan Stanley dummy	0.02	0.12	0	1
	ISS14	Nationwide dummy	0.01	0.09	0	1
	ISS15	Royal Bank of Scotland dummy	0.06	0.23	0	1

4.7 The Impact of Card, Consumer and Supplier Attributes

A quick glance at the payment card industry, an individual would not be wrong in assuming that credit cards are homogenous products. After all, all credit cards permit the user to purchases something and defer payment for a number of days. In addition, all credit cards allow individuals to borrow on the spur of the moment to finance a purchase. However, credit cards are not homogenous products, as Ausubel (1991) naively suggests they are; instead product differentiation can be observed. Heterogeneity can be observed amongst issuer and consumers.

The analysis undertaken in this section seeks to contribute to the understanding of credit card pricing by determining and quantifying the impact of card, organisation and consumer attributes on price. At the card-level, the value of individual characteristics which are not separately tradable are quantified and hence offer an insight into the cost/price implication of differentiation on individual attributes when only a bundle of characteristics are available to the customer. This is important because product differentiation can be used by suppliers to dampen price competition in the face of heterogeneous consumer preferences (Shaked and Sutton, 1982).

The transactor/revolver dimension is not the only dimension in which consumers differ. For example, some consumers are willing to pay an annual fee and/or a price premium for a credit card which permits them to earn frequent flyer miles, whereas others may prefer to use cards which feature the logo of their favourite football team or charity. Hence the analysis undertaken below will help consumers to understand the cost of choosing such characteristics.

4.7.1 Methodology

Following the seminal work of Rosen (1974), hedonic regression models have become an established way of examining how price dispersion is determined by different product attributes. Recent studies however have also incorporated buyer attributes (Lucas, 1997) and organisational attributes (Berndt *et al.*, 1995; Delgardo and Waterson, 2003). Following these approaches, a hedonic regression model incorporating card attributes, consumer attributes, and the organisational attributed

of the card issuers is estimated. Therefore, in order to determine and quantify how various card, organisational, and consumer attributes impact on the price of the i^{th} credit card in period *t*, a hedonic regression of the following form is estimated:

$$P_{it} = \beta W_{mit} + \gamma X_{kit} + \eta Z_{hit} + \varepsilon_{it} \qquad (4.9)$$

Where P_{it} is the price of credit card *i* at time *t*, denoted by the typical APR, ***W*** is a vector of *m* customer characteristics, ***X*** is a vector of *k* card characteristics and ***Z*** is a vector of *h* firm characteristics, ε is a stochastic error term and β, η and γ are all unknown coefficients which are to be estimated.

The vector ***X*** contains a number of card characteristics which may explain why price dispersion in occurs in the UK credit card market. Points and reward schemes also influence an individual's choice of credit card, as consumers like to think that they are getting something for nothing (Uncle, 1994). Five loyalty programmes were pin pointed in the initial review of card characteristics; they include points, cashback, discounts, airmiles and other. Other represents loyalty schemes such as free gifts or competitions to win once in a lifetime prizes.

By including firm characteristics it is possible to investigate whether the type of institution offering the card impacts on the price. Li (2002) identifies eight business middles which have challenged the business model of the traditional banks. The inclusion of firm characteristics enables different business models to be investigated in the terms of pricing. Internet banks are often argued to have cost advantages over the traditional bricks and mortar institutions (Li, 2002), and hence it is envisaged that these differences will be picked up by the INTERNET variable. The MUTUAL dummy variable intends to show if there are significant differences between building societies and their plc counterparts. The price differential between supermarket banks and other financial institutions is investigated using the SUPERMARKET dummy variable.

The relationship between a particular card and the card issuer can be classified as a co-branded relationship, an affinity relationship or a generic relationship. A generic relationship indicates that the card represents the issuer's "own" brand.

The vector *W* includes both customers' age and income attributes.

4.7.2 Empirical Results

Equation (4.9) is estimated using OLS and the results are presented in Table 4.6.[38] This model assumes that there is no unobserved product or card heterogeneity. Following the estimation of the model a number of hypothesis were formed and Walds tests undertaken, these results can be found in Table 4.7. The constant term is statistically significant and highly positive, thus suggesting that the theoretical base card (MBNA, standard, generic bank card, VISA) with no added extras such as a loyalty scheme or an interest free period would have an interest rate of 10.4 percent. Naturally, the inclusion of introductory offers, charitable or non-charitable donations, an interest free "grace" period or an annual fee, will impact on the price of the credit card.

4.7.2.1 The Impact of Brand on Price

Credit cards in the UK are issued by either domestic banks or by companies which are subsidiaries of US banks. A joint significance test was undertaken to investigate the hypothesis that UK issuers all offer the same interest rates and that all US issuers offer the same interest rate as each other. This hypothesis was rejected in favour of issuers charging different mark-ups. These differing mark-ups may reflect differences in cost-bases and the willingness of issuers to respond to changes in the cost of funds, due to not wanting to increase interest rates in case they attract a riskier pool of borrowers.

To be a Barclaycard holder (ISS4), an individual must pay a premium of 3.1%. Barclaycard enjoys the privilege of being the first mover into the UK credit card market and has built up a strong reputation. The name "Barclaycard" is a premium brand which has enabled Barclaycard to charge a higher APR than its mainstream competitors (Wonglimpiyarat, 2005).

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[38] The standard hedonic model, as depicted by equation (4.8), was regressed for a second tome, with the inclusion of a time trend, *t*. A t-test was carried out on this variable, to test the null hypothesis that the coefficient on *t* is equal to zero. In addition the same model was estimated with the inclusion of time dummies. A joint significance test was constructed to test the null hypothesis that the time dummies were significantly different from zero. The inclusion of either a time trend or time dummies did not impact significantly on the coefficients of other variables in the model and therefore a decision was made not to include them in the model reported here.

Table 4.6: OLS Estimation Results

Independent Variable	Coefficient	Standard Error
FV	**-3.3817**	0.2961
ISS1	**-6.5171**	0.6952
ISS2	**-2.2086**	0.5989
ISS3	-0.5136	0.4875
ISS4	**3.1597**	0.3852
ISS5	**2.0029**	0.6683
ISS6	**-2.5670**	0.8407
ISS7	**1.5600**	0.2937
ISS8	**4.1977**	0.8741
ISS9	**-3.7287**	0.5612
ISS10	**-0.7418**	0.3779
ISS11	-0.1479	0.2983
ISS12	**1.2383**	0.4741
ISS14	**2.0535**	0.4411
ISS15	-0.3833	0.6552
ISS16	**2.9210**	0.5558
ISS17	**2.0378**	0.3873
TYP1	0.1868	0.2525
TYP2	0.2248	0.1851
TYP4	**1.3778**	0.4802
STAT1	**2.3559**	0.5359
STAT2	**-0.2710**	0.1332
STAT3	**-1.5100**	0.3411
LENPUR	**0.0604**	0.0289
LENBAL	**0.0575**	0.0256
MINPAY	**3.4452**	0.2747
FEEPA	**0.0807**	0.0043
INTFREE	**0.0655**	0.0093
DEFAULT	0.0008	0.0756
POINTS	**0.5382**	0.1746
CASHBACK	0.2288	0.1968
DISCOUNT	**0.5034**	0.1729
AIRMILES	**2.3814**	0.3304
OTHER	**-0.7050**	0.1635
DONOPEN	**0.0541**	0.0146
DONSPEND	**1.6221**	0.5682
MUTUAL	-0.3450	0.2154
INTERNET	**-1.0217**	0.3075
SUPERMARKET	**-3.9917**	0.4622
CLASS1	**1.3669**	0.2058
CLASS2	**1.4076**	0.2069
MININC	**-0.00004**	0.0000
MINAGE	**-0.4334**	0.0666
CONS	**10.4222**	1.5388
R^2	0.638	F (43, 1882) 77.41
		Prob > F 0.0000

Note: All coefficients in bold are significant at the 5 percent significance level

Table 4.7: Significance Tests

Hypothesis	Chi-sq	p-value
All issuers charge the same mark-up	31.88	0.0000
All UK issuers have the same mark-up	21.61	0.0000
All US issuers have the same mark-up	67.26	0.0000
NatWest and RBS have the same mark-up	2.58	0.1081
Halifax and HBOS have the same mark-up	0.64	0.4241
All loyalty schemes have the same impact on the interest rate	16.75	0.0000
LENPUR = LENBAL	0.06	0.8014

These findings are consistent with the argument put forward by Wonglimpiyarat (2005) that Barclaycard does not complete on price instead choosing to market its product as a unique service. This enables Barclaycard to differentiate itself from other high-street bank credit cards that are simply sold as another feature of the bank's service. Barclaycard has invested heavily in a sustained advertising campaign which has been designed to send out a message emphasising peace of mind in the case of emergency, medical problems on holiday or losing goods which have been purchased using the card.

Discriminatory pricing appears to be apparent between credit card providers who are members of the same banking group. The Royal Bank of Scotland (ISS17) and NatWest (ISS16) are both divisions of the Royal Bank of Scotland (RBS) group, while Halifax (ISS11) and the Bank of Scotland (ISS3) are both part of the Halifax Bank of Scotland (HBOS) group[39].

This suggests that although they are members of the same banking group they are attempting to target different segments of the market. To hold a card issued by NatWest an individual must pay a premium of 2.8% compared to 1.8% to hold a card issued by RBS. A significant test is undertaken to investigate they hypothesis that cards NatWest and RBS charge the same mark-up over the cards issued by MBNA. A Walds test suggests that the two issuers do not complete on price, this suggests that instead they choose to compete on non-price characteristics, such as loyalty programs and added extras.

[39] In the wake of the current credit crunch HBOS was takeover by Lloyds TSB. Halifax and the Bank of Scotland along with Lloyds TSB are all now part of the Lloyds Banking Group.

Cards issued by BOS are found to 0.5% cheaper than cards issued by MBNA, while cards issued by Halifax are only 0.1% cheaper. A Walds test is undertaken to see if these issuers have charge the same rate of interest. BOS and Halifax are found not to compete with each other on price. The reason for the merger of Halifax and BOS provides some insight into why the two divisions price the same. The BOS was one of the two banks which dominated the Scottish Banking market, with a share of approximately 30%. Prior to the merger with Halifax, the presence of BOS in England and Wales was marginal. The BOS strengths were in business and corporate banking rather than retail and therefore it formed a good strategic fit with Halifax, which was strong in retail but lacked experience in business and corporate activities (Bank of Scotland, 2006). This suggest that as Halifax is more experienced in the retail banking sector, it is responsible for decisions relating to the retail side of the business, and hence BOS will follow suit. Another argument is that the two issuers choose not to compete on price but to compete on non-price characteristics such as type of loyalty programme or cardholder effects.

Recent entrants into the UK credit card market, such as the Bank of Ireland (ISS2) have rates which are lower than that of MBNA, this is possibly because they are attempting to seek market share and attract customers. A lack of brand awareness/reputation means that they have to use price to attract customers.

4.7.2.2 The Impact of Card Characteristics

Variable-rate loans have been legal since the early 1980s and immediately became prevalent in the mortgage and personal loan markets (Stango, 2002). The majority of issuers in the UK offer variable-rate cards to customers, however a small number of fixed rate cards are available. Typically, a fixed rate card is 3.4% cheaper than a variable rate card. Usually, fixed rate cards are associated with higher age and minimum income requirements suggesting that they are given to customers who are deemed to have lower default risk attached. Fixed rate cards are a method of gaining consumer loyalty.

While the coefficients are insignificant on gold (TYP1) and platinum (TYP2) credit cards, the coefficient on student card (TYP4) is positive and highly significant. This suggests that on average student cards are 1.3% more expensive than standard/classic credit cards. Students are deemed by banks to be risky individuals to loan too and hence a premium is charged.

The FEEPA variable is positive and highly significant. As the annual fee rises, so does the price of the credit card, that is for every pound the cardholder must pay for the privilege of using the card, the APR rises by approximately 0.1%. This result confirms the findings of Heffernan (2002). It can be argued that credit card companies are engaging in price discrimination because other credit cards are available with similar characteristics but without the annual fee. Increased competition has led to annual fees being abolished on all but the most exclusive cards.

Credit cards allow consumers to carry interest-free balances for up to two months, the credit cardholder is able not only to carry the balance, interest-free during the credit cycle but also for a number of days, typically around 25 days, after the initial credit period has ended. Thus, convenience users can avoid all interest charges by paying the outstanding balance in full before the interest period ends. The coefficient on INTFREE is positive and highly significant, which suggests that subsidisation occurs between transaction (convenience) users and revolvers. Interest-free periods are a benefit which is coveted by cardholders but expensive to issuers, thus it is not surprising to find that as the length of the interest-free "grace" period increases so does the interest rate charged on outstanding balances. For each day the interest free "grace" period is extended, the interest rate charged increased by 0.1%.

There are two potential reasons as to why banks encourage convenience users. First, extending credit to convenience users could be interpreted as a bank purchasing options of the future borrowing of consumers. Second, banks may opt to subsidise convenience users, simply to make their overall portfolio performance look better in the terms of lower charge-offs and larger credit volumes (Chakravorti and Emmons, 2001).

Chakravorti and Emmons (2001) argue that convenience users are being subsidised by their revolving counterparts. They find that the interchange fee charged by American Express (Amex), who is primarily a charge-card issuer, is higher than the fee charged by Visa and MasterCard, who are primarily credit card issuers. The coefficient on Amex (STAT1) is both significant and positive suggesting that the cards issued on the Amex network are 2.4% more expensive than cards issued on the Visa network. This finding is consistent with Schmalensee (2002) who found that although Amex is smaller than both the Visa and MasterCard systems, Amex has generally charged a substantially higher merchant discount.

The coefficient on MasterCard (STAT2) is significant and negative, suggesting that cards issued on the MasterCard network are approximately 0.3% cheaper than cards issued on the Visa network. Visa has dominated the UK credit of card market, and consistently had twice has many credit cards in issue than MasterCard. However, since 2003 Visa's dominance has been eroded. At the beginning 2003, Visa had approximately 40 million cards in circulation compared to MasterCard who had around 20 million cards, however by the beginning of 2007 the number of cards in circulation was 37 million and 30 million respectively (BAA, 2007). There are two potential explanations for this. Firstly, MasterCard have been more willing than Visa, to encourage members to co-brand (Worthington, 2001). Second, from the findings of this empirical study, consumers are choosing to hold card on the MasterCard network as they appear to be fractionally cheaper than cards issued on the Visa network.

The credit card industry has utilised point-based programmes to attract and retain customers for a number of years. A typical credit card loyalty programme allows members to earn points based on the amount they spend using the card, the points can then be redeemed for a variety of rewards. Benefits of programme membership include free travel miles, cashback, rebates, discounts, member-only promotions, gift certificates, free merchandise, special treatment, or other benefits/recognition.

Most retailers implicitly suggest that the aim of their schemes is to reward repeat purchasing. This is achieved through a combination of discounts and other rewards. Uncles (1994) suggest that consumers are motivated to participate in such schemes

because, fundamentally, the majority of people like to get something for nothing. However, the results obtained suggest that cardholders do not get something for nothing; they must pay towards joining and participating in a particular loyalty scheme.

As mentioned previously, the majority of loyalty programmes are based on a point system. The coefficient on POINTS is positive and highly significant. This suggests that to join the point scheme cardholders must pay a premium of 0.5%. This premium will reflect the cost associated with running the loyalty programme.

Credit card companies allow cardholders to earn reward points by using their credit cards for purchases. To do this, the credit card company must purchase the miles from airlines and other enterprises (Waterson *et al.* 2002). The coefficient on AIRMILES is significant and highly positive, suggesting that the offering of airmiles to cardholders increases the price of the card by 2.4%. This suggests that card issuers are passing the cost of airmiles on to the cardholder.

Companies are now leaning towards rewarding customers for repeat purchases by using experimental rewards, for example a once in a lifetime experience rather than simple point reward systems. The variable OTHER, includes experimental rewards, for example, the Manchester United credit card, offers cardholders the opportunity to win Manchester United "money can't buy" prizes. For every pound spent or transferred on to the card a point is awarded and for every 50 points earned is equal to one entry into a monthly draw. The prizes are provide by Manchester United and therefore are not a cost to MBNA, however they do encourage Manchester United fans to make purchases using their card. This is reflected by the coefficient on OTHER being significant and negative.

To entice new applicants, credit card issuers offer promotional offers on purchases and balance transfers. For every month that the promotional offer on purchases and balance transfers runs, the interest rate which the cardholder must pay on outstanding balances increases by 0.1%. If a cardholder chooses a card with an offer on purchases and balance transfers, then the price increases by 0.2% for each month these offers run simultaneously. A test of equality is conducted to test the hypothesis, that LENPUR

and LENBAL is both equal and thus raise the price of credit by the same amount in the long-run. It is found that the impact of these offers of the APR is the same.

Affinity cards generally call for an issuer to contribute a percentage of the amount charged to the card and/or a certain amount for each card issued to a member of the affinity group (Varadarajan and Mendon, 1988). The providers of affinity cards often state that the donations made to the affinity partner are made at no extra cost to the cardholder. Thus, the hedonic regression model provides an opportunity to test the hypothesis that donations made by card issuers to their affinity cards are made at no additional cost to the card holder. The results suggest that for every pound the card issuer donates to the affinity card, the interest rate increases by 0.05%. In addition, for every additional point the card issuer promises to donate, the interest rate on the credit card increases by 1.6%. These findings suggest that credit card issuers do not make donations for free, but instead take advantage on cardholder's charitable nature, to make additional profits.

4.7.2.3 The Impact of Consumer Characteristics

Credit card issuers are increasingly distinguishing between their customers based on risk characteristics, thus offering lower interest rates to a select group of low risk customers with good payment records. Higher interest rates are retained for customers who are assumed to be high risk with a history of late payment or customers who have yet to develop a detailed credit history. When advertising credit cards, issuers outline a number of requirements which potential applicants must meet. Two such requirements are minimum age and income. The MINAGE variable is statistically significant and negative, indicating that the interest rate declines with age. The age of an individual can be used as an approximation to how they are likely to behave. Income is also positive and significant, although the impact on price is extremely small.

4.7.2.4 The Impact of Firm Characteristics

The current account offered by the majority of banks, forms their "gateway" to customer relationships as this is the first product which consumers purchase (IBM, 2003). Providers then extend their relationship by selling other products such as

insurance, personal loans and credit cards. In a similar manner, building societies have used mortgage products as their gateway product. This suggests that individuals are most likely to hold a credit card issued by a building society, if they are already a member of the society.

The internet has had a profound effect on the financial service sector, dramatically changing the cost and capabilities for marketing, distributing and servicing financial products, thus enabling new types of products and services to be developed (Clemons and Hitt, 2000). Cards issued by internet providers are approximately 1% cheaper than cards which come from issuers who have a high street presence. This suggests that internet banks do in fact pass their cost advantage of being "internet-only" on to their customers.

Financial products offered by supermarkets, often top the list of best buys by undercutting banks using the economies of scale provided by their distribution networks. The coefficient on SUPERMARKET is both significant and positive suggesting that in average credit cards supplied by supermarket banks are 3.3% cheaper than cards issued by banks. This finding supports the research undertaken by IBM in 2003, who investigated whether supermarket banks were fulfilling their potential. One possible explanation for this price difference is that for supermarket banks there are no fixed costs associated with providing the service (IBM, 2003). Supermarket have form profit-sharing ventures with existing retail banks. Supermarket banks have adopted an open "component" based approach to create a high quality, low-cost operating model (IBM, 2003). The enormous physical presence of supermarkets has raised consumer awareness and proves an opportunity for low-cost marketing. Supermarkets may simply be passing their cost advantages on to consumers.

Supermarket banks may have sought to create a clear differential between their product and products being offered by existing banks. It is possible that supermarket have simply extended their "champion" role, based on core grocery brand values if trust, value, convenience, and customer service on to credit card products, thus making them easier and cheaper than existing products (IBM, 2003). In addition, a

credit card is a complement to supermarket shopping and a method of retaining consumer loyalty.

4.7.2.5 The Impact of Relationship Characteristics

Credit card issuers do not only offer generic bank cards, they also issue cards on behalf of others. The coefficient on AFFINITY, suggests that card issued on behalf of affinity cards are 1.3% more expensive than "own-brand" credit cards. Co-branded cards are also more expensive than an issuer's own card. Schlegelmilich and Woodruffe (1995) argue that affinity programmes have lower than traditional marketing costs and, unlike co-branded cards, do not require large amounts of revenue sharing or discounts. Therefore, taking this into account, it may be expected that the mark-up on co-branded cards are higher.

4.7.3 Summary

This section has attempted to determine and quantify the relationship between credit card prices and card, supplier and consumer attributes. In so doing, it provides insights into the factors which impact on credit card pricing in the UK. Card heterogeneity makes it difficult for consumers to make comparisons between different cards, as credit cards are sold as a bundle of attributes rather than attributes which can be bought on an individual basis. The analysis undertaken in this section has made the pricing behaviour of issuers more transparent.

Overall, the results indicate that buyer, card, firm and relationship attributes impact on the observed price. The explanatory power of the model is good and the data set confirms the strong positive price effects for attributes such as charity donations, loyalty programmes, annual fee and introductory offers. Other attributes such as fixed interest rates, minimum age and minimum income have a strong negative impact on the price of credit cards.

4.8 Loyalty Schemes, Switching Costs and Paying Customers to Switch

As mentioned previously, The Department for Trade and Industry (DTI)[40] found that credit card customers could save £1.9billion a year in interest rate payments by switching to cheaper credit cards (DTI, 2003). If this is the case, why are credit cardholders in the UK incredibly reluctant to switch credit cards? The theoretical literature predicts that when switching costs are present, firms are able to charge higher prices (Klemperer, 2005)[41]. However, Chen (1997) argues that the presence of switching costs explains the practice of paying customers to switch. The practice of paying customers to switch is a business practice prevalent in the UK credit card market via introductory offers on balance transfers and new purchases.

Previous empirical work on the US credit card market has sought to explain price stickiness and consumers' apparent unwillingness to switch. Ausubel (1991) propose an adverse selection model where low risk customers are less sensitive to interest rates than high risk customers. This particular scenario occurs because the former to not intend to borrow using a credit card. Issuers will therefore decide not to compete on price because this will only attract customers who are high risk. Calem and Mester (1995) and Calem *et al.* (2006) suggest that switching costs arise due to adverse selection. Customers develop a reputation with one issuer who will extend their borrowing levels; however, a rival firm will not accept a large balance transfer due to adverse selection. Therefore the size of the balance acts as a switching cost. Stango (2002) also finds that credit card prices are an increasing function of both outstanding balances and annual fees, which can act as switching costs.

The work makes three contributions to the literature on switching costs in the credit card market: (1) it is the first to analyse loyalty schemes as switching costs, (2) it determines whether introductory offers are used to pay customers to switch, (3) it is the first to capture characteristics at the *card* and *issuer* level employing a nested two-level error component model. This model, unlike previous studies, is therefore able to

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[40] The Department of Trade and Industry was replaced by the Department for Business, Enterprise and Regulatory Reform (BERR) in 2007. Subsequently, this has become the Department for Business Innovations and Skills (BIS) in June 2009.

[41] Klemperer (2005) provides a detailed review of the literature.

control for unobserved heterogeneity at the issuer and card level. The paper also makes a contribution to the debate on default charges, determining whether they are used to subsidise lower prices. Finally, by examining whether customers pay different prices for using proprietary or cooperative payment systems the paper contributes to the antitrust debate on payment systems (Schmalensee, 2002).

4.8.1 Methodology

In order to determine and quantify how various card, organisational and customer attributes impact on the price of the j^{th} credit card, issued by the i^{th} issuer in period t, equation (4.9) is adapted and a multilevel mixed-effects hedonic regression of the following form is employed:

$$ln\ P_{ijt} = \beta W_{ijt} + \gamma X_{ijt} + \eta Z_{ijt} + u^1_i + u^2_{ij} + \varepsilon_{ijt} \qquad (4.10)$$

where *ln P* is the natural logarithm of the typical Annual Percentage Rate (APR), ***W*** is a vector of customer characteristics that issuers use to screen applicants, ***X*** is a vector of card characteristics and ***Z*** is a vector of organisational characteristics, u^1_i is a random intercept term capturing unobserved characteristics at the issuer level, u^2_{ij} is a random intercept term at the card level (which is nested within the issuer level), **ε** is a stochastic error term and β, η and γ are unknown coefficients to be estimated. It is assumed that $u^1_i \sim N(0,\sigma_1^2)$ and $u^2_{ij} \sim N(0,\sigma_2^2)$ independently of each other. Equation (4.10) is, therefore, a two-level nested error components model of the form outlined by Baltagi *et al.* (2001). Panel data applications typically capture unobserved heterogeneity using an idiosyncratic error term. A two-level nested error component structure is employed in order to capture unobservable characteristics at the issuer and card level where cards are naturally grouped within issuers.

The key variables of interest to this study are included in the vector ***X***. Namely, the points, Airmiles and cash back loyalty schemes and the introductory offers on balance transfers and new purchases. These attributes of cards might be used by issuers as a means of product differentiation, which issuers use to dampen price competition in the face of heterogenous consumer preferences (Shaked and Sutton, 1982). Dummy

variables are used to capture cash back, points for using the card and Airmiles. Points and Airmiles schemes will generate switching costs because customers typically use them as savings schemes. They create 'lock-in' while customers save points or Airmiles for particular products or services they can be redeemed against. With cash back schemes there is 'lock-in' via forced saving. Customers benefit from the scheme, and liquidate their savings, at the end of the year through a rebate on their outstanding balance.[42] These switching costs are novel features of the current research. Ausubel (1991) and Stango (2002) suggest that the annual fee is a switching cost, which is also included. The annual fee makes it more costly for customers to switch and to carry more than one credit card. Whilst customers have choices about whether to use credit cards with switching cost attributes or not, a feature of all these attributes is that once the customer makes the choice to use such a credit card, there are costs to switching. Therefore, following Klemperer (1995), it is posited that variables that capture switching costs and lock-in will be associated with higher prices.

Competitors in the credit card market seek to capture rivals' market share with introductory offers. Chen (1997) suggests that the presence of switching costs can explain the practice of paying customers to switch. Introductory offers tend to take two forms: discounts on new purchases and discounts on balance transfers. Two variables are included in this model to measure (in months) the introductory offer periods on balance transfers and new purchases. Although introductory offers are costly to issuers, if issuers are using introductory offers to pay customers to switch and are investing in market share, we predict that they will be negatively priced.

Other interesting variables in the vector $\boldsymbol{X}$ capture payment systems and default charges. Dummies are included for cards that allow customers to use both the MasterCard and Visa payments, MasterCard and Amex. Visa is the base payment system. Ownership structure is an interesting feature of these systems with Visa and MasterCard cooperatively setting interchange fees whilst Amex is a proprietary system

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[42] Some cards also offer discount schemes, which exploit customers' loyalty to certain retail outlets where the discounts are available. In this scheme customers benefit at the point of transaction at selected retail outlets. This attribute is used by issuers as a means of product differentiation, which is distinct from switching costs because customers are not locked in. Product differentiation is used to dampen price competition in the face of heterogeneous consumer preferences (Shaked and Sutton, 1982).

owned by American Express. Visa and MasterCard have consequently received attention from antitrust authorities regarding how the interchange fee is set (Schmalensee, 2002). However, Schmalensee (2002) argues that the interchange fee maximises total output, producers' and consumers' surplus. If this is the case then the interchange fee would have no significant effect on the price customers' are charged.

Default charges are a source of revenue and ultimately large profits for credit card issuers. Indeed, in April 2006 the UK Office of Fair Trading (OFT) announced that default charges were excessive (generating in excess of £300 million a year for the industry) and were significantly higher than what is legally fair. In addition, Zywicki (2000) suggests that late payment and over-limit charges are principal predictors of eventual default and that these "hidden fees" are targeted almost exclusively at high-risk card users who are the most likely to default.

The remaining control variables included in the vector ***X*** are: dummies for card type (i.e. platinum, gold, standard, student and initial), the interest free period, a fixed rate dummy and charity donations when an account is opened and via card expenditure. The vector ***W*** includes both customers' age and income attributes required to obtain a card. The vector ***Z*** includes the organisational characteristics of the issuer i.e. ownership structure, joint venture and alliance, personal loan specialist, and internet service provision.

4.8.2 Empirical Results

The empirical results are presented in Table 4.8, columns (1) and (2) contain the results obtained from estimating the standard hedonic regression, while columns (3) and (4) report the results associated with the hedonic model which has been augmented with organisational and consumer attributes. The chi-square tests indicate that the consumer and organisation variables are jointly significant at the 1% level. While the LR tests indicate that both the one-level and two-level nested error components are significant and thus the latter is preferred. Furthermore, the coefficients and their associated standard errors are noticeably different, demonstrating the importance of capturing unobserved heterogeneity at both the issuer and card level. Following, the aforementioned tests, the discussion will focus on the results reported in column (4).

Table 4.8: Estimation Results

Variable	(1) One level R.E.		(2) Two level R.E.		(3) One level R.E.		(4) Two level R.E.	
	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err	Coeff	Std Err
FV	**-0.371**	0.020	**-0.507**	0.044	**-0.285**	0.019	**-0.393**	0.046
TYP1	**0.741**	0.047	**0.892**	0.110	**0.761**	0.046	**0.907**	0.107
TYP2	0.007	0.016	0.016	0.040	**0.073**	0.016	0.065*	0.050
TYP3	**-0.091**	0.010	**-0.074**	0.022	**0.028**	0.012	0.002	0.025
TYP5	**0.265**	0.032	**0.182**	0.070	**0.239**	0.031	**0.142**	0.068
PAY1	-0.016	0.032	-0.102*	0.053	0.055*	0.033	-0.033	0.065
PAY2	**-0.026**	0.009	0.002	0.022	-0.012	0.009	-0.002	0.022
PAY3	**-0.083**	0.023	-0.032	0.056	-0.023	0.023	0.033	0.061
LENPUR	**0.005**	0.002	**-0.009**	0.001	**0.005**	0.002	**-0.009**	0.001
LENBAL	**0.013**	0.002	**0.004**	0.001	**0.010**	0.002	**0.004**	0.001
MINPAY	**0.036**	0.016	**-0.127**	0.014	0.003	0.018	**-0.138**	0.015
FEEPA	**0.004**	0.000	**0.004**	0.001	**0.004**	0.0003	**0.004**	0.001
INTFREE	**0.005**	0.001	**0.005**	0.002	**0.006**	0.001	**0.007**	0.002
DEFAULT	**0.002**	0.001	-0.001	0.0004	0.002*	0.001	-0.0004	0.000
POINTS	**0.058**	0.012	-0.013	0.011	**0.055**	0.012	-0.015	0.010
CASHBACK	0.020	0.013	0.005	0.017	0.004	0.013	0.004	0.017
AIRMILES	**0.169**	0.020	**0.146**	0.053	**0.174**	0.019	**0.153**	0.051
DISCOUNTS	**0.057**	0.010	**0.062**	0.017	**0.053**	0.010	**0.067**	0.017
DONOPEN	**0.005**	0.001	0.004	0.001	**0.006**	0.001	0.002	0.001
DONPUR	**0.142**	0.039	**0.217**	0.092	**0.188**	0.039	**0.277**	0.094
COMMERCIAL					0.018	0.015	-0.005	0.034
CONVERTED					**-0.104**	0.023	**-0.138**	0.059
INTERNET					0.003	0.018	-0.059	0.046
MUTUAL					0.017	0.015	0.012	0.037
NON-PROF					**0.034**	0.014	0.024	0.039
PERSONAL					**-0.048**	0.023	-0.057	0.049
SPORT					0.010	0.014	-0.008	0.035
SUPERMARKET					0.041	0.028	**0.168**	0.063
MINAGE					**-0.021**	0.004	**-0.026**	0.008
MININCOME					**-5e-6**	1.2e-6	**-3e-6**	1.6e-6
Constant	**2.222**	0.061	**2.725**	0.093	**2.625**	0.097	**3.151**	0.156
Time	3.13	[0.79]	12.51	[0.05]	3.24	[0.78]	12.98	[0.04]
Random effects [Prob]	46.29	[0.00]	2619.33	[0.00]	87.17	[0.00]	2436.58	[0.00]
Two vs. One level [Prob]	-	-	2573.05	[0.00]	-	-	2349.42	[0.00]
Fixed vs. Random effects [Prob]	16.29	[0.93]	18.77	[0.81]	16.06	[0.99]	17.66	[0.00]
Regressors [Prob]	2600.90	[0.00]	488.58	[0.00]	3344.16	[0.00]	592.56	[0.00]
Consumer [Prob.]	-	-	-	-	250.5	[0.00]	36.78	[0.00]
Organisation [Prob]	-	-	-	-	48.22	[0.00]	19.99	[0.01]

Notes: (1) All coefficients in bold are significant at the 5 percent level, * denoted significant at 10 percent level;
(2) *Time* is a joint test statistic [probability level] of the time dummies;
(3) *Random effects* is a test statistic [probability level] of the random intercept terms;
(4) *Two vs. One level* is a test statistic [probability level] of the nested two-level model versus the one-level model;
(5) *Fixed vs. Random* is a Hausman test statistic [probability level] of fixed issuer effects versus random issuer effects;
(6) *Regressors* is a joint test statistic [probability level] of the regressors;
(7) *Consumer* is a joint test statistic [probability level] of the consumer characteristics;
(8) *Organisation* is a joint test statistic [probability level] of the organisation characteristics.

At the card level, the findings of pervious issuer level studies (Ausubel, 1991; Stango, 2002; Heffernan, 2002) are re-affirmed, as the findings are consistent with the annual fee being a significant switching cost. The coefficient estimate on FEEPA in column (4) indicates that for every £1 increase in the annual fee, the APR increases by 0.37%, in other words for every £100 owed the cardholder must pay an additional 37 pence on the debt.

Only the Airmiles loyalty programmes are found to be a statistically significant switching cost. Cards which have the Airmile scheme attached have on average an APR which is 16.56% higher than cards which do not have a loyalty scheme attached. This finding is consistent with issuers using Airmiles to create consumer lock-in with switching costs and exploiting lock-in with higher prices (Klemperer, 1995).

The coefficient on LENPUR indicates that each additional day on the introductory offer for purchases is associated with an average 0.94% lower APR. This is consistent with issuers paying customers to switch in the presence of switching costs as predicted by theory (Chen, 1997). It is also consistent with issuers using the introductory offer to attract customers that are not locked in to a credit card and then locking them in with switching costs (Gehrig and Stenbacka, 2004). In any case, in a competitive environment issuers are using the offer on purchases as an investment in market share.

In contrast to purchases, the introductory offer on balance transfers costs customers an average 0.38% for each additional day of the offer period. If customers are locked in due to switching costs, a customer accepting the offer can expect to pay a higher price when the offer period expires. If switching costs are not effective, however, customers not benefiting from the introductory offer are paying for issuers to increase market share. Though introductory offers are not available to all customers, it is still interesting to incorporate them in a hedonic regression in order to determine their impact on pricing.

The robustness of the findings for switching costs and introductory offer variables are examined by testing their stability over time. These key variables are allowed to vary

over time by interacting them with time dummies. The null hypothesis that coefficients are constant over time is rejected for CASHBACK, FEEPA, AIRMILES and LENBAL However, coefficient estimates on these variables all have the same sign over time and the coefficients reported previously in Table 4.8 are simply an average of those where there is month-to-month variation. The results of models allowing key variables to vary on a monthly basis and tests of the equality of coefficients over time are shown in Table 4.9.

Though not central to this study, it is interesting to note that customers do not pay significantly different prices for using different payment systems. This suggests that it does not matter to the customer whether a payment system is cooperative or proprietary. In the UK the Amex network is smaller than its Visa and MasterCard rivals that can offer greater network externalities. Gandal (1994) found customers were prepared to pay for network externalities in the spreadsheet software market. However, we do not find this to be the case in the credit card market.

Critics have suggested default charges are a hidden fee. If they were used to subsidise the 'headline' APR on which firms compete then we would expect the default charge variable to be negatively related to price. We do not find evidence to support this. This suggests that issuers are abiding by principles on fair default charges as set out by the UK's Office of Fair Trading in 2006.

4.8.3 Summary

This is the first study to analyse the effect of switching costs and introductory offers on credit card pricing using both issuer and card level data. Full use of this rich data is made by estimating a nested two-level error component model, controlling for unobserved heterogeneity at both the issuer level and the card level. Indeed, tests validate the use of this modelling approach and it is found that it impacts on the results when comparing it with the one-level model. These findings have implications for issuers, customers and policy-makers.

Table 4.9: Time Variant Results

Variable		(1) One level R.E.		(2) Two level R.E.	
		Coeff	Std Err	Coeff	Std Err
FV		**-0.259**	0.019	**-0.361**	0.045
TYP1		**0.757**	0.045	**0.899**	0.104
TYP2		**0.078**	0.016	**0.083**	0.038
TYP3		**0.030**	0.012	0.006	0.023
TYP5		**0.271**	0.031	**0.180**	0.066
PAY1		0.044	0.033	-0.039	0.060
PAY2		-0.013	0.008	-0.002	0.021
PAY3		-0.029	0.023	0.032	0.059
LENPUR	t=1	**0.007**	0.003	**-0.008**	0.001
	t=2	**0.007**	0.003	**-0.008**	0.001
	t=3	0.005	0.003	**-0.007**	0.001
	t=4	0.005	0.003	**-0.006**	0.001
	t=5	**0.007**	0.003	**-0.006**	0.001
	t=6	**0.011**	0.003	**-0.006**	0.002
	t=7	**0.012**	0.003	**-0.006**	0.002
LENBAL	t=1	**0.018**	0.003	**0.008**	0.002
	t=2	**0.019**	0.003	**0.009**	0.002
	t=3	**0.017**	0.003	**0.009**	0.002
	t=4	**0.010**	0.003	**0.006**	0.001
	t=5	**0.008**	0.002	**0.005**	0.001
	t=6	**0.006**	0.002	**0.005**	0.001
	t=7	**0.006**	0.002	**0.005**	0.001
MINPAY		0.019	0.018	**-0.109**	0.014
FEEPA	t=1	**0.002**	0.001	**0.001**	0.001
	t=2	**0.003**	0.001	**0.003**	0.001
	t=3	**0.003**	0.001	**0.003**	0.001
	t=4	**0.003**	0.001	**0.003**	0.001
	t=5	**0.005**	0.001	**0.005**	0.001
	t=6	**0.006**	0.001	**0.005**	0.001
	t=7	**0.006**	0.001	**0.006**	0.001
INTFREE		**0.006**	0.001	0.007	0.002
DEFAULT		**0.002**	0.001	0.000	0.000
POINTS	t=1	**0.054**	0.029	-0.015	0.015
	t=2	**0.076**	0.028	0.001	0.015
	t=3	**0.097**	0.028	0.006	0.015
	t=4	**0.077**	0.029	0.003	0.015
	t=5	**0.070**	0.029	-0.019	0.015
	t=6	**0.058**	0.023	-0.008	0.012
	t=7	**0.049**	0.023	-0.007	0.012
CASHBACK	t=1	-0.011	0.036	-0.001	0.021
	t=2	-0.006	0.025	0.007	0.018
	t=3	-0.017	0.025	0.004	0.018
	t=4	0.014	0.025	0.034	0.018
	t=5	0.038	0.026	**0.051**	0.018
	t=6	0.070	0.044	**0.099**	0.024
	t=7	0.080	0.044	**0.116**	0.025

Table 4.9: Time Variant Results Cont.

Variable		(1) One level R.E. (2)		(2) Two level R.E.	
		Coeff	Std Err	Coeff	Std Err
DISCOUNTS	t=1	0.048	0.025	0.032	0.018
	t=2	**0.049**	0.024	**0.037**	0.018
	t=3	**0.066**	0.024	**0.037**	0.018
	t=4	**0.064**	0.024	**0.047**	0.018
	t=5	**0.053**	0.024	**0.037**	0.018
	t=6	0.042	0.024	**0.036**	0.018
	t=7	0.040	0.024	0.030	0.018
AIRMILES	t=1	**0.211**	0.044	**0.210**	0.052
	t=2	**0.189**	0.044	**0.188**	0.052
	t=3	**0.191**	0.044	**0.187**	0.052
	t=4	**0.194**	0.044	**0.171**	0.052
	t=5	**0.150**	0.044	**0.132**	0.052
	t=6	**0.170**	0.044	**0.131**	0.052
	t=7	**0.187**	0.045	**0.164**	0.052
DONOPEN		**0.006**	0.001	0.001	0.001
DONPUR		**0.199**	0.038	**0.301**	0.091
COMMERCIAL		0.014	0.014	0.002	0.032
CONVERTED		**-0.100**	0.022	**-0.135**	0.057
INTERNET		0.016	0.018	-0.036	0.044
MUTUAL		0.013	0.015	0.012	0.036
NON-PROF		**0.032**	0.014	0.023	0.038
PERSONAL		**-0.054**	0.022	-0.062	0.046
SPORT		0.009	0.014	-0.003	0.033
SUPERMARKET		0.018	0.027	**0.141**	0.061
MINAGE		**-0.019**	0.004	**-0.015**	0.007
MININCOME		**0.000**	0.000	**0.000**	0.000
Constant		**2.504**	0.098	**2.858**	0.152
Random effects [Prob]		86.48	(0.000)	2621.93	(0.000)
Two vs. One level [Prob]		-	-		
LENPUR [Prob]		6.70	(0.350)	3.56	(0.736)
LENBAL[Prob.]		39.46	(0.000)	26.77	(0.000)
FEEPA [Prob]		45.01	(0.000)	288.44	(0.000)
Points [Prob]		2.44	(0.875)	4.91	(0.556)
Cashback [Prob]		7.74	(0.258)	60.70	(0.000)
Discounts [Prob]		1.11	(0.981)	2.01	(0.919)
Airmiles [Prob]		1.25	(0.974)	19.09	(0.004)

Notes: (1) All coefficients in bold are significant at the 5 percent level
(2) *Random effects* is a test statistic [probability level] of the random intercept terms;
(3) *Two vs. One level* is a test statistic [probability level] of the nested two-level model versus the one-level model;
(4) *LENPUR* is a joint test statistic (probability level) of the coefficients LENPUR
(5) *LENBAL* is a joint test statistic (probability level) of the coefficients LENBAL
(6) *FEEPA* is a joint test statistic (probability level) of the coefficients FEEPA
(7) *Points* is a joint test statistic (probability level) of the coefficients POINTS
(8) *Cashback* is a joint test statistic (probability level) of the coefficients CASHBACK
(9) *Discounts* is a joint test statistic (probability level) of the coefficients DISCOUNTS
(10) *Airmiles* is a joint test statistic (probability level) of the coefficients AIRMILES

The evidence indicates that Airmiles and loyalty schemes are attributes which can be used by issuers to create consumer lock-in. Such lock-in creates switching costs, which in turn allows issuers to charge a higher price for products offering this attribute compared to those credit cards that do not possess such attributes. The empirical evidence suggests that points and cashback schemes do not create customer lock-in which can be exploited by issuers. A policy intervention might require issuers to be transparent regarding the cost of loyalty schemes. However, it is not clear, whether policymakers should act to inhibit loyalty schemes. Indeed, paying customers to switch occurs because of the presence of switching costs (Chen, 1997). Thus, the market itself might be providing a solution to the presence of switching costs.

The Amex payment network is accepted by fewer merchants compared to Visa and MasterCard. This implies that Visa and MasterCard can offer greater network benefits to customers compared to Amex. Previous empirical research on spreadsheets, undertaken by Gandal (1994), found that product attributes exhibiting positive network effects are associated with higher prices. Indeed, network attributes do not significantly affect pricing. There has also been policy concern regarding the potential abuse of the collectively set interchange fees of Visa and Mastercard. The main concern is with the effect on merchants, whose fees are generally affected by the interchange fee (Schmalensee [2002]). Our results confirm that customers are not affected by whether the payment system is a collective or under proprietary ownership i.e. Amex.

In April 2006, the OFT announced that default charges were excessive and were significantly higher than what was deemed to be legally fair, There has been some concern that the revenues from default charges are being used to subsidise lower "headline" prices; however, no evidence has been found in this instance to support this claim. A possible explanation may be that issuers have begun to set their default charges fairly by following the guidelines outlined by the OFT in 2007.

4.9 Conclusion

The adoption of new pricing structures has increased credit costs for some consumers and has deceased for others. Low-risk individuals are able to behave in such a way,

that they are able to avoid new and increased fees and generally experience lower credit costs then they might have done during the early 1990s. High-risk borrowers, who may not have previously qualified for unsecured credit, can now obtain credit by paying a risk premium. The current pricing structure has resulted in credit card users "paying their own way."

This chapter has attempted to determine and quantify the relationship between credit card prices and credit card attributes, supplier attributes and consumer attributes. In so doing, it provides insights into the factors which impact on credit card pricing in the UK. Card heterogeneity makes it difficult for consumers to make comparisons between different cards, as credit cards are sold as a bundle of attributes rather than attributes which can be bought on an individual basis. The OFT has found that almost 70% of individuals do not shop around for the cheapest deal and that those who choose an average priced credit card rather than the cheapest option are losing an average of £137 a year (Which? News, February 2008). Therefore, the analysis undertaken in this chapter attempts to make the pricing behaviour of card providers and card issuers more transparent by quantifying the card, buyer and issuer attributes. Alena Kozakova, Principal Economist for consumer body Which? stated that: "People believe that APRs are a dependable way of comparing credit cards, but our research shows that APR cannot be relied upon for true comparisons" (Which? News, April 2007).

The subsequent chapters will empirically analyse the price-setting behaviour of the major credit card issuers in the UK. The next chapter will analyse the interest rate channel of the monetary transmission mechanism and pricing asymmetries using monthly posted interest rates on purchases.

CHAPTER 5
INTEREST RATE PASS-THROUGH: THE CASE OF THE UK CREDIT CARD MARKET

5.1 Introduction

There are a number of conduits which central banks can use to utilise monetary policy. An important channel is the manipulation of the central bank's official interest rate to enable inflation targets to be achieved. For this monetary policy tool to be successful in influencing future spending as well as the inflation rate, official changes must produce similar changes in short money market instruments and retail rates. Retail rates are likely to have some influence on aggregate demand (Kwapil and Scharlar, 2006). In the UK, the impact of official interest rate changes on retail interest rates is the most important medium for influencing consumption, which makes up 60% of aggregate demand (Fuertes and Heffernan, 2006).

Early studies on the transmission mechanism of monetary policy assumed immediate and complete pass-through of changes in official rates to retail rates (see for example, Bernanke and Gertler, 1995; Kashyap and Stein, 2000; Altunbas *et al.*, 2002). However, more recent studies have shown that pass-through maybe incomplete and that the speed of adjustment maybe sluggish. Pass-through and adjustment speed have also been found to differ across financial institutions and across financial products (see for example: Cottarelli and Kourelis, 1994; Mojon, 2000; de Bondt, 2002; Hoffman and Mizen, 2004). Furthermore, it has been found that the speed of adjustment may be asymmetric (see for example, Frost and Bowden, 1999; de Haan and Sterken, 2005).

While there are numerous studies on monetary policy transmission, the retail interest rate process is relatively under explored in the context of credit cards. Thus, this chapter analyses the dynamic relationship between the Bank of England Base Rate and retail credit card rates by measuring the pass-through process between these interest rates in the UK banking system. Official interest rate changes are intended to influence short rates of money market instruments and retail products, such as deposit accounts and mortgages. Often complete pass-through is simply taken for granted. In an ideal world, official base rate changes should be completely "passed through" to market and

retail rates over a reasonably short time span. In practice, official base rate changes may not be fully and instantaneously passed through to retail rates, differentials may persist for a period of time. Many empirical studies have found that interest rates appear to respond on a less than one-for-one basis to policy rate changes (for example, de Bondt, 2005; Ehrmann *et al.*, 2003).

Numerous studies on the response of loan rates to monetary policy have established two stylised facts. First, loan rates are sluggish or sticky in responding to monetary policy actions. Second, financial structure appears important in explaining this phenomenon. Many theories of slow or incomplete price adjustment in goods and labour markets have been suggested. These include theories based on market structure and a lack of competition, implicit risk-sharing contracts, cost of changing prices and consumer switching costs. Blanchard and Fischer (1989) provide a detailed summary of the various theories of price rigidity. In the banking sector, price stickiness has often been attributed to a lack of competition (Hannan and Liang, 1991). There are many examples in the existing literature of explanations used to explain price stickiness in goods markets being applied to financial markets. For example, Hannan and Berger (1991) use the menu cost model of Rotemberg and Saloner (1987) to explain stickiness in bank deposit rates. While Klemperer (1987) suggests that his model of switching costs could also be used to explain stickiness. Fried and Howitt (1980) used Azariadis' (1976) model of implicit insurance contracts in labour markets to explain loan rate stickiness as a method of assuring risk averse lenders of a relatively constant rate of interest.

This chapter is structured as follows. Section two provides a detailed definition of pass-through. In addition, it introduces several theories which provide explanations for sluggish and incomplete adjustment of retail interest rates. Section three provides an overview of the existing literature with respect to base rate pass-through. Section four introduces the data used within the study and considers the stylized facts relating to the UK credit card market. A simple linear model of interest rate pass-through is presented in section five. Section six uses a simple linear error correction model to investigate the response of credit card interest rates to changes in the cost of funding. Before the model is estimated, some preliminary analysis is undertaken on the time

series data. It is often argued that the adjustment of bank interest rates is non-linear; therefore, section seven analyses pass-through using a non-linear model. Also, explanations for asymmetric price adjustments are identified and these explanations are discussed with respect to the credit card market. Section eight concludes this chapter.

5.2 The Determinants of Pass-Through

The pass-through mechanism involves a process whereby impulses on interest rates administered by the monetary authorities or on money market interest rates are transmitted to short-term lending rates (Humala, 2005). Measuring pass-through involves assessing the impact of changes in money market rates on retail rates both in the short-term and the long-term, as well as the speed of adjustment.[43]

However, the meaning of pass-through appears to vary across studies. Therefore, in the context of this study, the term pass-through refers to the extent to which changes in money market rates are reflected in changes in retail rates both in the short- and long-run. Complete pass-through is said to occur when a movement in the money market rate leads to a one for one change in retail rates. Retail rates are often described as "sticky" due to the slow response of these rates to movements in the money market rate (see for example, Ausubel, 1991; Calem and Mester, 1995; and Mester, 1994).

5.2.1 Why Doesn't Pass-Through Occur Straight Away?

Hoffman and Mizen (2002) argue that for there to be a departure away from continuous adjustment to retail rates, there must be costs associated with adjusting retail rates. Costs may arise due to the search for information, Blanchard and Fischer (1989); menu costs related to adjusting prices, Rotemberg (1982), Akerlof and Yellen (1985), Ball and Romer (1989), Mankiw (1985), Benabou and Gertner (1993), Ball and Mankiw (1994); or non-pecuniary costs of lost custom after adjustments are made, Okun (1981) and Rotemberg (1992). All retailers offering financial products face these types of costs when making adjustments to retail interest rates but the incidence of

[43] The length of tome from the initial impact until the final effect is observed.

the costs may not be identical, hence this may possibly explain why the adjustment to retail rates differs by type of institution.

5.2.2 The Determinants of Pass-Through

The influence of monetary policy on interest rates depends importantly on the structure of the financial system. Significant changes to the structure of financial markets and institutions in the UK are likely to have altered the interest rate channel. Key developments include the deregulation of the financial system, the growth of capital markets as an alternative to bank intermediation, increased competition amongst intermediaries both domestically and internationally, and greater transparency by the Bank of England about monetary policy operations. These changes in the financial system may have altered both the timing and the magnitude of the response of interest rates to monetary policy. Sellon (2002) argues that the failure of long-term interest rates to respond to monetary policy easing maybe an indication that monetary policy may have less influence on interest rates than it did previously. Thus, there are a number of factors which are likely to determine the degree to which changes in the money market rate are passed through to retail rates and the speed at which such pass-through occurs. The determinants of the interest rate transmission mechanism are reviewed below.

- **Monetary Policy Effects**

Lags in the adjustment of retail rates are likely to occur due to the difficulty of interpretation of whether changes in policy are permanent or temporary (Bredin, Fitzpatrick and O'Reilly, 2001). The banking sector may therefore be slower too respond to temporary changes in the base rate, but quicker to respond to permanent changes.

Banks which are well-capitalised and liquid are able to smooth their interest rates. If banks are well capitalised and liquid then they are not forced to adjust immediately to changes in monetary policy and have the potential to swallow shocks, at least temporarily (Horvàth, Krekó and Naszódi, 2004). The stickiness of retail rates may be compounded due to the presence of adjustment costs associated with changing retail

rates to customers and this may lead to the smoothing of retail rate changes with respect to changes in money market rates.

The relationship between short-term and long-term interest rates is another important consideration when examining the impact of monetary policies, for a number of reasons. First, the proportion of fixed and variable retail rates will determine the relative importance of movements in short and long-run interest rates, and ultimately influence the degree of pass-through from money market rates to retail rates. Second, it is important to consider whether financial intermediates source their funds from short or long-run capital markets. If a financial intermediary's main source of funding is from short-term capital markets, then changes in short-term rates are likely to feed into retail rates. However, if the main source of financing is from long-term capital, then there is likely to be a weak link between changes in policy rates and retail rates (Bredin, Fitzpatrick and O'Reilly, 2001). Sarno and Thornton (2004) argue there may not be a one way causation running from money market rates to retail rates.

- **The Role of the Financial System**

The strength and speed of monetary interest rate transmission can be strongly related to the structural properties of a financial system, see for example, Cottareli and Kourelis (1994), Ehrmann *et al.* (2001) and Mojon (2000). Disintermediation, the intensity of competition within the banking sector, the capitalisation and liquidity position of banks as well as monetary policy and interest rate volatility can all impact on the strength and speed of the transmission of interest rate changes.

The degree of disintermediation and the role of non-bank financing have an impact on the elasticity of both loan demand and deposit supply with respect to the money market rate. On the asset side, loan demand is expected to react more intensely to interest rate changes in an economy which has highly developed capital and money markets, as companies are then able to substitute bank loans with other forms of financing (Horvàth, Krekó and Naszódi, 2004).

The intensity of competition amongst banks will also influence the interest rate elasticity of loan demand and deposit supply. Bredin, Fitzpatrick and O'Reilly (2001)

argue that in monopolistic or oligopolistic settings, in general a one for one movement in retail rates in response to changes in money market rates will not occur. Deposit rate rigidity under the assumption of menu costs and monopolistic competition has been studies by Rotemberg and Saloner (1986) and Hannan and Berger (1991).

- **Other Determinants**

Berlin and Mester (1999) claim that banks which rely heavily on non-insured funding, will adjust their deposits rates by more and at a faster rate than those banks whose liabilities are less affected by market movements. Berger and Udell (1992) argue that financial institutions which maintain a close tie with their customers will change their lending rates comparatively less and at a much slower speed. Weth (2002) finds that in Germany, banks who have large volumes of long-term business with households and firms change their prices less frequently than those who do not.

Cottarelli and Kourelis (1994) and Mojon (2000) have attempted to relate country and specific characteristics to the degree of pass-through in the short-run. Both studies use a panel data approach to relate estimates of the degree of short-run pass-through to variables such as banking competition, money market factors, financial structure, and bank costs. These studies find that inflation, a volatile money market rate and a lack of competition all positively contribute to the "stickiness" of interest rates. Other determinants which may also impact on the speed and degree of pass-through include the characteristics of a borrower (saver) and cyclical elements.

5.2.3 Theories of Bank Rate Stickiness

If perfect competition and complete information existed, then price would be equal to marginal cost and thus the derivative of price with respect to marginal cost would be equal to one. However, as an industry deviates away from perfect competition this derivative typically becomes less than one. Cottarelli and Kourelis (1994) referred to the degree of stickiness of bank lending rates as the speed at which these rates adjust to their long-run equilibrium values after monetary shocks affecting money market rates. Theories concerning the pricing behaviour of banks form a special sub-area of the theories of pricing, in addition, explanations about price and wage stickiness are

also applicable for bank rates. This section discusses the various theories as to why the price of a bank loan may not respond one for one with the cost of providing a loan[44].

- **Adverse Selection**

Stiglitz and Weiss (1981) develop a model of agency costs with respect to the banking sector. According to their model, the firm/individual borrower is assumed to know the riskiness of their project, while the bank is unable to distinguish between projects. Accordingly, this information asymmetry introduces the problems of moral hazard and adverse selection. An increase in the interest rate at which investors are able to borrow will reduce the expected profit on all investment projects. As banks increase the loan rate, those individuals with the safest projects will be the first to withdraw from the market. This results in the mix of applicants applying for loans to change adversely. When faced with higher interest rates, firms may decide to undertake riskier projects.

- **Switching Costs**

In a market in which consumer goods are sold, the seller is not concerned with who buys the product which they are attempting to sell to, as one customer is the same as the next. For example, anyone who wants to buy at the listed price from a market stall can do so. This is not the case in the bank loan market. Banks are concerned with the risk profile and potential behaviour of their customers, as a consequence, banks must find out information about the characteristics of each and every potential customer. The cost of acquiring information is often passed onto the buyer by way of a fixed one-off up-front fee. Often, it is this fee which makes it costly for a buyer to switch from one bank to another.

In addition, there are regular search costs, or "shoe leather" type costs from moving from one supply source to another. For example, costs arise from searching and comparing different rates, filling out application form and obtaining the relevant documentation. Klemperer (1987) illustrates that, in general, the existence of switching costs leads to market segmentation, and reduces the elasticity of demand facing each firm.

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[44] For a more detailed summary of these theories, see Lowe and Rohling (1992)

Calem (1992) argues that switching costs are important in the US credit card market. When a customer wishes to change credit card providers, the new issuer may require the individual to pay off the balance on the existing card. As a consequence this may involve several months of curtailed spending, which constitutes a considerable switching cost.

- **Risk Sharing**

If borrowers are more averse to risk than the shareholders of a bank, then potentially the stickiness of bank interest rates can be explained using the implicit risk insurance argument. Fried and Howitt (1980) applied Azariadis' (1976) model of implicit labour contracts to the banking sector. If a borrower is risk averse, then they will prefer stable interest payments. As a result the bank would charge a less variable interest rate than its marginal cost of funds. The bank seeks compensation for the additional risk by charging a higher rate of interest than they would have charged it the borrower had been risk neutral. Essentially, the difference between the rate charged to the risk neutral and the risk adverse borrowers is an insurance premium. Fried and Howitt (1980) argue that customers will not change banks when the lending rate is higher than the marginal cost of funds due to the existence of switching costs. Since both parties face these switching costs, it is deemed mutually advantageous to maintain a long-term relationship. The result is interest rate stickiness.

- **Consumer Irrationality**

Ausubel (1991) argues that search and switching costs, while present do not adequately explain why credit card rates are sticky. Generally, the majority of borrowers believe that they will pay the outstanding balance in full before the end of the billing cycle, for whatever reason they fail to do so. This type of cardholders is insensitive to interest rate changes and is deemed to be low risk. High risk credit card borrowers, on the other hand, are more likely to be interest rate sensitive because they fully intend to borrow on their credit card. As a consequence, a reduction in the interest rate on purchases will only attract those customers who fully intend to borrow. This "reverse" adverse-selection problem means that issuers are less likely to compete on price and thus rates are likely to be sticky, especially in a downwards

direction, with credit card issuers choosing to compete on non-price elements such as loyalty schemes, and free purchase insurance.

- **Other Explanations**

Under certain circumstances and assumptions bank rates may overreact or forego changes in the policy rate. According to one argument, bank rates can change prior to changes in the marginal cost of funding. For example, banks may anticipate a rise in the cost of funding and increase loan rates in advance. This is particularly relevant for banks that finance longer-term loans with short-term deposits.

5.3 A Review of the Existing Literature

The last decade has been characterised by increased interest in the mechanics of the transmission of monetary policy to the banking sector. The effectiveness of monetary policy depends on the degree and the speed of interest rate adjustment to change in the policy controlled interest rate (Ozdemir, 2009). Thus, both theoretically and empirically, the interest rate channel of monetary transmission mechanism has received great attention from academics.

The transmission of changes in the money market interest rate into changes in deposit and loan interest rates has been empirically investigated in a number of countries using bank level data from, for example: Neumark and Sharpe (1992) for the US, Berstien and Fuentes (2003) for Chile, Gambacorta (2004) for Italy, Hoffman and Mizen (2002, 2004) for the UK, de Graeve *et al.* (2004) for Belgium and Weth (2002) for Germany. In general, these studies are interested in evaluating the responsiveness of interest rates to changes in monetary policy and many stress the importance of bank characteristics in determining the speed of adjustment. The issue of the pass-through of market interest rates to retail interest rates continues to attract significant attention in Europe and the US.

Moore *et al.* (1988) and Diebold and Sharpe (1990), investigate interest rate rigidities in the US using aggregate deposit rates. Both report strong evidence of retail rates being slow to respond to changes in market rates. Neumark and Sharpe (1992) use a switching model of partial adjustment for US deposit rates. The model switches

according to an indicator function, which indicates whether the bank is above or below its long-run equilibrium mark-up, assuming that long-run equilibrium deposit rates are proportional to Treasury bill rates.

In the UK, Paisley (1994) and Heffernan (1997) use conventional linear methods to investigate the relationship between the pass-through of official interest rate changes and changes in the retail rates of banks and building societies. Heffernan's (1997) study finds complete pass-through for repayment mortgages and incomplete pass-through for savings and current accounts in the long-run for both UK banks and building societies. Paisley (1994) does not find complete pass-through in mortgage rates for UK building societies. Hoffman and Mizen (2002, 2004) employ 17 years of monthly data on mortgages and 90-day term deposits in an error correction model (ECM) framework. They find complete pass-through for mortgages but not for deposits. Hoffmann and Mizen (2002, 2004) introduced asymmetries in the adjustment process using both exogenous and endogenous drivers. The actual or expected change in the official rate proved to be significant.

In Ireland, Fitzpatrick and O'Reilly (2001) using a money market rate as a proxy for an official rate, examine the relationship between base rate changes and four Irish retail loan rates. Pass-through in this case is found to be incomplete and that the speed of adjustment varies with the type of loan. Evidence is found to suggest that structural change is present.

A number of studies such as Sander and Kleimier (2004), Toolsema, Sturm and de Haan (2002), de Bondt (2002), Mojon (2000), Borio and Fritz (1995) and Cotteralli, Ferri and Generale (1995) consider differences in pass-through not only across different bank lending and deposit rates but also across countries within the euro zone. These studies find that there is a substantial degree of short-run bank interest rate stickiness.

There are a small number of empirical investigations of pass-through which use a qualitative dependent variable approach to rate setting. Hannan and Berger (1991) and Mester and Saunders (1995), model US deposit and prime rate changes respectively using a logit model. This approach enables the authors to assess the effect

of a change in the cost of funds and other variables on the probability of deposit/prime rate changes. Mester and Saunders (1995) found that changes in the Federal Funds rate are generally prompted by a larger probability of an upward response than a downward response in prime rates. Hannan and Berger (1991) conclude that deposit rates are significantly more rigid when the direction of the stimulus is upward.

In summary, the main conclusions which can be drawn from the empirical literature associated with estimating pass-through are as follows: (1) Lending rates are very sticky with respect to movements in policy and market rates in the short-run, however in the long-run in many cases pass-through is almost complete. (2) The process of transmissions of changes in the policy/market rate to retail rates varies across country. (3) The structure of financial market and institutional arrangement inside a country are the main factors that contribute to variability of path across countries.

While a significant number of studies have investigated base rate pass-through in the United Kingdom (for example Mizen and Hoffman, 2002 and 2004; Heffernan, 1997), they have largely ignored the credit card market choosing to focus on deposit and mortgage lending. Therefore, the subsequent work undertaken in this chapter seeks to make a contribution to the existing literature by empirically investigating the relationship between the base rate and retail credit card lending rates, thus, providing an insight into the effects of the monetary transmission mechanism of the UK credit card market.

5.4 Data

In order to analyse pass-through with econometric models, data at different levels of aggregation are used. The data sample contains individual monthly interest rate data for the top ten issuers for the period January 2000 to May 2007, as well as aggregated interest data calculated as a weighted average of individual card provider's interest rates for the period January 1995 to July 2008. Based on the data, it is already possible to formulate some stylised facts about interest rates and pass-through in the UK credit card market.

The analysis is based on monthly data to investigate the interest pass-through of official base rate to credit card rates in the United Kingdom. The empirical work analyses data collected from the Bank of England (BoE) and Moneyfacts magazine (MM), which includes information on lending rates and money market rates. MM is a private company which specialises in the collection of large amounts of financial information on deposit, loan, investment (e.g. unit trusts) and business finance; all of this information is published in a monthly industry magazine.

The aggregate interest rate data was collected from the Bank of England's statistical interactive database. The retail rate is the weighted average interest rate on credit cards for banks and building societies. As banks and building societies typically issue a range of credit cards, the Bank of England gives preference to the most popular card (if known) or the card which has a standard interest free period. Temporary reductions in interest rates for things such as "introductory offers", annual fees or cash back are not included unless these have already been factored into the APR calculation by the issuer. The banks average is weighted according to gross new lending during the month for each of the sample institutions. The building society average is weighted according to the aggregate building society gross advances during the month.[45] The credit card data set does not reflect all available information on each credit card product since there can be substantial competition in an array of non-price inducements built into the retail products offered by banks and building societies that may alter more frequently than the rate itself.[46]

A description of variables is presented in Table 5.1. Information on market interest rates has been collected from the BoE interactive statistical database.[47] BoE data from January 1995 to July 2008 is used to consider the average behaviour of credit card issuers and MM data from October 1999 to May 2007 is used to model individual issuer behaviour.

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[45] Bank of England Explanatory Notes – Household interest rates <http://213.225.136/mfsd/iadb/notesiadb/Household_int.htm>

[46] Chapter four of the thesis has considered the impact of these inducements on interest rates.

[47] See <http://www.bankofengland.co.uk/statistics/index.htm> for more information

The rest of this section will introduce the data set being used and analyses the spread activity of credit card issuers. The analysis of average monthly spreads allows a detailed review of spread behaviour and an opportunity to look for differences in the behaviour of different categories of issuers as well as product sectors and individual issuers. The spread is defined as the difference between the credit card rate and the base rate. Due to space restrictions some of the tables and figures can be found in Appendix B.

Table 5.1: Descriptive Statistics

Variable	Description	Obs.	Mean	Standard Deviation	Min Value	Max Value
INT	Monthly average interest rate charged on credit cards	164	18.43	2.93	14.80	23.01
INT_i	Monthly average interest rate charged by credit card issuer i	See table 5.6 for information on individual issuers				
TB	Monthly average rate of discount 3 month sterling treasury bill	164	5.19	1.00	3.31	7.29
LIBOR	Monthly average London Inter-Bank Lending Rate (LIBOR), 3 month	164	5.48	1.11	3.42	7.71
BASE	Monthly average official bank rate	164	5.34	1.05	3.50	7.50

5.4.1 Market Rates

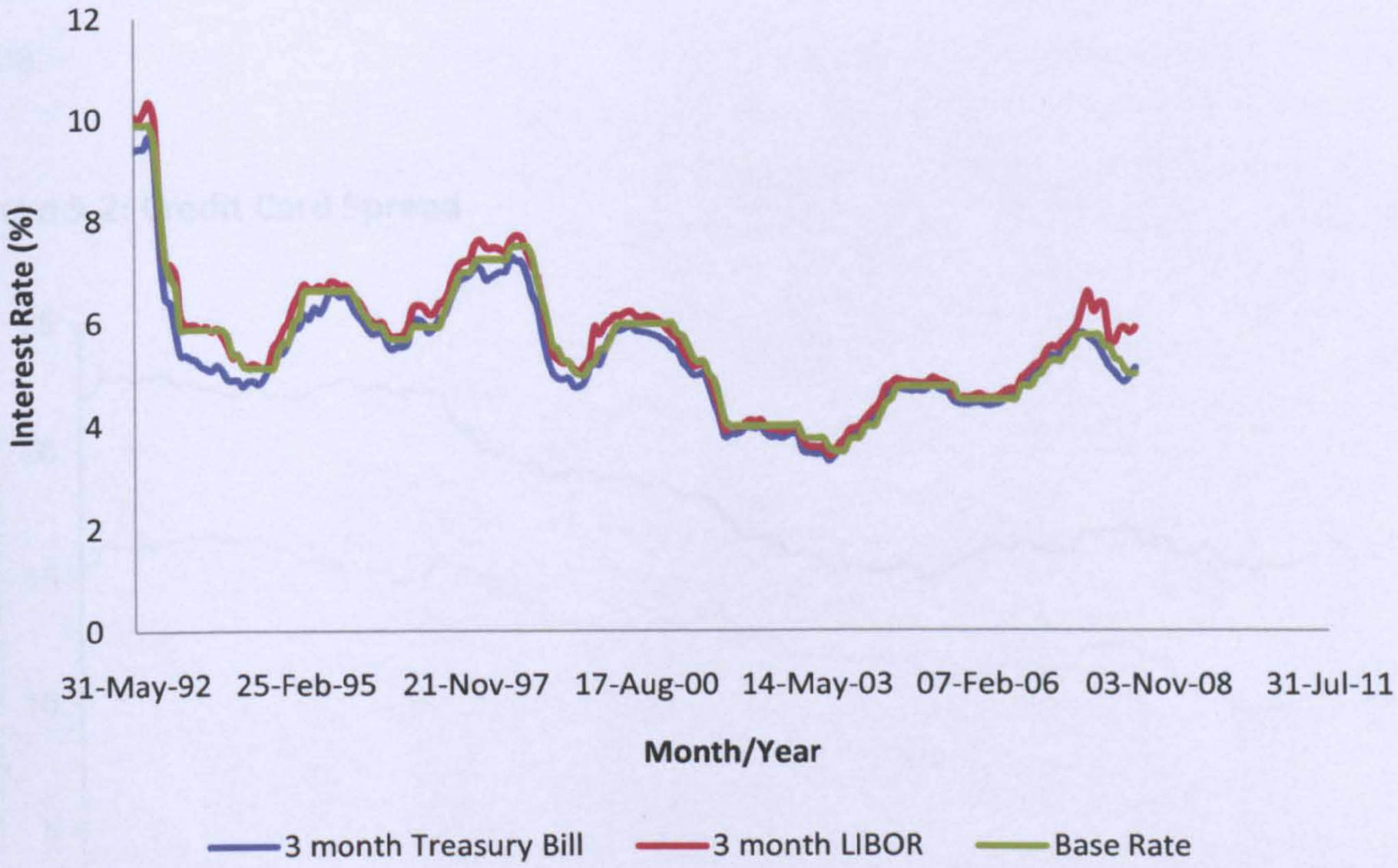
Since this chapter is focusing predominantly on monetary policy issues, a direct measure of the Bank of England's monetary policy stance is provided by the Bank's official base rate. Another potential measure would be to use either the 3 month LIBOR or 3 month Treasury Bill rate as a proxy to the official rate. Heffernan (1993, 1997 and 2002) uses LIBOR as a proxy for the cost of funds. Table 5.2 reports the correlation matrix for the base rate, T-Bill rate and the LIBOR rate.

Table 5.2: Market Rate Correlation Matrix

	3 Month Treasury Bill	3 Month LIBOR	Base Rate
3 Month Treasury Bill	1		
3 Month LIBOR	0.9875	1	
Base Rate	0.9821	0.9868	1

Table 5.2 indicates all three rates are highly correlated with each other. Fuertes, Heffernan and Kalotychou (2009) argues that using either the LIBOR or T-Bill rate raises a number of issues, because although money market rates change with the policy rate (Bank of England base rate), they are effectively driven by the demand and supply for global interbank funds. Furthermore, anticipated changes to the policy rate are often reflected in the market a few weeks earlier which, if incorrect, simply adds noise to the retail rate–policy rate nexus.

Figure 5.1: Market Interest Rates



Source: Bank of England

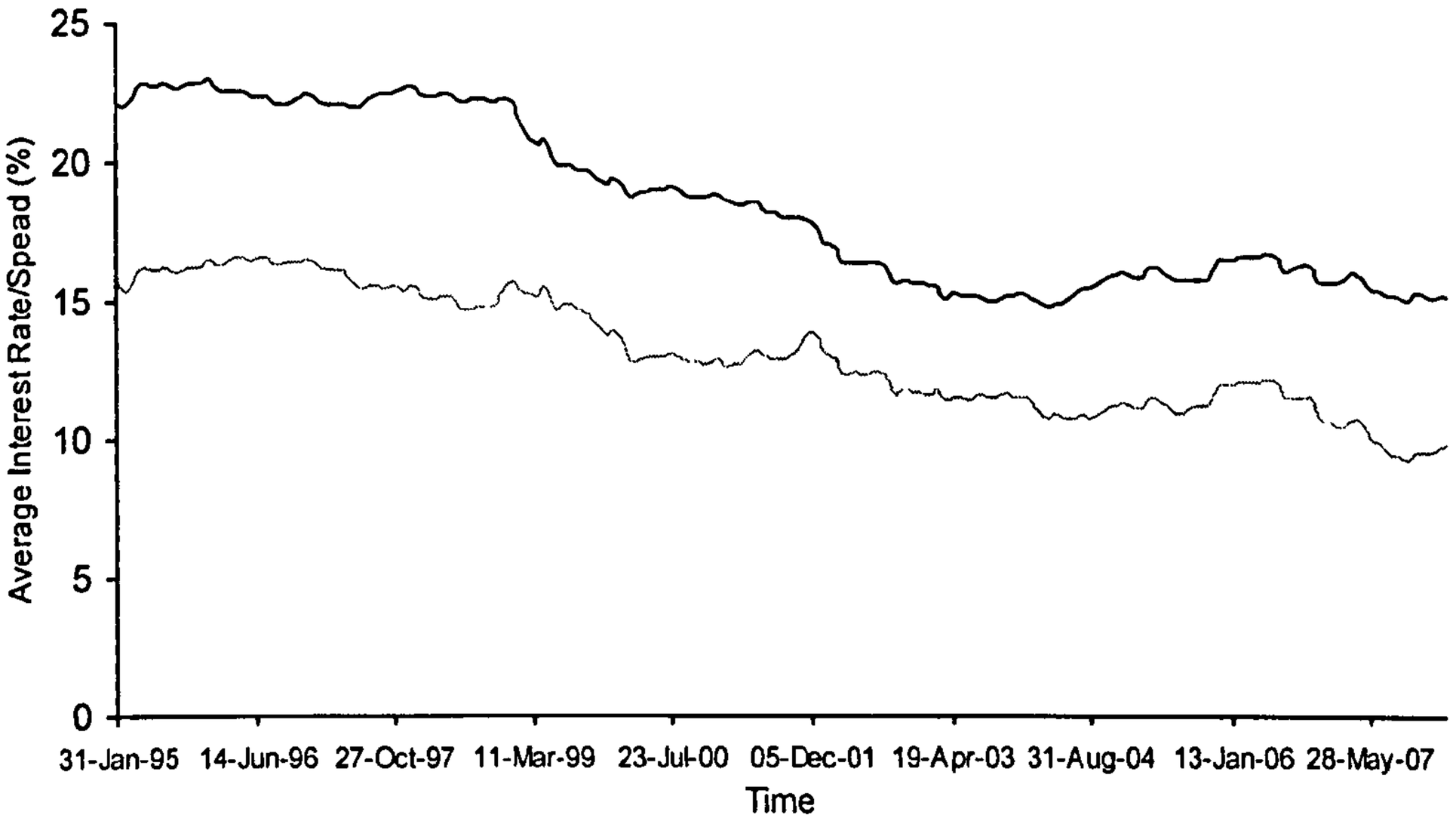
Figure 5.1 indicates the three market rates generally behave in the same manor. The base rate is less volatile than the three month LIBOR and the 3 month T-bill rate, retaining the same value for a number of consecutive months. For example, the base rate remained at 4% for 14 months during the period December 2001 to

January 2003. All three market rates declined dramatically between July 1992 and July 1994. The base rate and LIBOR rates do occasionally diverge sharply from each other. This is particularly noticeable from June 2007. This sharp divergence was caused by global market turbulence and the subsequent "credit crunch". In August 2007, the three month LIBOR rate stood at 6.8 percent which was over 100 percentage points above the base rate.

5.4.2 Aggregate Interest Rates

Figure 5.2 illustrates the mark-up between average credit card rates and the base rate. The figure indicates that credit card interest rates have been declining over the sample period 1992-2008, as a consequence the average spread has also been declining. The average interest rate charged by credit card providers during the period 1992-1999 was 21.94% while over the period 2000-2008 the average rate was 16.42%. Spreads have also declined over the period; the average spread was 15.63% over 1992-1999, however this has fallen to 11.65% over the period 2000-2008.

Figure 5.2: Credit Card Spread



Source: Bank of England

Heffernan (2002) finds that the spread for credit cards offered by banks and building societies are higher than that of unsecured loans. This is not surprising

considering that providing the cardholder pays the outstanding balance in full at the end of the billing cycle; they are effectively getting a free loan for a month. Credit card issuers recoup this by charging higher interest rates to the small proportion of customers who only pay a percentage of their outstanding balance each month. As can be seen from Table 5.3 credit card spreads are on average 10% higher than the base rate. Ausubel (1991) attributes higher credit card rates to an adverse selection problem. According to Ausubel (1991), desirable customers are those who do not intend to borrow but do end up borrowing; these customers are deemed to be low risk. On the other hand, high risk customers fully intend to borrow. Low-risk customers are less responsive to changes in the interest rate because they do not intend to borrow. In this situation, unilaterally lowering the credit card rate would disproportionately entice high-risk customers. This adverse selection problem enables card issuers to maintain high credit card rates and make high profits.

Table 5.3: Average Interest Rates and Average Spreads on Credit Card Products

Time Period	Average Official Rate	Average Interest Rate	Average Spread
1995-2008	18.48	5.35	13.13
1995-1999	21.94	6.32	15.63
2000-2008	16.42	4.77	11.65
1995	22.66	6.57	16.09
1996	22.36	5.89	16.58
1997	22.27	6.54	15.74
1998	22.31	7.23	15.08
1999	20.10	5.35	14.75
2000	18.94	5.97	12.97
2001	18.25	5.21	13.12
2002	16.27	4.00	12.27
2003	15.23	3.69	11.53
2004	15.36	4.38	10.98
2005	15.98	4.65	11.33
2006	16.31	4.64	11.67
2007	15.43	5.51	9.92
2008	15.42	5.23	10.19

Source: Bank of England

The presence of switching costs when changing credit cards enables credit card issuers to maintain high interest rates. Individuals who have large card balances are more likely to be turned down for new cards, than those with small balances (Calem and Mester, 1995). If switching costs are significant, then credit card

issuers know that they are able to charge higher rates of interest; this is a sign of imperfect competition.[48]

5.4.3 Institutions' Rates

Credit cards in the UK are provided by a wide range of providers, all of which have different institutional backgrounds and cost structures. The credit cards have been classified into seven different categories. Table 5.4 presents a summary of the finding; part A presents the findings for the period 1992-1999, while part B present the findings for the period 2000-2007.[49]

Table 5.4: Average Interest Rates and Spreads for Different Institutions

Type of Issuer	Average Interest Rate	Interest Rate Spread
Bank	20.61	14.25
Building Society	19.38	13.02
Converted Building Society	19.29	12.92
Internet	16.65	10.29
Personal Loan Specialists	16.94	10.58
Joint Ventures	18.61	12.25
Charities	21.39	15.03

a. 1992-1999

Type of Issuer	Average Interest Rate	Interest Rate Spread
Bank	17.50	12.83
Building Society	16.75	12.08
Converted Building Society	15.58	10.91
Internet	13.74	9.07
Personal Loan Specialists	16.91	12.25
Joint Ventures	16.87	12.19
Charities	17.70	13.03

b. 2000-2007

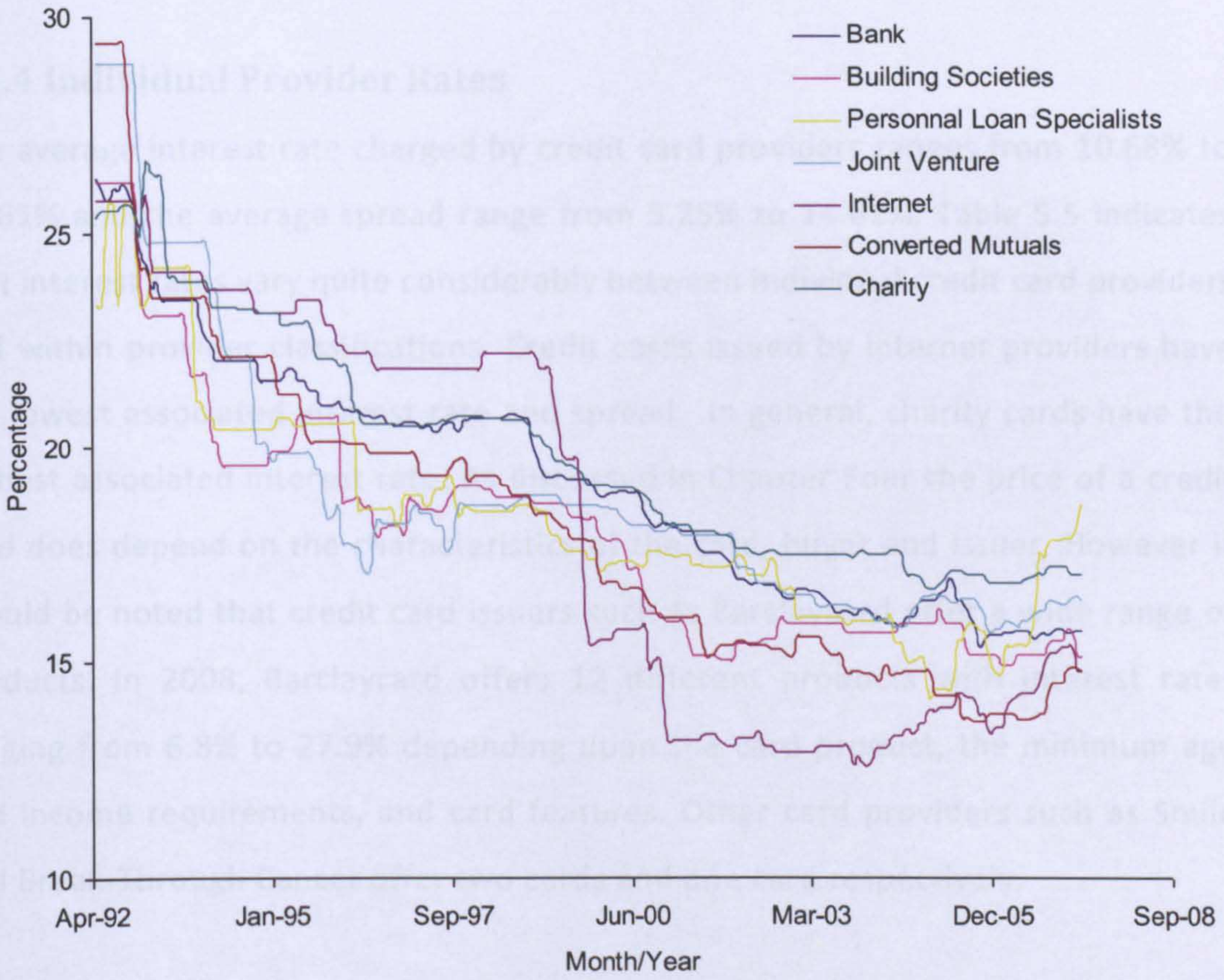
The average interest rate has declined across the two-sub samples, for all issuer types with the exception of personal loan specialist who, on average, have charged approximately the same rate of interest in both periods. Personal loan specialists have

[48] Switching costs have been investigated in chapter four, section eight.
[49] The spread diagrams can be found in Appendix B.

been credited with increasing competition in the UK credit card market (Worthington, 1998).

Average interest rates for cards issued by banks have declined by approximately three percent as have the average credit card rates of internet providers. Building society rates have fallen by approximately 2.5 percent and converted mutuals by 3.5 percent. Interest rates on credit cards issued by joint ventures or charities have fallen by approximately two and 3.5 percent respectively.

Figure 5.3: Average Interest Rates of Different Types of Institutions



Source: Moneyfacts

Figure 5.3 illustrates the interest rates charged by different types of credit card providers over the period 1992-2007. Due to a lack of competition and issuers offering almost identical products, interest rates were extremely high. There was a sharp decline in the average rate of interest charged by these providers between January 1998 and January 2000; this is partially due to an influx of new internet

providers. In addition many institutions who operated over the telephone switched the majority of their operations to the internet.

The adoption of the internet meant that such companies were able to streamline their operations and thus become more competitive. An interesting point to note is that across the two periods the average interest rates charged by personal loan specialists have not significantly altered, this suggests that when entering the UK credit card market, these providers who are mainly from the USA, decided to price aggressively to gain market share. In addition, personal loan specialists have chosen not to charge an annual fee.

5.4.4 Individual Provider Rates

The average interest rate charged by credit card providers ranges from 10.68% to 19.61% and the average spread range from 5.25% to 14.61%. Table 5.5 indicates that interest rates vary quite considerably between individual credit card providers and within provider classifications. Credit cards issued by internet providers have the lowest associated interest rate and spread. In general, charity cards have the highest associated interest rate. As discussed in Chapter Four the price of a credit card does depend on the characteristics of the card, buyer and issuer. However it should be noted that credit card issuers such as Barclaycard offer a wide range of products. In 2008, Barclaycard offers 12 different products with interest rates ranging from 6.8% to 27.9% depending upon the card product, the minimum age and income requirements, and card features. Other card providers such as Smile and Break-Through Cancer offer two cards and one card respectively.

As it would be impossible to examine pass-through for every single credit card provider and issuer in the UK, ten credit card issuers are chosen to be included in the analysis. They are the top five issuers in the UK based upon market share (Barclaycard, MBNA, the Royal Bank of Scotland, Lloyds TSB and HSBC), a building society (Nationwide), an internet provider (Egg) and two banks (the Co-operative and HBOS). The top five issuers include four banks and one personal loan specialist. The top five issuers in the UK account for approximately 65 percent of the entire market. While the top ten

credit card issuers account for 90 percent of the total market in the terms of outstanding balances.

Table 5.5: Average Interest Rates Spread of Selected Card Providers 2000-2008

Category	Card Provider	Average Interest Rate	Spread over Average Official Rate
Bank	Bank of Scotland	17.61	12.94
	Barclaycard	17.95	13.28
	Co-operative Bank	18.43	13.76
	Coutts & Co	19.61	14.94
	Lloyds TSB	15.72	11.05
	Midland/HSBC	15.85	11.18
	NatWest	17.27	12.60
	Royal Bank of Scotland	16.77	12.10
	Yorkshire Bank	17.51	12.84
Converted Mutual	Abbey National	15.93	11.26
	Alliance & Leicester	16.65	12.00
	Halifax	14.36	9.69
Building Society	Britannia	15.40	10.73
	Leeds Building Society	16.81	12.14
	Nationwide	15.23	10.55
	Norwich and Peterborough	14.90	10.23
	Yorkshire Building Society	14.84	10.17
Personal Loan Specialist	American Express	16.16	11.49
	Capital One	16.34	11.81
	GE Capital	16.59	11.91
	MBNA	16.40	11.70
	Morgan Stanley	15.67	10.99
Internet	Egg	12.87	8.20
	Intelligent Finance	12.80	6.01
	Mint	10.68	9.25
	Smile	13.92	7.92
Joint Ventures	Marks and Spencer	15.92	11.25
	Sainsbury's Bank	15.26	10.59
	Tesco Personal Finance	15.41	10.73
Charity	Break-Through Cancer	16.10	11.43
	Comic Relief	17.06	12.39
	Greenpeace	18.51	13.84
	Help the Aged	18.09	13.42

Notes:

1. Royal Bank of Scotland and NatWest are both members of the Royal Bank of Scotland Group.
2. Halifax and Bank of Scotland are both part of HBOS.
3. The top five issuers in the UK are Barclaycard, MBNA, HBSC, HBOS and Royal Bank of Scotland

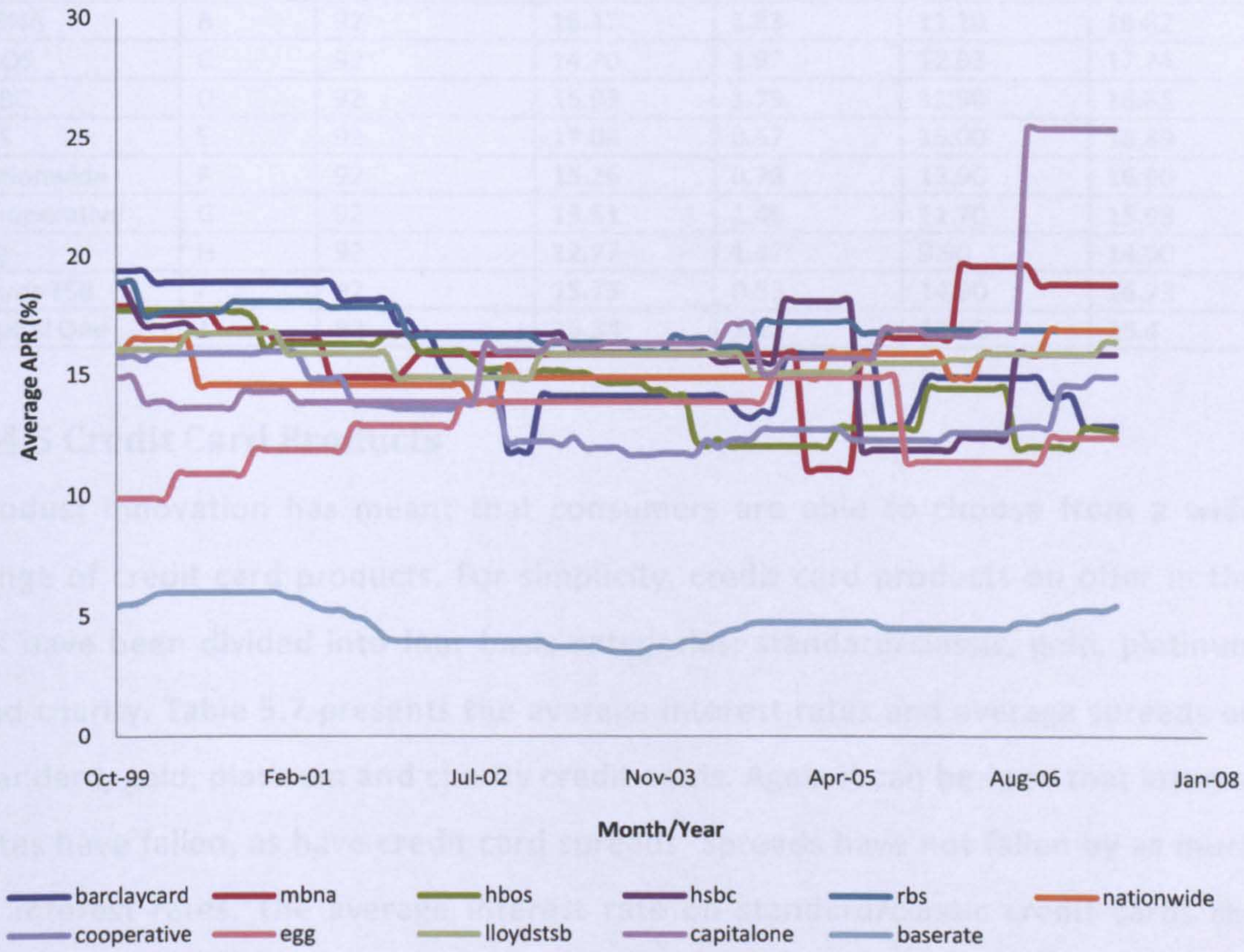
Source: Moneyfacts

A summary of the top ten issuers can be found in Table 5.6. Figure 5.4 illustrates how issuer's interest rates have moved over the period October 1999 to May 2007. All credit card issuers add a significant mark-up to the base rate and in some cases such as

Capital One this mark-up has increased over the sample period. It is not clear however from Figure 5.4, if credit card issuers respond to changes in the base rate.

Some of the issuers have been included in the sample due to their institutional characteristics; Capital One is included as a personal loan specialist and to allow a comparison with MBNA. The inclusion of Nationwide enables the behaviour of a building society to changes in the base rate to be examined. HBOS was formed in 2001 when Halifax, a former building society, merged with the Bank of Scotland. The inclusion of HBOS allows a comparison to be made between building societies, banks and converted mutuals to be examined.

Figure 5.4: Average Issuer Interest Rates and the Base Rate



Source: Moneyfacts and Bank of England

Heffernan (2005) found that converted mutuals respond more rapidly to changes in the base rate. The inclusion of HBOS allows analysis of how HBOS behaves with regards to changes in the base rate in comparison with other types of issuers other than building societies.

While classed as a bank, the Co-operative Bank, which markets itself as an ethical bank, is a financial entity which belongs to its members, who at the same time are the owners and the customers of their bank. Therefore it is possible that it behaves differently to changes in its cost of funds to that of other commercial banks. Egg is the only internet supplier in the sample, thus it is likely to have lower costs than other issuers.

Table 5.6: Summary of Issuers

	Code	Observations	Mean	Standard Deviation	Minimum	Maximum
Barclaycard	A	92	15.70	2.23	11.90	19.40
MBNA	B	92	16.42	1.83	11.10	19.62
HBOS	C	92	14.70	1.97	12.03	17.74
HSBC	D	92	15.93	1.79	11.90	18.83
RBS	E	92	17.08	0.67	16.00	18.89
Nationwide	F	92	15.26	0.79	13.90	16.90
Co-operative	G	92	13.51	1.46	11.70	15.98
Egg	H	92	12.77	1.47	9.90	14.90
Lloyds TSB	I	92	15.73	0.53	14.90	16.73
Capital One	J	92	16.34	3.22	13.65	25.4

5.4.5 Credit Card Products

Product innovation has meant that consumers are able to choose from a wide range of credit card products. For simplicity, credit card products on offer in the UK have been divided into four basic categories; standard/classic, gold, platinum and charity. Table 5.7 presents the average interest rates and average spreads on standard, gold, platinum and charity credit cards. Again it can be seen that interest rates have fallen, as have credit card spreads. Spreads have not fallen by as much as interest rates. The average interest rate on standard/classic credit cards the interest rate has fallen by approximately five percent, while the interest rate spread has fallen by around three percent.

The average interest rates on gold and platinum credit cards have fallen by three percent but the spread has only fallen by one percent. The average rate of interest on charity cards has fallen by around five percent.

Table 5.7: Average Interest Rates and Spreads on Credit Card Products

Type of Credit Card[1]	Average Interest Rate	Interest Rate Spread
Classic/Standard	21.35	14.99
Gold	18.34	11.92
Platinum	17.03	10.66
Charity	22.12	15.76

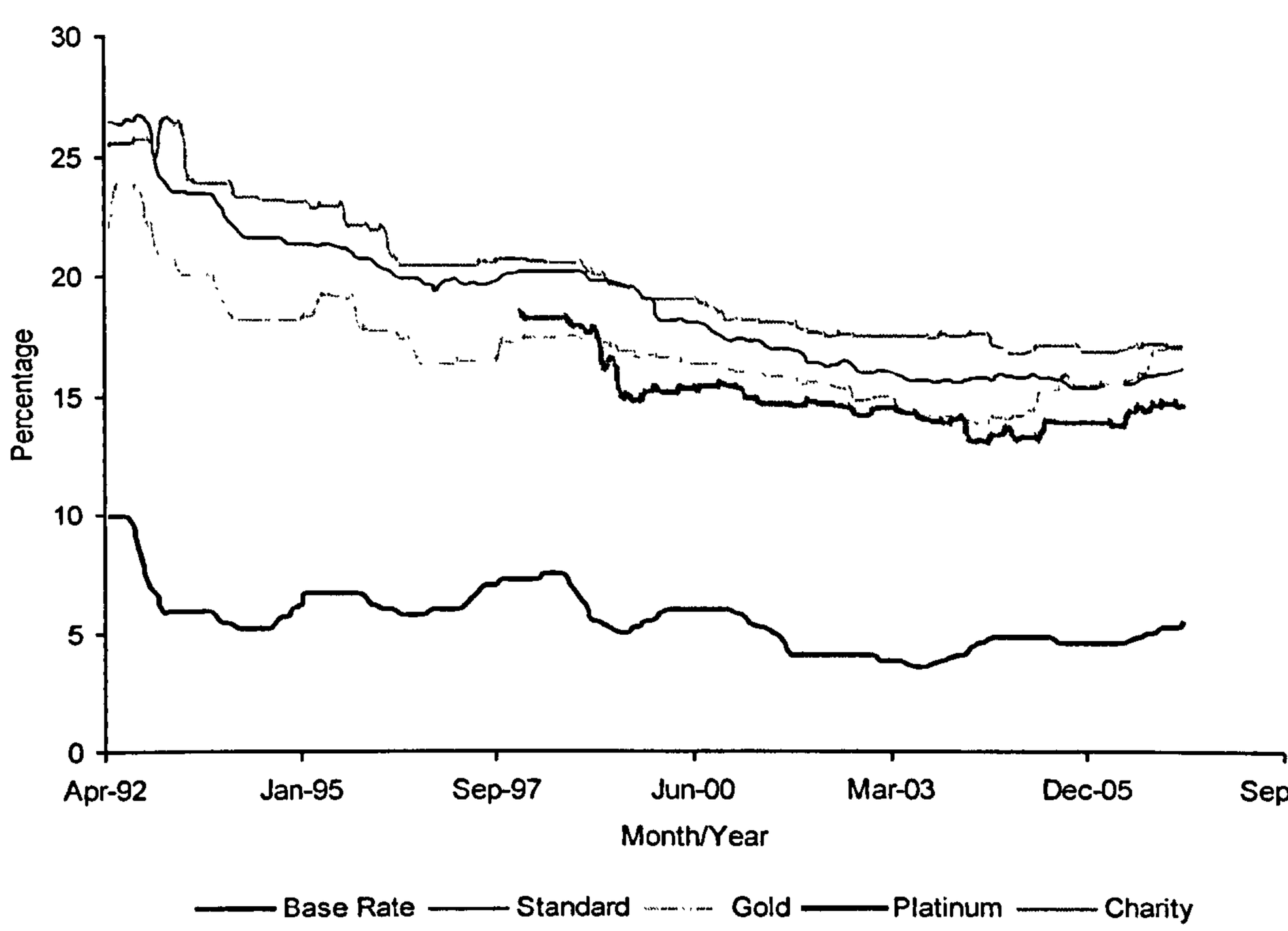
a. 1992-1999

Type of Credit Card[1]	Average Interest Rate	Interest Rate Spread
Classic/Standard	16.28	11.61
Gold	15.34	10.67
Platinum	14.27	9.60
Charity	17.57	12.89

b. 2000-2008

Notes: As Moneyfacts does not document student credit cards, while these cards will be considered in other analysis it is not possible to include them here.

Figure 5.5: Average Interest Rates of Selected Credit Card Products



Source: Moneyfacts and Bank of England

Figure 5.5 shows a plot of the average interest rates of the four categories of credit cards, which confirms that interest rates have been declining. Platinum

products were introduced to the market in October 1997, originally with an average interest rate which was higher than gold credit cards. When platinum cards were first introduced they were by invitation only and in many cases had an annual fee attached to them and only a small number of issuers offered this type of product. As platinum cards have become more common place, the annual fee has disappeared and rates have fallen below that of gold credit card products. In general interest rates on all types of credit cards have declined over the sample period. However, towards the end of the sample period interest rates appear to be slowly increasing.

Pass-through is examined for three segments of the credit card market: standard/classic, gold and platinum at the aggregate level, thus allowing differences, if any, in the speed of adjustment to be analysed. It is envisaged that changes will be made more quickly to premium credit cards due to the lower associated margins.

5.4.6 Rising and Falling Market Rates

By examining the spreads over periods of sustained rising and falling base rates, it is possible to observe if there are any asymmetries in the way in which institution behave during periods of continued base rate rises and periods of declining base rates. Heffernan (2002) finds that in the credit card market, rising LIBOR is associated with a falling spread of approximately 2.81% for banks and 1.58% for the four converted building societies she includes in her sample.[50] Therefore, it appears that converted building societies pass on the effects of rising LIBOR more than banks. With respect to falling LIBOR, Heffernan (2002) finds that spreads for banks are reasonably steady for the first four months, and then fall to a low in June 1996, before rising for the rest of the sample period, overall rates declined by 0.92%. Converted building societies maintain a largely unchanged spread during the first three months, which then rises sharply until June 1996, before falling off, over the period interest rates declined by 0.15%. It appears that converted

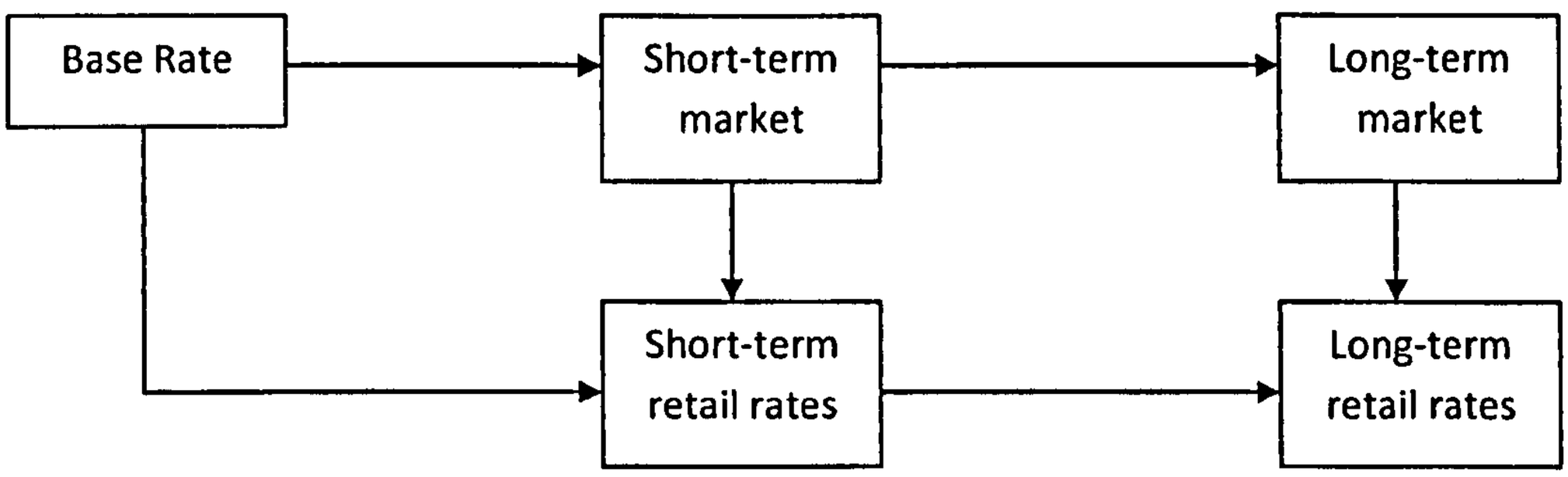
[50] The four converted building societies included in Heffernan's analysis are Halifax, Alliance and Leicester, Northern Rock and Bradford and Bingley. However not all of these converted building societies issue their only credit cards. For example, Alliance and Leicester (now part of the Santander Group) sold their credit card portfolio to MBNA.

building societies are trying to obtain higher spreads by not passing on the benefits of declining LIBOR rates to consumers. However, banks appear, according to Heffernan's (2002) empirical study, to be doing the opposite. This suggests that the credit card market is not highly competitive.

5.5 A Model of Interest Rate Pass-Through

The transmission mechanism of how changes in base rate are passed-through to retail interest rates is described in Figure 5.6. This chapter will examine the relationship between the official interest rate (the Bank of England base rate) and retail credit card rates.

Figure 5.6: The Transmission Mechanism



Source: Crespo-Cuaresma *et al.*, (2006)

The historically slow response of credit card rate changes in the money market rates is consistent with imperfect competition (Calem and Mester, 1995a). Mester (1994) argues that the demand for credit cards may potentially be influenced by the level of real interest rates in a financial market. There are numerous providers of credit cards and no barriers to entry, therefore one would expect such a market structure to lead to a competitive performance, in which price aligned with costs and issuers earn a normal rate of profit.[51] The Irish Financial Services Regulatory Authority (IFSRA), in 2004, undertook an investigation into the extent and speed of interest rate pass-through on a basket of bank products. They found that retail interest rates on standard credit cards have a very weak relationship with the official rate.[52] The IFSRA was able to demonstrate that while average spreads had declined throughout the period of

[51] For further discussion of the structure and performance of the credit card industry see Ausubel (1991), Calem (1992), Calem and Mester (1995) and DeMuth (1986).
[52] In the context of the Irish study the official rate refers to the ECB repo rate.

study, spreads had widened since decreases in official rates had not be fully passed on to consumers.

Credit card rates tend to be sticky, in other words, they tend to respond slowly to changes in cost. Economists have developed an explanation for this phenomenon. For example, when a lender lowers its interest rate, those borrowers who are most interested in increasing their line of credit are those who are mostly likely to be the least creditworthy. Lenders are only able to imperfectly indentify these lenders. Thus, as a result, a reduction in the interest rates could potentially lead to higher default rates, which in turn lead to the lenders costs riding. The lender can lessen this problem by only passing on a fraction of the market interest rate fall to its consumers.

The interest rate charged on credit card loans helps to cover many costs which associated with offering credit card services; this may also explain why issuers do not change their rates in tandem with changes in their cost of funds. Raskovich and Froeb (1992) investigated how quickly various loan rates changed in response to changes in the net cost of providing loans. They found that during the 1980s interest rates on credit cards loans varied with changes in the net cost of providing credit card loans to about the same extent as interest rates on other types of loans responded to the net cost of providing these loans.

Interestingly, credit card interest rates appear to have become more responsive to changes in the cost of funds in the 1990s (Evans and Schmalensee, 1999). Variable-rate credit card plans were of minor importance up until the early 1990s (Stango, 2002), however by the mid-1990s variable-rate deals outnumbered the fixed-rate offerings, and accounted for a greater proportion of cards in circulation (Evans and Schmalensee, 1999). A potential explanation for this shift is that innovations in credit scoring have enabled issuers to identify which cardholders are good and which cardholders are bad credit risks with great accuracy. Issuers are therefore able to fine-tune their credit card offerings to individual cardholders.

5.5.1 Marginal Cost Pricing Model

In a textbook setting of perfect competition with complete information, prices are equal to marginal costs and the derivative of prices with respect to marginal cost is equal to one. The derivative of prices with respect to marginal cost typically deviates away from one when the assumptions of perfect competition and complete information are relaxed. Following Rousseas (1985) the marginal cost pricing model for the price setting of banks is:

$$r_{i,t} = \gamma_{0,i} + \gamma_{1,i} r_t^m + \epsilon_{i,t} \quad (5.1)$$

where r_t is the "price" set by bank by *i*, in other words the interest rate, γ_0 is a constant term and r_t^m is the marginal cost of providing credit approximated by the base rate.

The intercept term γ_0 is a measure of mark-up, that is, how much a credit card issuer's rate is marked above the Bank of England's official base rate over the long-run. The parameter γ_0 is expected to be positive for credit cards. The slope coefficient, γ_1, measures the degree of interest rate pass-through in the long-run from the Bank of England's base rate to the interest rate charged to cardholders on outstanding balances. If bank interest rates are set within a fully competitive environment they will respond quickly and completely, while interest rates set in less competitive or oligopolistic segments, adjustment will be slow and incomplete (Laudadio, 1987). Values larger than one may signal overshooting, and values below one may represent limited pass-through. Both over- or under-shooting are the result of market imperfections, but do not solely reflect market power (Sterken, 2006). Complete pass-through exists in the long-run if $\gamma_1 = 1$. Pass-through is incomplete in the long-run if $\gamma_1 < 1$. Incomplete pass-through may be attributable to switching costs, informational asymmetries, or other market imperfections (Payne and Waters, 2008). If $\gamma_1 > 1$, then De Bondt (2002) argues that banks are not rationing credit rationing, but instead are increasing lending rates to compensate got additional risks. In addition, Kok Sörensen and Werner (2006) argue that overshooting may be due to credit risk factors reflecting asymmetric information between banks and borrowers.

The issue of interest rate pass-through is usually estimated using one of the following methodologies: panel data estimation, error correction model (ECM) and vector autoregression model (VAR). This research will employ the error correction methodology.

5.5.2 The Adjustment of Retail Credit Card Rates to the Base Rate Using an Error-Correction Framework

Hannan and Berger (1991) state that in the presence of fixed adjustment costs retail bank interest rates will adjust to changes in market interest rates are lower than the costs of maintaining a non-equilibrium bank rate. As a consequence, it is important that a time dimension is explicitly considered in the adjustment process of retail bank interest rates to changes in market interest rates (de Bondt, 2002). According to de Bondt (2002), the degree of market power and asymmetric information costs are likely to have long-term effects, while switching costs are expected to play a role in the short-term adjustment process of bank rates to changes in the market interest rate.

It is therefore appropriate to specify the adjustment of retail bank interest rates to changes in the base rate within an error correction framework. The main advantage of using this empirical approach is that it takes into account both the short-term dynamics as well as the possibility of a cointegration or long-term equilibrium relationship between the retail interest rate and the base rate (Scholnick, 1991; Winker, 1999).

Thus, using the single equation ECM it is possible to model both the long-run relationship and the short-run dynamics. The term "error correction" model applies to any model which directly estimates the rate at which a change in Y_t returns to equilibrium following a change in X_t. The ECM implies that the behaviour of Y_t is tied to X_t in the long-run and that short-run changes in Y_t respond to deviations from the long-run equilibrium. The single equation ECM enables the impact of such structural change to be easily analysed. Following de Bondt (2002), the error correction model can be written as:

$$\Delta r_t = \alpha + \beta \Delta r_t^m - \lambda(r_{n,t-1} - \gamma_0 - \gamma_1 r_{t-1}^m) + \varepsilon_t \qquad (5.2)$$

Where $r_{n,t}$ is the interest rate charged on outstanding balances in period t and r_t^m is the market interest rate in month t. The long-run equilibrium relationship is given by $r_{n,t-1} - \mu_n - \delta_n r_{t-1}^m$ lagged one period.

λ gives the rate at which the model re-equilibrates, that is, the speed at which it returns to its equilibrium. Formally, λ indicates the proportion of the disequilibrium which is corrected with each passing month.

The error correction model is estimated both on aggregated and issuer level data. There are two reasons motivating this decision to estimate the model on aggregate data. First, the sample period is longer; second, some issuers had to be excluded from because they had an insignificant market share. The aggregate data set comprises information on all the interest rates if all issuers which exist in a particular month.

5.6 Econometric Estimation and Results

This section presents the empirical results of estimating an error correction model to examine the dynamics of base rate pass-through. However, before estimation can take place some preliminary analysis must be undertaken.

5.6.1 Preliminary Time Series Analysis

Non-stationarity is a property which is common to many macroeconomic and financial time series and indicates that a variable has no clear tendency to return to a constant value of a linear trend (Greene, 2002). In the case of a *K*-variable system of non-stationary series, it should be possible to determine up to $K - 1$ cointegrating vectors. Thus, if both the credit card and the base rate series are non-stationary, the spread between the credit card interest rate and the base rate should be stationary. If these rates are cointegrated, then a VECM should reveal the short-term dynamics of the pass-through mechanism (Humala, 2005). Therefore it is important to examine the stationary condition before continuing further.

5.6.1.1 Unit Root Tests

Preliminary standard unit root tests have been conducted for each interest rate series. Unit root tests are conducted to verify the stationarity properties (absence of trend and long-run mean reversion) of the time series data so as to avoid spurious regression (Ozdemir, 2009). A series is said to be weakly or covariance stationary if the mean and autocovariances of the series are not time dependent. If a time series has a unit root, the most convenient way to remove non-stationarity is to take first differences of the relevant variable. A non-stationary series which after being differenced *d* times, becomes stationary, is said to be integrated of order *d* and denoted as I(*d*) (Chama and Deadman, 1997).

Following a visual inspection of the base rate and the credit card rate and their first differences, which appear to follow a random walk. The results of the unit root tests are presented in Table 5.8. The null hypothesis of a unit root in the base rate cannot be rejected, however the first difference of the base rate appears to be stationary, this leading to the conclusion that the series is I(1). The null hypothesis of a unit root in the credit card rate cannot be rejected at the 5% significance level; however the null hypothesis is rejected after first differencing the credit card rate.

Table 5.8: Unit Root Tests - Aggregate Data

	Augmented Dickey-Fuller	Phillips-Perron
Credit Card	-0.975	-1.017
ΔCredit Card	**-11.489**	**-11.565**
Base Rate	-0.975	-1.489
Δ Base Rate	**-7.129**	**-7.400**

Notes: All coefficients in bold are significant at the 5 percent level
No intercept or constant included. No lags included based on the Schwarz Information Criterion.
Δ is the first difference operator

The aggregate market segment data is examined over the period November 1999 to May 2007. A visual inspection of the data was undertaken and the unit root tests carried out. Table 5.9 presents the results of the unit root tests. Due to the sample period being shorter than the aggregate data, the base rate is again tested for stationarity. In all cases the absence of a unit root could not be established and it was possible to accept the null hypothesis of a unit root at the 5 percent significance level.

Table 5.9: Unit Root Tests - Market Segment

	Augmented Dickey-Fuller	Phillips-Perron
Standard	-0.805	-0.723
ΔStandard	**-10.107**	**-10.113**
Gold	-1.174	-1.162
ΔGold	**-9.420**	**-9.425**
Platinum	-0.854	-1.088
ΔPlatinum	**-7.313**	**-7.297**
Base Rate	-0.585	-1.022
Δ Base Rate	**-5.342**	**-5.344**

Notes: All coefficients in bold are significant at the 5 percent level
No intercept or constant included. No lags included based on the Schwarz Information Criterion.
Δ is the first difference operator

Finally, the individual issuer's interest rate time series are tested for stationarity along with the base rate. Table 5.10 presents the results of the Augmented Dickey-Fuller and Phillips-Perron tests for stationarity.

Table 5.10: Unit Root Tests - Individual Issuers

	Augmented Dickey-Fuller	Phillips-Perron
Barclaycard	-1.576	-1.595
ΔBarclaycard	**-8.894**	**-8.877**
MBNA	-2.033	-2.226
ΔMBNA	**-9.343**	**-9.350**
HBOS	-1.337	-1.351
ΔHBOS	**-9.247**	**-9.247**
HSBC	-2.527	-2.644
ΔHSBC	**-9.277**	**-9.277**
RBS	-2.868	-2.858
ΔRBS	**-9.602**	**-9.609**
Nationwide	-1.720	-1.638
ΔNationwide	**-10.062**	**-10.116**
Co-operative	-1.400	-1.434
ΔCo-operative	**-9.481**	**-9.491**
Egg	-2.135	-2.144
ΔEgg	**-9.417**	**-9.417**
Lloyds TSB	-1.845	-1.953
ΔLloyds TSB	**-9.323**	**-9.384**
Capital One	-0.079	0.029
Δ Capital One	**-9.591**	**-9.597**
Base Rate	-0.585	-1.022
Δ Base Rate	**-5.342**	**-5.344**

Notes: All coefficients in bold are significant at the 5 percent level
No intercept or constant included. No lags included based on the Schwarz Information Criterion.
Δ is the first difference operator

The Augmented Dickey Fuller (ADF) test shows non-rejection of the null hypothesis of a unit root for all interest rates in levels and a clear rejection of the null hypothesis of a unit root for those rates in first-differences. Thus, this evidence is consistent with interest rates being integrated of order one, I(1). The Phillips-Perron test also indicates that for each interest rate series, the null hypothesis of a unit root cannot be rejected. All interest rates series are found to be of order I(1).

5.6.1.2 Cointegration Tests

Engle and Granger (1987) argue that, although a set of economic time series are not stationary, there may exist some linear combination of the variables which is stationary. Thus the next step is to test for cointegration in the data series, to determine whether there is a long-run relationship between the variables.

To test for the presence of cointegration between each credit card interest rate and the market interest rate, Johansen's (1988) test for cointegration was used. The Johansen methodology searches for cointegrating relations in a vector autoregressive (VAR) model, and thus indicates how many co-integrating vectors, if any, may be present. The Johansen test is considered to be superior to the residual-based methodology proposed by Engle and Granger (1987), because the latter test is inefficient and may be inappropriate if there are multiple cointegrating vectors (Heffernan, 1997).

Having found that all series are of order I(1), Johansen's trace test is used to test for cointegration between the chosen credit card series and the base rate. Table 5.11 shows that co-integration is indeed found between the aggregate credit card rate and the base rate. A lag length of seven is chosen.

The maximum eigenvalue and trace statistics show that there is one cointegating relationship between the aggregate credit card rate and the base rate, at the five percent level. The finding confirms the existence of an underlying long-run stationary steady-state relationship between aggregate credit card rates and the developments in the base rate.

Table 5.11: Johansen Cointegration Test - Aggregate Data

Maximum Rank	Trace Statistic	5% Critical Value
r=0	20.93	18.17
r≤1	**0.8049**	3.74
r≤2	-	

a. Trace Statistic

Maximum Rank	Max Statistic	5% Critical Value
r=0	2013	16.87
r≤1	**0.8049**	3.74
r≤2	-	

b. Maximum Eigenvalue Statistic

Maximum Rank	SBIC	HQIC	AIC
r=0	-0.65	-1.22	-1.60
r≤1	**-0.68**	**-1.29**	-1.70
r≤2	-0.66	-1.27	-1.69

Notes: All coefficients in bold are significant at the 5 percent level

c. Information Criterion

The results of the trace statistic for the market segment data is found in Table 5.12. All three rates are found to be cointegrated with the base rate, however the chosen lag length depends on the market segment. A lag length of 21 was chosen for standard credit cards, a lag length of 18 for gold cards and a lag length of 24 for platinum credit cards.

Table 5.12: Johansen Cointegration Test - Market Segment

	Standard	Gold	Platinum
Lag Length	21	18	24
Trace Test			
r=0	19.08	36.63	67.13
r=1	**0.31**	**0.43**	**1.80**
r=2	-	-	-

Note: All coefficients in bold are significant at the 5 percent level

In all three cases the trace statistic indicates that there is one cointegrating relationship between the chosen market segment interest rate and the base rate at the five percent level.

Table 5.13 shows the results of testing for co-integration between Barclaycard's portfolio interest rate and the base rate. As the trace statistic at r=0 of 32.40 exceeds its critical value of 15.41, thus the null of no cointegrating vectors is rejected. In contrast, since the trace statistic at r=1 of 1.16 is less than the critical value of 3.76, the null hypothesis of one or fewer cointegrating equations cannot be rejected. Thus, it can be concluded that there is one cointegrating vector. This finding is confirmed by the maximum-eigenvalue statistics and by minimizing the information criterion.

Table 5.13: Johansen Cointegration - Barclaycard

Maximum Rank	Trace Statistic	5% Critical Value
r=0	32.4027	15.41
r≤1	**1.1606**	3.76
r≤2	-	

a. Trace Statistic

Maximum Rank	Max Statistic	5% Critical Value
r=0	31.2422	14.07
r≤1	**1.1606**	3.76
r≤2	-	

b. Maximum Eigenvalue Statistic

Maximum Rank	SBIC	HQIC	AIC
r=0	3.7729	2.1077	1.0104
r≤1	**3.5087**	**1.7854**	0.6498
r≤2	3.5528	1.8102	0.6618

Notes: All coefficients in bold are significant at the 5 percent level

c. Information Criteria

Detailed results of testing for co-integration between other issuers and the base rate are reported in Appendix B, however a brief summary of the results can be found in Table 5.14.

Table 5.14: Lag Length and Rank

Issuer	Lag-Length	Rank
Barclaycard	22	1
MBNA	-	*No Co-integrating Vector*
HBOS	17	1
HSBC	24	1
RBS	23	1
Nationwide	16	1
Co-operative	-	*No Co-integrating Vector*
Egg	-	*No Co-integrating Vector*
Lloyds TSB	24	1
Capital One	13	1

Note: Alaike Criterion used to choose lag length

5.6.2 Aggregate-Level Analysis

Having determined that there is a cointegating equation between the credit card interest rate series and the base rate series, it is now possible to estimate a bivariate cointegating VECM for these two time series. Following Ozdemir (2009) a symmetric error correction model with the following specification is estimated:

$$\Delta creditcard_t = \sum_{k=1}^{K} \varphi_k \, \Delta creditcard_{t-k} + \sum_{q=0}^{Q} \omega_q \, \Delta baserate_{t-Q}$$
$$+\lambda[creditcard_{t-1} - \beta baserate_{t-1} - \tau Trend - \alpha] + \varepsilon_t$$

$$K = 1,2,\ldots,12 \qquad Q = 0,1,2,\ldots,12 \qquad (5.3)$$

where $creditcard_t$ denotes the interest rate charged by credit card issuers on outstanding balances, $baserate_t$ is the base rate as determined by the Bank of England. The error term ε_t is assumed to be normally distributed and not serial correlated. The term inside the square brackets is the long run equilibrium lagged by one period. The speed of adjustment parameter is denoted by λ. The adjustment parameter is interpreted in the following way: for example, if λ is estimated to be -0.25, then this would indicate that in a case of a shock to the credit card rate which changes its value relative to the equilibrium value, the one forth of divergence is eliminated in the following period (Ozdemir, 2009).

Equation (5.3) is estimated with a lag of twelve months and a trend coefficient, thus a model has been generated which captures both the long-run relationship and the

short-run interaction between the average rate of interest charged by issuers on outstanding balances and the base rate. Table 5.15 summarises the long-run coefficients α and β as well as the speed of adjustment coefficient λ.

Table 5.15: VECM Results - Aggregate Data

	Coefficient	**Standard Error**
Adjustment Parameters		
λ	**-0.090**	0.044
Short-Run Parameters		
$\sum_{k=1}^{K} \varphi_k$	0.610	*
$\sum_{q=0}^{Q} \omega_q$	-0.132	*
Long-Run Parameters		
α	**-11.589**	**
β	**-1.707**	-0.146
τ	**0.032**	**

Notes: * All Short-Run estimates and associated standard errors can be found in the Appendix.

** Identification of the parameters in the cointegrating equation is achieved by constraining them to be fixed. Fixed parameters do not have standard errors (Stata Corporation, 2005).

All coefficient is bold are significant at the 5 percent level

The estimates of the normalised cointegrating vector (long-run) which illustrate the long-run adjustments for the credit card rate-base rate relationship is given by the following equation:

$$creditcard_{t-1} - 1.71 baserate_{t-1} + 0.03 Trend - 11.59 \qquad (5.4)$$

Based on the results present in Table 5.15 and equation (5.4), the long-run adjustment of the credit card rate with respect to a one percent change in the base rate is 1.71 percent. Final pass-through of the base rate to retail credit card rates is well above 100 percent. This overshooting may, amongst other factors, be explained by asymmetric information costs without credit rationing (de Bondt, 2002). If credit card issuers increase their lending rates exactly one-for-one with the base rate then they will attract a more risky class of borrowers. Thus as a consequence, issuers have to increase the lending rate premium.

A number of studies have documented that the credit card business has been exceptionally profitable (Park, 1997). Ausubel (1991) finds that the credit card market

is extremely profitable due to the substantial premiums which are involved in the sale of credit cards. Therefore it is of no surprise to find that the average mark-up over the base rate is 11.59 percent.

At the macro level, if the Monetary Policy Committee are using the base rate as the key instrument for changing aggregate expenditure and money aggregates. The coefficient λ describes the speed at which any disequilibrium in the long-run relationship between the base rates and the lending dissipates. The adjustment parameter, λ, suggests that on average only 9 percent of any base rate change is passed-through to consumers within a one-month period. The adjustment towards equilibrium is extremely sluggish in the credit card market. This finding supports the work of Ausubel (1991) and Calem and Mester (1995), who suggest that interest rates associated with credit cards are sticky.

As mentioned previously in Chapter Two, Ausubel (1991) suggests a variety of explanations for this puzzle, including the possibility that credit card borrowers do not fully anticipate the degree to which they will use credit cards. Calem and Mester (1995) provide empirical evidence that consumer search and switching costs may explain interest rate stickiness. Section 4.8 of Chapter Four confirms that there are switching costs present in the UK credit card market.

This sluggishness in the short-run may be due to a wide array of factors. Firstly, issuers may be slow to respond to changes in the base rate as they face adjustment/menu costs. As a consequence, issuers may decide to adjust lending rates less frequently but when they do decide to adjust their rates they do so by a substantial amount. An alternative explanation for this sluggish behaviour is that instead of changing interest rates in response to a change in the cost of funding, credit card issuers manipulate non-price attributes. In Chapter Four, a hedonic pricing model was used to ascertain the implicit values of non-price attributes on a sample of credit cards available to new consumers and it was found that there was a wide range of characteristics related to any given credit card. It is possible that an issuer may choose to change, for example, the length of the introductory offer on purchases or balance transfers or the components of the loyalty programme in response to a change in the cost of funds, as

the cost associated with doing so are lower than that of the menu costs associated with notifying cardholders to changes to their interest rates.

Second, the way in which banks adjust their lending rates is likely to depend on the maturity mismatch of their loan and deposit portfolio. The more long-run loans which are covered by long-term deposits, the less pressure banks feel to adjust their lending rates. In other words, it matters how responsive their liability side is to base rate changes. Banks that have extensive recourse to long-run deposits such as saving deposits which are not particularly affected by market rates are likely to be slower to adjust their lending rates compared to those banks whose liability side relies more heavily on deposits or other forms of financing, which are more sensitive to market rates (Weth, 2002). Third, if banks have long-term relationships with their customers, they may wish to smooth interest rate changes. Finally, macroeconomic conditions may also have a bearing on the pass-through mechanism.

Credit card issuers offer a range of credit cards to consumers. Thus the market has been separated into three market segments: standard, gold and platinum. By doing this it is possible to determine whether issuers behave differently depending on the card. Each individual market segment is analysed and the results are presented in Table 5.16.

Table 5.16: VECM Results - Market Segment

	Standard		Gold		Platinum	
	Coeff.	**Std. Error**	**Coef.**	**Std. Error**	**Coef.**	**Std. Error**
Adjustment Parameters						
λ	-0.42	0.17	**-0.39**	0.23	-0.25	0.35
Short-Run Parameters						
$\sum_{k=1}^{K} \varphi_k$	4.83	*	3.99	*	0.92	*
$\sum_{q=0}^{Q} \omega_q$	-3.86	*	-3.50	*	12.73	*
Long-Run Parameters						
α	**-12.43**	**	**-11.69**	**	**-9.44**	**
β	**-0.86**	0.200	**-0.97**	0.06	**-0.94**	0.04
τ	**-0.03**	**	**-0.0003**	**	**-0.03**	**

Notes: * All Short-Run estimates and associated standard errors can be found in the Appendix

** Identification of the parameters in the cointegrating equation is achieved be constraining them to be fixed, fixed parameters do not have standard errors (Stata Corporation, 2005).

All coefficients in Bold are significant at the 5 percent level

The estimates of the normalised cointegrating vector (long-run) which illustrate the long-run adjustments for the credit card rate-base rate relationship is given by the following equations:

$$creditcard_{t-1} - 0.86baserate_{t-1} - 0.03Trend - 12.43 \quad (5.5)$$

$$creditcard_{t-1} - 0.97baserate_{t-1} - 0.0003Trend - 11.69 \quad (5.6)$$

$$creditcard_{t-1} - 0.94baserate_{t-1} - 0.03Trend — 9.44 \quad (5.7)$$

Based on the results present in Table 5.16 and equations (5.4 to 5.6), the long-run adjustment of the average standard credit card rate with respect to a one percent change in the base rate is 0.86 percent, while for the gold and platinum cards it is 0.97 percent and 0.94 percent respectively. This implies that there is complete pass-through from changes in the base rate to the issuers' retail credit card rates as all of these are extremely close to one.

The mark-up over the base rate for standard cards is 12.43 percent. The mark-up over the base rate for gold and platinum credit cards is 11.69 percent and 9.44 percent respectively. Unsurprisingly the mark-up is highest for standard credit cards. Standard credit cards have lower minimum income and minimum age restrictions than gold and platinum credit cards. The mark-up on the average standard credit card is 0.54 percent higher than the mark-up on the average credit card described above using aggregate data, while the gold card is 0.1 percent higher and the platinum card 2.15 percent lower.

The symmetric short-run adjustment of credit card lending rates following a deviation from the long equilibrium in the previous period is 0.42 for standard rates, 0.39 for gold rates and 0.25 platinum rates. Only the gold estimate is significant at the 5 percent level.

5.6.3 Individual Issuer Analysis

This section presents the results of individual credit card issuers, as well as enabling a comparison to be drawn between different issuers; it also enables a comparison to be

drawn between different types of issuers. The analysis is carried out for the top ten issuers in the UK; this includes 6 banks, 2 personal loan specialists, 1 building society and 1 internet provider. From the preliminary analysis only seven out of the ten issuers had a cointegrating relationship with the base rate. As a consequence MBNA, the Co-operative Bank and Egg are excluded from this analysis. Adapting equation (5.3), the error correction model for individual issuers takes the following specification:

$$\Delta issuer_{n,t} = \sum_{k=1}^{K} \varphi_k \Delta issuer_{n,t-k} + \sum_{q=0}^{Q} \omega_q \Delta baserate_{t-q} + \lambda\left[issuer_{n,t-1} - \beta baserate_{t-1} - \alpha_n\right] + \varepsilon_{n,t} \quad (5.8)$$

where $issuer_{n,t}$ denotes the issuer under investigation. The other coefficients are defined as above. At the issuer level it was not found necessary to estimate equation (5.8) with a trend variable. The number of lags chosen to estimate the model varied depending upon the issuer in question. The maximum lag length used is 24 months. The chosen lag length for each issuer can be found in Table 5.14. For example, Barclaycard is estimated with a lag-length of 22, thus in this instance K=1,2,...,22 and Q=0,1,2,...22. Table 5.17 provides the results of the bivariate error correction models.

The estimates of the normalised cointegrating vector (long-run) which illustrate the long-run adjustments for the credit card rate-base rate relationship for each individual issuer is given by the equations in Table 5.18. As can be seen from equations 5.9 to 5.15 the mark-up over the base rate varies quite substantially. Nationwide has a mark-up of 10.40 percent, which is the lowest of all issuers. This is not surprising given that the Nationwide is the only building society in the sample. As the objective of the building societies manager is to act in the best interests of the customers, rather than shareholders in the case of Banks, this may be reflected in the lower mark-up.

HSBC has the highest mark-up of all the issuers. HSBC has a mark-up of 24.43 percent over the base rate. This value appears to be rather large but could simple be down the portfolio of cards that this issuer offers which leads to a high mark-up.

Table 5.17: VECM Results -Individual Issuers

	Barclaycard		HBOS		HSBC		RBS		Nationwide	
	Coeff	**Std Error**	**Coeff**	**Std Error**	**Coeff**	**Coeff**	**Coeff**	**Std Error**	**Coeff**	**Std Error**
Adjustment Parameters										
λ	-0.19	0.20	-0.15	0.08	0.44	0.37	-0.49	0.80	0.03	0.12
Short-Run Parameters										
$\sum_{k=1}^{K} \varphi_k$	0.03	*	-0.22	*	-13.84	*	1.54	*	-1.02	*
$\sum_{q=0}^{Q} \omega_q$	-0.57	*	-2.97	*	-4.89	*	-1.44	*	-1.02	*
Long-Run Parameters										
α	**-11.09**	**	**-16.59**	**	**-24.43**	**	**-14.25**	**	**-10.40**	**
β	**-0.83**	0.42	**-0.71**	0.57	**-1.65**	0.43	**-0.59**	0.06	**-1.02**	0.23

	Lloyds TSB		Capital One	
	Coeff	**Error**	**Coeff**	**Error**
Adjustment Parameters				
λ	**0.03**	0.10	0.11	0.16
Short-Run Parameters				
$\sum_{k=1}^{K} \varphi_k$	1.93	*	-2.00	*
$\sum_{q=0}^{Q} \omega_q$	0.05	*	-0.40	*
Long-Run Parameters				
α	**-14.49**	**	**-12.37**	**
β	**-0.26**	0.16	**-0.28**	0.53

Notes: * All Short-Run estimates and associated standard errors can be found in Appendix B which supports this Chapter.

** Identification of the parameters in the cointegrating equation is achieved be constraining them to be fixed, fixed parameters do not have standard errors (Stata Corporation, 2005).

All coefficients in Bold are significant at the 5 percent level

Table 5.18: Long- Run Equations for Individual Issuers

Issuer	Normalized Cointegrating Vector	
Barclaycard	$Barclaycard_{t-1} - 0.83baserate_{t-1} - 11.09$	(5.9)
HBOS	$HBOS_{t-1} - 0.71baserate_{t-1} - 16.59$	(5.10)
HSBC	$HSBC_{t-1} - 1.65baserate_{t-1} - 24.43$	(5.11)
RBS	$RBS_{t-1} - 0.59baserate_{t-1} - 14.25$	(5.12)
Nationwide	$Nationwide_{t-1} - 1.02baserate_{t-1} - 10.40$	(5.13)
Lloyds TSB	$LloydsTSB_{t-1} - 0.26baserate_{t-1} - 14.49$	(5.14)
Capital One	$CapitalOne_{t-1} - 0.28baserate_{t-1} - 12.37$	(5.15)

The average mark-up over the base rate for Barclaycard is 11.09 percent which is the second lowest mark-up of all the issuers considered. Over the last several years, Barclaycard has reacted to falling market share by attempting to offer customers better service and lower interest rates. As demonstrated in Section 6.3.3, Barclaycard has gone from being the most expensive credit card in each segment, to being one of the cheapest, if not the cheapest credit card.

Capital One has an average mark-up of 12.37 percent. Capital One has chosen in recent years to concentrate its efforts on the platinum segment of the UK credit card market, thus offering a number of cards which have exceedingly low interest rates compared to its competitors. RBS and Lloyds TSB have very similar mark-ups in the region of 14.37 percent; this is not surprising given that these two issuers compete in the same markets offering products that are like-for-like. HBOS has an average mark-up of 16.59 percent.

The long-run adjustment of lending rates varies between issuers. Out of the seven issuers consider only one issuer "overshoots", five have incomplete pass-through and one passes changes on a one-for-one basis. Based on equation (5.13) it can be seen that the long-run adjustment of Nationwide's lending rate with respect to a one percent change in the base rate is one percent, this implies that in the long-run there is complete pass-through from changes in the base rate to Nationwide's credit card rate.

Nationwide is the only issuer who has complete pass-through. HSBC is the only issuer who "overshoots", with respect to a one percent change in the base rate, the lending rate adjusts by 1.65 percent. Lloyds TSB and Capital One have the lowest long-run adjustments with a one percent increase in the base rate leading to approximately a 0.27 percent increase in the lending rate. Barclays passes through 0.83 percent, HBOS 0.71 percent and RBS 0.59 percent of a one percent change in the base rate.

There is considerable variance in the percentage of error correction within an issuer. The coefficients on error correction term (λ) is expected to be negative and significant (Ozdemir, 2009). In the case of HSBC, Nationwide, Lloyds TSB and Capital One, the value is positive and thus an interpretation cannot be made. The symmetric short-run adjustment of Barclaycard's lending rate following a deviation following a deviation from the long-run equilibrium in the previous period is 0.19. The adjustment parameter for HBOS is 0.15 and RBS has the highest adjustment parameter of 0.49. All the coefficients are all statistically insignificant at the 5 percent level.

5.6.4 Summary

The pass-through process clearly differs across retail credit card rates in the UK. The most sluggish interest rates are those interest rates associated with standard credit cards. The most sluggish interest rates with respect to issuers are those of Barclaycard and HBOS. Furthermore, retail credit card interest rates adjust to changes in the Bank of England's base rate with a delay and incompletely in the short-run. At the same time, a long-run equilibrium relationship exists between retail credit card interest rates. At the market level credit card interest rates more than fully adjust to changes in the base rate in the long-run. Interest rates on standard, gold and platinum credit cards almost fully adjust to changes in the base rate. However at the issuer level, retail credit card rates vary, however in the main issuers fail to pass-through base rate changes.

5.7 Analysis of Non-Linear Adjustment

The analysis undertaken in the previous section assumes that the speed of adjustment is the same, regardless if the direction. This assumption is fundamentally flawed as the forces which drive adjustment in one direction may not have the same composition as

those which drive them in the opposite direction. According to empirical evidence, in the majority of markets, prices respond faster to cost increases than to cost decreases (Peltzman, 2000). In other words, price rigidity is often asymmetric, and in many cases there is relatively more downward rigidity than upward rigidity. The phase "more downward rigidity" refers to the scenario in which prices respond faster and/or more to an increase than to a decrease in cost.

Peltzman (2000) analyzes the price adjustments of 77 consumer goods and 165 producer goods and concludes that this type of asymmetry in prices adjustment is prevalent in two out of every three markets. The market for petrol (gasoline) is a well-known example. Consumers closely observe retail petrol prices and regularly complain that they rise faster than they fall. This suspicion has generally been confirmed by observing time series of gasoline and crude oil prices. For example, Borenstein *et al.* (1997) demonstrated that gasoline prices in the US did indeed rise more quickly following an increase in crude oil prices, than they fall following a decrease in crude oil prices. However not all empirical evidence supports this notion, Godby *et al.* (2000) does not find any evidence of asymmetries in price adjustments for retail gasoline in Canada.

Asymmetries in interest rates have attracted considerable attention in the financial literature, both in the terms of empirical regularities and the underlying theory. Asymmetrical rate setting has been studied in the context of deposit rates and mortgage rates. The general finding is that US prime rates tend to have more downward pressure than upwards stickiness. There are a number of theoretical reasons for the non-linear adjustment of bank rates. If the conditions of perfect competition are violated, the pricing behaviour of banks might depend on properties such as the size and/or direction of the interest rates shocks, and their affect on expectations. According to Horvath, Krekó and Naszódi (2004):

1. The adjustment of bank rates might differ depending on the size of the base rate change and/or the deviation from the long-run equilibrium. Due to the presence of menu costs and the intention of banks to smooth interest rates for their customers,

banks may react more intensely to wider changes in the money market rate. In this case the adjustment might be significantly faster above a certain threshold.

2. The adjustment of bank rates may also differ depending on the sign of the base rate change and/or the sign of the deviation from the long-term equilibrium.
3. The effect of yield volatility on pass-through is analysed. Higher volatility and hence higher interest rate uncertainty might attenuate the adjustment, as banks judge the changes in the money market rate to be transitory.

Toolsema and Jacobs (2007) study the asymmetric price adjustment of mortgage rates in the Netherlands. They use two main interest rates series for their study. The first is the average interest rate that the Dutch banks charge for a mortgage with a fixed interest term of five years. The second is the long-term (10-year) interest rate. Using these two time series, Toolsema and Jacob (2007) estimate a co-integration relationship in a bivariate VAR framework, where the mortgage rate is explained by the deviation from the long-run equilibrium in the previous month and by the current and lagged increases as well as decreases in the capital market rate. Toolsema and Jacobs (2007) find that Dutch market rates adjust asymmetrically to changes in their costs. Specifically, they find that the response of the mortgage rate it is stronger if the cost, that is the capital market rate, increases in comparison to the situation where the cost decreases.

5.7.1 Explanation of Asymmetric Price Adjustments

A number of theoretical explanations for asymmetries in price adjustment have been advanced in the current literature on pricing. This section provides an overview of general explanations. Economic theory does not suggest a pervasive tendency for prices to respond faster to costs changes in one direction than to those in the other direction. According to traditional economic theory, homogenous firms which compete on price will earn zero profit and costs shocks are completely transferred to final prices.

Perhaps the most intuitive explanation for asymmetric price adjustment relates to market concentration. For example, if barriers to entry are high, then there may be scope for firms to co-ordinate prices. Even if firms are unable to explicitly co-ordinate

on price there may be room for tacit collision. It is possible for tacit collusion to occur with full or partial information on input prices which are available to all participants in the market. If information about input prices are asymmetric and firms are engaging in an implicit collusive agreement. If firm X's input price increases and other firms are unable to observe this, then firm X will choose to quickly increase their output price to signal that they are adhering to the agreement. On the other hand, if firm X's input price falls, it will be hesitant to decrease its output price, as other firms may interpret this as firm X deviating from the collusive agreement, and thus punish firm X by competing aggressively (Damania and Yang, 1998).

However, even if input prices are common knowledge, it is still possible for tacit collusion after a decrease in input prices, if the old output price is used as a trigger price. In this situation, before the price change, all firms charge the equilibrium oligopoly price. The equilibrium will decline, if the input decreases. Firms can then use the old equilibrium price to facilitate collusion. If every firm chooses to continue to charge the old equilibrium price, then all the other firms will make supernormal profits. If one firm decides to reduce their price, all the other firms will follow in order to protect their market share. Essentially, no firm has an incentive to adjust their output price following a decrease in the input price. Neumark and Sharpe (1992) analyse consumer deposit rates and observe that asymmetries occur as a consequence of market concentration, which acts as a proxy of market power.

A second potential explanation based on market power builds on consumer search and switching costs. Often it is assumed that searching for a lower price is costly. With regards to local monopolies, in the short-run the firm will have some market power, as they only have to lower prices to the competitive level, after consumers have engaged in the process of search. In other words, the firm is able to slowly pass on decreases in the input price to consumers, so they are able to benefit temporarily from higher profit margins. This particular argument is more relevant to markets which the demand for the product is relatively inelastic (Toolsema and Jacobs, 2007)

Asymmetries may be caused by adjustment or small menu costs which are incurred by firms when they wish to adjust the price or output of a product. Levy *et al.* (1997) finds

that menu costs may indeed prevent price changes. With respect to supermarkets, Levy *et al.* (1997) finds that approximately 20-35 percent of cost-based price adjustments are not implemented because the cost of the adjustment exceeds the benefit they would receive from doing so. Survey evidence by Blinder (1994) suggests that the presence of asymmetric adjustment costs deters price increases more often than price decreases; this implies a downward asymmetry in price adjustment. Blinder (1994) suggests that this type of asymmetry occurs because firms fear that they may lose sales if rivals choose not to match their price increase.

Unexpected changes to firms' inventory can result in firms incurring costs in the short-run. Finite inventories and production lags mean that positive demand shocks cannot be accommodated as quickly as negative shocks to demand (Reagen and Weitzman, 1982). Borenstien *et al.* (1997) argues that this partially explains the asymmetries which are observed in the market for gasoline. Although, according to Peltzman (2000) this effect is not particularly important.

The concept of the kinked demand curve can be used to explain asymmetries. While the standard kinked demand curve model does not explain asymmetric adjustments it does predict price stickiness in either direction (Toolsema and Jacobs, 2007). Roufagalas (1994) assumes that there is a "re-optimisation" cost to consumers' financial planning. If a price increase occurs after consumers have decided on their optimal consumption bundle, then consumers must re-optimise and incur the associated cost, as otherwise their budget constraint will be violated. However, a reduction in price will only lead to consumers re-optimising when the decrease is large enough. If the reduction is only small, then consumers will simply choose to consume the planned bundle and save the excess. This explanation implies that the inverse demand function has a complete inelastic (vertical) segment below the current price. Thus, a firm facing this demand curve will have no incentive to reduce output after a reduction in input prices; as such a reduction will not imply higher sales. Brown and Yücel (2000) suggest another variety of the kinked demand concept, when explaining asymmetries in the gasoline sector. They argue that, when gasoline prices rise, consumers may accelerate purchases in order to beat further price increases, thereby causing the price to rise even faster. However, on the other hand, as prices fall, the

purchase of gasoline may not slow by much, as consumers fear running out of gasoline.

Other explanations include, for example, Peltzman (2000) who suggests vertical market linkages, since they tend to be positively correlated with the asymmetry in his empirical results (Toolsema and Jacobs, 2007). Asymmetries tend to increase as the number of intermediaries increase. Brown and Yücel (2000) mention mark-ups over the business cycle. The difference between price and marginal cost tends to rise as the price level increases. De Haan and Sterken (2005) suggest that asymmetries occur as banks incur, so-called "offer costs". Mortgage deals offered by financial institutions often have an expiry date. While offering a particular deal it is possible for the market rate to rise. The client may be allowed to benefit from a lower interest rate if the market rate decreases and this may induce asymmetric pricing (Toolsema, 2003).

5.7.2 Asymmetric Price Adjustments in the Credit Card Market

Not all of the explanations discussed above apply to the credit card market. For example, tacit collusion due to asymmetric information with respect to input prices does not seem to be a relevant explanation, since the main "input price" is known by all participants in the market. In addition, theories based on inventories and input supply shocks does not seem very important for credit cards either, since credit card issuers can always turn to the capital market where they ultimately face an "infinite" supply of funds at the current interest rate. Also, explanations based on menu costs and vertical market linkages do not seem particularly relevant either. Therefore, asymmetric credit card rate adjustments might be due to tacit collusion with symmetric information, consumer search or switching costs, or varying mark-ups over the business cycle.

A potential explanation for asymmetries in the dynamic behaviour of credit card rates is related to prepayment risk (Alink, 2002). In the case of credit cards this refers to the risk that current clients may transfer outstanding balances to other issuers if interest rates are uncompetitive. This may lead to lower interest revenues from outstanding balances. Asymmetries in credit card rate changes may be due to the practice of offering fixed rate credit cards for a period of five years. Fixed-rate cards are offered by

a number of issuers in the United Kingdom, however the popularity has declined in recent years.

5.7.3 A Model of Asymmetric Cost Adjustment

The majority of studies which focus on the asymmetric pricing of loans and deposits find that the asymmetries favour the lender, for example, Hannan and Berger (1991), Neumark and Sharpe (1992), Allen, Rutherford and Wiley (1999), Toolsema and Jacobs (2001) and de Haan and Sterken (2005). However, a small number of papers favour the borrowers such as Frost and Bowden (1999) and Chong, Liu and Shrestha (2006).

Consider the following simple long-run mark-up model, which assumes that, in the long-run, issuers set interest rates as a simple mark-up on the cost of funding:

$$r_{i,t} = \alpha_i + \beta_i r_t^m + \epsilon_{i,t} \qquad (5.16)$$

Where $r_{i,t}$ is the interest rate charged on purchases by issuer *i* at time *t, and* r_t^m is the base rate. The coefficients α_i and β_i are issuer-specific mark-up and pass-through parameters, respectively. $\epsilon_{i,t}$ is a residual. To recap, a long-run multiplier of one implies a perfect (one-to-one) pass-through of the market rate change to the retail interest rate in the long-run. A long-run multiplier less than one, implies that there is limited pass-through in the long-run, whereas a long-run multiplier larger than one implies a kind of overshooting (Sörensen and Werner, 2006).

To capture the short-run dynamics an error correction model is specified. Following Geweke (2004) the short-run model allows for two types of asymmetric price adjustment.

$$\Delta(r_{i,t}) = \sum_{s=0}^{n} \lambda_i^+ \Delta r_{t-s}^{m,+} + \sum_{s=0}^{m} \lambda_i^- \Delta r_{t-s}^{m} + \omega^+ RES_{i,t-1}^+ + \omega^- RES_{i,t-1}^- + \epsilon_{i,t} \qquad (5.17)$$

RES are the residuals which are obtained by estimating equation (5.16). The subscripts + and – refer to the positive part and the negative part of the time series so that:

$$X_t^+ = \begin{cases} X_t \; if \; X_t > 0 \\ 0 \; if \; X_t < 0 \end{cases} \tag{5.18}$$

$$X_t^- = \begin{cases} 0 \; if \; X_t > 0 \\ X_t \; if \; X_t < 0 \end{cases} \tag{5.19}$$

The first two terms in equation (5.17) are current and lagged base rate increases and decreases, respectively. Collectively (λ^+, λ^-) are amount parameters and (ω^+, ω^-) are adjustment asymmetry parameters. Amount asymmetry relates to the short-run dynamics, in other words, does the interest rate charged by credit card issuers respond as quickly to input price increases as they do to price decreases. The adjustment-asymmetry parameters measure whether price moves towards the long-run equilibrium from below at the same rate as they do from above. Short-run amount asymmetry occurs when $\sum \lambda^+ \neq \sum \lambda^-$ (de Haan and Sterken, 2005).

The estimated coefficient of ω^+ measures the speed of adjustment in response to the previous period disequilibrium relationship between the base rate and the lending rate when rates are above their equilibrium level. The coefficient of ω^- measures the speed of adjustment in response to the previous period disequilibrium relationship between variables when rates are below their equilibrium level. To test whether interest rates adjust asymmetrically is to test whether ω^+ is significantly different from ω^-. If $\omega^- > \omega^+$ then it can be implied that credit card issuers adjust interest rates upwards faster than they adjust them downwards.

Since the data involves monthly observations with irregular and discrete jumps, the positive and negative changes are integrated using the average moving sum (AMS) operator:

$$R(x,T) = \frac{\sum_{s=1}^{T} x_{-s}}{T} \tag{5.20}$$

Hence the model which will be estimated is:

$$\Delta r_{i,t} = \lambda_i^+ R_t^+ + \lambda_i^- R_t^- + \omega^+ RES_{t-1}^+ + \omega^- RES_{t-1}^- + \varepsilon_{i,t} \tag{5.21}$$

5.7.4 Results

5.7.4.1 Aggregate Results

The interest rate time series were tested for stationarity using Dickey-Fuller and Phillips-Perron unit root tests, these results have previously presented in section 5.6.1, thus they are not reported here. From the results of the stationarity tests it has been concluded that the unit root properties of the time series can be used to estimate an error correction model. This sub-section presents the findings for the credit card market as a whole and for different market segments within the credit card market. Aggregate data at the market level is analysed over the period January 1995 to June 2008. Aggregate data at the standard, gold and platinum level is analysed over the period October 1999 to May 2007.

- **Pass-Through of Costs**

The long run parameters α and β are estimated by estimating equation (5.16). A simple OLS model is estimated. The results are presented in Table 5.19. The coefficient β gives the long-run response of the credit card interest rate with respect to a change in the base rate. In other words, this coefficient summarises the degree of long-run pass-through. Complete pass-through would be achieved if β=1. The slope coefficient is found to be 2.31, which is significantly greater than one. This indicates that credit card issuers are passing on base rate changes to consumers on an approximately two for one basis. This may suggest that perhaps credit card issuers are increase lending rates to compensate for additional risks, as pointed out by De Bondt (2002). This "overshooting" may, for example, be due to credit risk factors reflecting the asymmetry of information between issuers and their borrowers. In addition, this "overshooting" suggests that credit card issuers may have been attracting riskier borrowers over the period under review.

Formal statistical tests also reject the null hypothesis that β=1. This suggests that credit card issuers engage in rent-seeking behaviour. By passing the changes in cost of funds on a two for one basis, credit card issuers are extracting uncompensated value from cardholders without making any contribution to the economy.

Table 5.19: Long-Run OLS Results – Aggregate Data

	Coefficient	Standard Error
α	**6.12**	0.08
β	**2.31**	0.41
Observation	164	-
Adjusted R^2	0.68	-
Wald Tests	*F*-statistic	(*p*-value)
H_0: $\beta = 1$	108.90	(0.000)
H_0: $\alpha = 0$	80.93	(0.000)

Note: All figures in bold are significant at the 5 percent level

Unsecured lending to private individuals comprises of both personal loans and credit card loans. The average interest rate charged on a £10,000 personal loan was 11.2% compared to 18.6% charged by credit card issuers on outstanding balances. Economic rent is defined as the difference between the income in the current use of the factor and the absolute minimum, required to draw a particular factor unto production, on average the associated economic rent of credit cards is 7.4%. While at first glance borrowing on credit cards at high rates of interest may appear irrational, the lower transaction costs can make credit card services more attractive than bank loans.

The mark-up over the base rate is found to be 6.12 percent. This mark-up is perhaps surprisingly low given the findings of section 6.6.2. Having investigated the credit card market as a whole, attention is turned to three segments of the credit card market: standard, gold and platinum cards. The long-run results are presented in Table 5.20.

Table 5.20: Long- Run OLS Results - Market Segment

	Standard		Gold		Platinum	
	Coef	Std Err	Coef	Std Err	Coef	Std Err
α	**16.46**	0.40	**13.27**	0.25	**11.50**	0.29
β	**0.17**	0.08	**0.63**	0.05	**0.75**	0.06
Observation	92	-	92	-	92	-
Adjusted R^2		-		-	0.64	-
S.E. of Regression		-		-		-
Wald Tests	*F*-statistic	(*p*-value)	*F*-statistic	(*p*-value)	*F*-statistic	(*p*-value)
H_0: $\beta = 1$	98.27	(0.00)	47.85	(0.00)	17.71	(0.00)
H_0: $\alpha = 0, \beta = 1$	1723.91	(0.00)	2738.59	(0.00)	1702.12	(0.00)

Note: All coefficients in bold are significant at the 5 percent level

With respect to standard credit cards, the mark-up is found to be 16.46 and the degree of pass-though is found to be considerably less than one. The mark-up on gold credit cards is 13.27 and again pass-through is found to be incomplete. Finally, the average mark-up on platinum credit cards is found to be 11.50, with pass-through incomplete as β is found to be less than 1. The following general conclusions can be drawn. Issuers set interest rates competitively in each market segment as the coefficient on β is significantly positive in each case. Standard credit cards appear to follow the market less closely than gold or platinum credit cards (β is the lowest). Platinum credit cards follow the market most closely. The mark-up parameter α is highest for standard credit cards. These large mark-ups are consistent with the findings of Ausubel (1991) who finds that the credit card market is highly profitable due to the substantial premiums involved in credit card portfolio sales.

The mark-up estimates here are not to dissimilar to that found in Section 5.6, however the pass-through estimates are found to be much lower. The standard credit card segments appears to be extremely sticky, with only 0.17 percent of a one percent change in the base rate being passed on to consumers. Pass-through is incomplete in both the gold and the platinum segments with 0.63 percent and 0.75 percent of a one percent change in the base rate being passed on to cardholders. These values are close to the estimates obtained previously. As the β's are statistically significant for all market segments, it can be concluded that interest rates are set competitively (de Haan and Sterken, 2005).

The estimated residuals from the above models are used in the corresponding ECM-models in the next section.

- **Asymmetric Pass-Through**

To analysis asymmetric cost adjustment, equation (5.16) is estimated. To recap, the λ-parameters indicate amount asymmetry, while the ω-parameters denote adjustment asymmetry. Table 5.21 provides the estimation results for the model using aggregate credit card data, while Table 5.22 present the estimation results of standard, gold and platinum interest rates.

Table 5.21: ECM Estimation Results - Aggregate Data

	Coefficient	Standard Error
λ_i^+	0.286	0.261
λ_i^-	**0.591**	0.227
ω^+	**-0.03**	0.016
ω^-	-0.01	0.0015
Observations	162	-
Adjusted R^2	0.11	-
Wald Tests	*F*-statistic	(*p*-value)
$H_0: \lambda_i^+ = \lambda_i^- \text{ v } H_1: \lambda_i^+ \neq \lambda_i^-$	0.79	0.376
$H_0: \omega^+ = \omega^- \text{v } H_1: \omega^+ \neq \omega^-$	0.50	0.482

Notes: All values in bold are significant at the 5 percent level

For the market level data, positive and negative changes were integrated using a lag of two months. Other lag-lengths were experimented with. The following conclusions were drawn with respect to amount and adjustment asymmetry. From the empirical evidence presented here it can be seen that while credit cards respond to base rates strongly in the long-run, in the short-run they do not respond very strongly at all. With respect to amount asymmetry, no evidence is found at the market level to suggest that base rate increases are passed on more rapidly than base rate decreases. Credit card interest rates are found to respond to market rate decreases but not market rate increases. A possible explanation for this maybe that over the course of the sample period, credit card interest rates have been declining, see Figure 5.2. This model could possibly have picked up the fact that increased competition from new entrants has forced the average interest rate down. The adjustment process towards the long-run is not asymmetrical, as the null that $\omega^+ = \omega^-$ is accepted.

For standard, gold and platinum cards positive and negative changes were integrated over a period of 12 lags. The amount parameters (λ^+, λ^-) were largest for gold credit cards and lowest for standard cards. The amount parameters are insignificant for standard credit cards. This is not surprising as standard credit cards were found not to follow base rate changes very closely and only to pass on an extremely low

percentage of the base rate change in the long-run, similarly they were found to respond very weakly in the short-run.

Table 5.22: ECM Estimation Results - Market Segment

	Standard		Gold		Platinum	
	Coef	Std Err	Coef	Std Err	Coef	Std Err
λ_i^+	0.79	0.71	1.05	0.75	**1.52**	0.59
λ_i^-	-0.46	0.66	**1.19**	0.49	**0.56**	0.34
ω^+	-0.07	0.05	**-0.21**	0.10	**-0.08**	0.07
ω^-	-0.79	0.11	**-0.17**	0.09	-0.12*	0.07
Observations	80	-	80	-	80	-
Adjusted R^2	0.04	-	0.14	-	0.13	-
Wald Tests	*F*-statistic	(*p*-value)	*F*-statistic	(*p*-value)	*F*-statistic	(*p*-value)
H_0: $\lambda_i^+ = \lambda_i^-$ v H_1: $\lambda_i^+ \neq \lambda_i^-$	1.24	0.27	0.02	0.89	1.75	0.19
H_0: $\omega^+ = \omega^-$ v H_1: $\omega^+ \neq \omega^-$	0.22	0.64	0.06	0.81	0.16	0.69

Notes: All coefficients in bold are significant at the 5 percent level.

Both gold and platinum cards have large amount parameters. In the short-run gold cards respond more strongly to decreases in input prices. However, platinum cards appear to respond more strongly to increases in input prices in the short-run. This response stronger respond to price increases may be related to the fact that platinum credit cards have a lower mark-up associated with them. It may indicate that issuers are less able to absorb increased costs due to platinum cards being priced closer to the true cost of issuing a credit card.

According to the estimated model for gold credit cards, the lending rate adjusts downwards by 0.21 following a previous period's decline in the base rate. This is compared with an upward adjustment of 0.17 when lending rates adjust upwards. These estimates are statistically significant at the 5 percent significance level. Platinum cards adjust downwards by 0.08 and upwards by 0.12 in response to disequilibrium. Gold cards respond more strongly to base rate decreases than base rate increases. Platinum cards respond more strongly to base rate increases.

Wald tests are undertaken to test whether the estimated asymmetric coefficients are significantly different from each other. If ω^+ is not significantly different from ω^-, then this implies that there is no significant asymmetry where the base rate is

increasing as opposed to decreasing (Schnolick, 1996). With respect to adjustment asymmetry it is found that the adjustment parameters are not statistically different for any of the credit card types. Thus there is no evidence to suggest that credit card issuers pass on interest increases more rapidly than they do decreases.

Wald tests are also undertaken to test whether the estimated amount parameters are significantly different from each other. If λ^+ is not significantly different from λ^- then interest rates respond to increases in the input price the same as they would to decreases input prices. None of the amount-asymmetry parameters are statistically different for any of the credit card types. This means that issuer respond similarly to input cost increase and decreases on impact.

5.7.4.2 Individual Issuer Results

Having analysed the possibility of asymmetric pricing at the market level, attention is now turned to issuer level. This sub-section analyses asymmetric price adjustment for the top ten issuers over the period October 1999 to May 2007.

- **Pass-Through of Costs**

Table 5.23 reports the results of estimated equation (5.16) for each individual issuer. The mark-up parameters, α_i, vary from issuer to issuer. However, since sample contains heterogeneous products, the estimated mark-ups are uninformative with respect to assessing market power (de Haan and Sterken, 2005). As β is not significant and positive for all issuers it can be concluded that not all issuers price their credit cards competitively, however it is clear that interest rate pass-through clearly differs across credit card issuers.

The pass-through coefficient for Barclaycard is 2.01. As this is greater than one this suggests that Barclaycard passes more than just the change in the base rate to consumers. The slope coefficient is significantly greater than one; this suggests that perhaps Barclaycard are increase lending rates to compensate for additional risks, as pointed out by De Bondt (2002). Barclaycard has a mark-up of 6.25.

Table 5.23: Long-Run OLS Results - Individual Issuers

	Barclaycard		MBNA		HBOS		HSBC		RBS	
	Coeff	**SD Error**	**Coeff**	**SD Error**	**Coeff**	**Error**	**Coeff**	**Error**	**Coeff**	**Error**
β_i	**2.01**	0.18	**0.64**	0.09	**0.94**	0.22	0.488*	0.11	**0.67**	0.05
α_i	**6.25**	0.85	**13.42**	0.42	**10.30**	1.02	**13.68**	0.62	**13.81**	0.23
Number of observations	92	-	92	-	92	-	92	-	92	-
Adjusted R^2	0.45	-	0.06	-	0.12	-	0.03	-	0.60	-
S.E. of Regression	0.01	-	0.01	-	0.01	-	0.01	-	0.01	-
Heteroskedasticity (p-value)	0.81	0.37	0.51	0.47	0.88	0.35	1.18	0.28	3.93	0.05
F-Statistic (p-value)	75.68	0.00	6.62	0.01	13.03	0.00	3.75	0.06	135.64	0.00
Durbin Watson	0.16	-	0.21	-	0.06	-	0.21	-	0.39	-
Wald Test	**F-stat**	**p-value**	**F-stat**	**p-value**	**F-stat**	**p-value**	**F-stat**	**p-value**	**F-stat**	**p-value**
H_0: β_i (df =89)	19.13	0.00	2.10	0.15	0.06	0.81	4.41	0.04	25.64	0.00

Notes: The following model has been estimated $r_i = \alpha_i + \beta_i r_m + \varepsilon_t$ to obtain the long-run relationship
$i = A, B, \ldots, J$ see Table 5.6 for key to which letter corresponds to which issuer
All coefficients in bold are significant at the 5% level
* indicates that is only just insignificant at the 5% level.

Table 5.23: Long-Run OLS Results Cont.

	Nationwide		Co-operative		Egg		Lloyds TSB		Capital One	
	Coeff	**SD Error**	**Coeff**	**SD Error**	**Coeff**	**Error**	**Coeff**	**Error**	**Coeff**	**Error**
α_i	**0.33**	0.11	**1.66**	0.08	**-1.24**	0.09	**0.41**	0.07	-0.17	0.35
β_i	**13.71**	0.49	**5.70**	0.42	**18.60**	0.43	**13.82**	0.32	**17.14**	1.44
Number of observations	92	-	92	-	92	-	92	-	92	-
Adjusted R^2	0.09	-	0.72	-	0.40	-	0.33	-	-0.01	-
S.E. of Regression	0.01	-	0.00	-	0.01	-	0.01	-	0.01	-
Heterskedasticity (p-value)	19.78	0.00	3.92	0.05	0.82	0.36	5.92	0.02	12.46	0.00
F-Statistic (p-value)	9.72	0.00	235.13	0.00	60.05	0.00	45.00	0.00	0.14	0.71
Durbin Watson	0.21	-	0.18	-	0.17	-	0.26	-	0.09	-
Wald Test	**F-stat**	**p-value**	**F-stat**	**p-value**	**F-stat**	**p-value**	**F-stat**	**p-value**	**F-stat**	**p-value**
H_0: β_i (df =89)	40.38	0.00	37.24	0.00	195.60	0.00	94.97	0.00	6.67	0.01

Notes: The following model has been estimated $r_i = \alpha_i + \beta_i r_m + \varepsilon_t$ to obtain the long-run relationship
$i = A, B, \ldots, J$ see Table 5.6 for key to which letter corresponds to which issuer
All coefficients in bold are significant at the 5% level
* indicates that is only just insignificant at the 5% level.

The coefficient on β is significant for MBNA. However, long-run pass-through is incomplete. This is not surprising as MBNA is the European subsidiary of the MBNA Corporation, which is based in the USA. MBNA thus has access funds in America and thus does not need to concentrate on changes in the base rate, as closely as British institutions, as if funds become too expensive if can access alternative sources with ease. The mark-up is positive and significant. HBOS has a β-parameter which is close to unity and thus follows the market closely. This confirms the finding of Heffernan (2004) that converted building societies respond more rapidly to changes in the market rate. In addition, HBOS also has the one of lowest mark-ups. HSBC does not follow the base rate very closely and has an extremely low pass-through rate, of less than 50 percent. HSBC also has a reasonable low mark-up compared to its fellow competitors. RBS has a long-run pass-through parameter of 0.65 which suggests that it pass on approximately 65% of the base rate change to consumers. The mark-up for RBS is 13.81, which is similar to that of Lloyds TSB.

Nationwide follows the base rate less closely than the other issuers. It has the lowest β coefficient with a value of 0.33. Heffernan (2004) argues that the managers of building societies are able to build up reserves or earn a smaller margin on loans and deposits because they do not have to maximise profits, service external capital, or pay a yearly dividends to shareholders. Thus, the objective of a building society manager is to maximise the utility of their customers-shareholders. While is has been pointed out that holding a credit card does not entitle an individual to become a shareholder, it would not be unreasonable to expect that cardholders also hold other products with the building society which do entitle them to be a shareholder. Thus, Nationwide may choose to smooth interest rates. The mark-up for Nationwide is 13.71 which is also one of the lowest market ups in the sample.

The pass-through coefficient for the Co-operative Bank is 1.66, this is greater than one. Again this could suggest that the Co-operative Bank is increasing lending rates to compensate for additional risks. As the Co-operative acts in the interest of its customers who are also it shareholders, it may be that it uses the profits

from its credit card business to subsidies other aspects of the business, which are less profitable.

The coefficient of β is significant and negative for Egg. A closer inspection of the Egg interest rate time series indicates that all interest rate changes have been positive, even when the base rate has fallen. Egg has the highest mark-up of all issuers.

Capital One also has a pass-through parameter which is not significant. A possible explanation for this is that Capital One decided to re-brand some of their credit card products during the sample. Capital One moved away from offering a standard credit card which had an interest rate comparable to other issuers, to a product which have an annual interest rate in excess of 30 percent, which targeted individuals with low or non-existent credit histories. As this coefficient is not statistically different from zero, it may be the case that Capital One chooses to ignore base rate changes, focusing on ensuring that interest rates match the risk associated with the portfolio it holds. Capital One has the second highest mark-up.

- **Asymmetric Pass-Through**

Having considered the long-run pass-through of base rate changes, equation (5.21) is estimated for issuers except for MBNA, the Co-operative Bank and Egg, using the residuals obtained by estimating equation (5.16). Equation (5.21) is estimated for MBNA, the Co-operative Bank or Egg despite no cointegrating relationship being found in the preliminary time series analysis which was undertaken in section 6.1.1.

Twelve lags were used to capture the shot-run dynamic relationship in the ECM system. The results of estimating the asymmetric cost adjustment are presented in Table 5.24. Hannan and Berger(1991) and Neumark and Sharpe (1992) argue that asymmetric rigidities are due to the cost of adjustment and the offer two reasons for asymmetrical adjustment: customer reaction and collusive pricing arrangements. According the consumer reaction hypothesis, great rigidity in loan rate increases may be expected if customers react unfavourably to unstable rates.

Table 5.24: ECM Estimation Results - Individual Issuers

	Barclaycard		MBNA		HBOS		HSBC		RBS	
	Coeff	**SD Error**	**Coeff**	**SD Error**	**Coeff**	**Error**	**Coeff**	**Error**	**Coeff**	**Error**
λ_i^+	**4.21**	2.54	-0.16	2.88	1.25	2.48	0.40	2.68	**1.81**	0.73
λ_i^-	4.35	2.33	-1.29	1.72	-0.10	1.98	**0.42**	2.14	**1.32**	0.53
ω^+	-0.12	0.11	0.07	0.08	-0.05	0.11	0.09	0.15	0.18	0.12
ω^-	**-0.19**	0.10	**-0.16**	0.08	-0.07	0.07	0.12	0.06	**-0.25**	0.12
Observations	81	-	81	-	81	-	81	-	81	-
Adjusted R^2	0.17	-	0.04	-	0.03	-	0.05	-	0.13	-
Wald Tests	*F-stat*	*p-value*	*F-stat*	*p-value*	*F-stat*	*p-value*	*F-stat*	*p-value*	*F-stat*	*p-value*
$H_0: \lambda_i^+ = \lambda_i^- \text{ v } H_1: \lambda_i^+ \neq \lambda_i^-$	0.00	0.96	0.11	0.74	0.14	0.71	0.00	1.00	0.25	0.62
$H_0: \omega^+ = \omega^- \text{v } H_1: \omega^+ \neq \omega^-$	0.34	0.56	0.58	0.45	0.57	0.45	0.02	0.89	0.17	0.68

	Nationwide		Co-operative		Egg		Lloyds TSB		Capital One	
	Coeff	**SD Error**	**Coeff**	**SD Error**	**Coeff**	**Error**	**Coeff**	**Error**	**Coeff**	**Error**
λ_i^+	0.34	1.02	0.99	1.17	1.45	1.80	-0.67	0.88	-1.95	3.39
λ_i^-	-0.31	0.73	**3.86**	1.22	-1.34	0.98	0.87	0.61	-2.54	3.42
ω^+	**-0.14**	0.07	**-0.37**	0.12	-0.04	0.08	**-0.18**	0.10	**-0.12**	0.04
ω^-	-0.09	0.09	-0.03	0.09	0.21	0.08	0.02	0.12	-0.06	0.15
Observations	81	-	81	-	81	-	81	-	81	-
Adjusted R^2	0.03	-	0.15	-	0.09	-	0.09	-	0.11	-
Wald Tests	*F-stat*	*p-value*	*F-stat*	*p-value*	*F-stat*	*p-value*	*F-stat*	*p-value*	*F-stat*	*p-value*
$H_0: \lambda_i^+ = \lambda_i^- \text{ v } H_1: \lambda_i^+ \neq \lambda_i^-$	0.21	0.64	2.27	0.14	1.77	0.19	0.01	0.92	1.42	0.24
$H_0: \omega^+ = \omega^- \text{v } H_1: \omega^+ \neq \omega^-$	0.13	0.72	4.57	0.04	2.78	0.09	0.13	0.72	0.72	0.40

In concentrated markets, lending rates may be more rigid downwards due to the cost of breaking collusive pricing agreements. The estimated coefficients of the asymmetric adjustments are in the main consistent with the common intuition that loan rates are more rigid downwards. According to the estimates in Table 5.24, Barclaycard's lending rates adjust downwards by 0.12 following a decline in the base rate the previous month, compared with an upwards adjustment of 0.19. However only the upwards adjustment coefficient is significant at the 5 percent significance level. MBNA is found to respond to base rate increases but not to decreases. The same is true for RBS.

Interestingly, some issuers respond more strongly to situations in which the previous month's base rate is below the long-run predicted rate. Nationwide adjusts lending rates downwards by 0.14 following a decline in the base rate during the previous month but responds to an increase in the base rate by adjusting lending rates upwards by 0.09. The Co-operative Bank also responds more strongly to when the base rate is below the long-run predicted rate. The Co-operative Bank responds by adjusting rates downwards by 0.37% but upwards by 0.03.

Given the nature of both the Nationwide Building Society and the Co-operative Bank, perhaps is should be of no surprise that these institutions are more willing to "pass-through" base rate changes more quickly than other issuers in the sample. In addition, during the Co-operative Bank offers a range of credit cards which are tied to the base rate. This means that the Co-operative Bank offered a rate of interest on outstanding balances which was tied to the base rate.

Lloyds TSB responds to base rate decreases but not base rate increases, as only the ω^+ is significant at the 5 percent level. Thus, in response to a decrease in the base rate, Lloyds TSB adjusts its interest rate by 0.18. Capital One also responds to base rate decreases but not to base rate decreases. A possible explanation for this is that Lloyds TSB and Capital One have become less competitive compared to their rivals (see section 6.6.3 for a review of competition) and they are attempting to become more competitive and gain market share from their rivals.

Wald tests are used in order to test whether the estimated asymmetric coefficients are significantly different from each other. From the results presented in Table 5.24, it can be seen that the adjustment-asymmetry parameters are not statistically different for most of the issuers. Thus, credit card issuers adjust their rates upwards when they are below equilibrium at the same speed as they adjust them downwards when they are above equilibrium. The null hypothesis of no adjustment asymmetry is rejected only in the case of the Co-operative Bank and Egg (at the 10 percent significance level).

In general the amount parameters are found to be insignificant for issuers at the 5 percent significance level, which suggests in the main issuers, do not respond to changes in the base rate in the short-run by changing their interest rates. Price asymmetry can favour borrowers (Allen and McVanel, 2009). Issuers are likely to encounter moral hazard and adverse-selection problems when they raise interest rates on outstanding balances in response to higher base rates. More specifically, by increasing interest rates, issuers leave themselves with a riskier pool of borrowers. Issuers thus may be slower, to raise rates when faced with a temporary cost increase. Credit card issuers may be slow to respond to a temporary cost decrease, due to the costs associated with notifying existing customers about changes to their interest rates, this may be true with temporary rate increases. For example, Barclaycard has 11.7 million customers in the UK (Barclays, 2008), it would be very expensive to notify every single cardholder if they responded to every temporary change in the base rate.

The amount parameters are largest for Barclaycard. Barclaycard responds strongly to increases in the base rate but not to decreases in the base rate. HSBC responds more strongly in the short-run to decreases in the base rate. However HSBC does not respond to increases in the base rate in the short-run. The Co-operative Bank also responds strongly to base rate decreases. RBS is the only issuer that responds to both base rate increases and decreases in the short-run. From the estimates it appears that RBS responds more strongly to increases in the base rate than decreases in the base rate.

Wald tests are also undertaken to test whether credit card prices respond as quickly to input price increase as they do to price decreases. With the exception of the Co-operative Bank, none of the amount-asymmetry parameters are found to be statistically different for any credit card. This indicates that credit card issuers respond similarly to input cost increases and decreases on impact.

5.7.4.3 Summary

In summary, the final pass-through of base rate changes to retail credit card interest rates is mixed. Issuers generally choose not to pass base rate changes on to consumer or they choose to "overshoot". "Overshooting" in the context of pass-through can mean that issuers are attempting to increase lending rates by a higher amount than the increase in the base rate, thus providing themselves with a risk premium for the increase in the share of more risky borrowers (Grynkiv, 2007).

In general, no evidence of asymmetric pricing is found in the credit card market. However, only one aspect of pricing has been considered. It may simply be the case that issuers choose not to change their interest rates in the short-term and instead choose to change another aspect of credit card pricing. For example, the can change the length and the interest rate on balance transfer offers. It may be easier for issuers to do this means that they only have to change the offers they make to new potential customers.

5.8 Conclusion

The principle objective of this chapter was to quantify the degree of pass-through between a variety of money market rates and credit card lending rates. This process is important since it will determine in part how sensitive the domestic economy is to monetary policy changes as well as determining the speed at which the real economy responds to such policy changes. An error correction model is used to capture the dynamics of the UK card rate responses to changes in the Bank of England base rate. The test is conducted using a monthly time series of interest rates for credit cards over the period 1995 to 2008. In addition, monthly interest rates set by individual credit card issuers over the period 1999:11 to 2007:5. The unique data set made it possible to estimate an error correction model (ECM) for every issuer and for different credit card

products. The adjustment process is found to vary considerably between and within credit card products. The results suggests that the UK credit card market exhibits many features of imperfect competition, and that adjustment differences could affect the speed of the money transmission mechanism.

The credit card data set used to investigate pass-through does not reflect all available information on each credit card product since there can be substantial competition in an array of non-price inducements built into retail products offered by banks and building societies that may alter more frequently than the retail rate itself. Official base rate changes may possibly be met by alterations to non-price dimensions of the products, particularly in short-run, in addition to changes in the associated retail rates. Therefore it is conceivable that a switch from one to the other introduces non-linearities into base rate pass-through as a result.

The historically slow response of credit card rates to changes in money market rates is consistent with imperfect competition (Calem and Mester, 1995). It is still the case that credit card interest rates are slow to respond to changes in the base rate, which would indicate that competition within the UK credit card market is imperfect.

Pass-through in the UK credit card market is found to be extremely mixed. Final pass-through of the base rate to retail credit card rates is well above 100 percent. This overshooting may, among other factors, be explained by asymmetric information costs without credit rationing. At the market segment level, standard credit cards rates are found to be extremely sticky. Gold and platinum credit cards appear to be more responsive to the base rate in the long-run.

No common consensus can be drawn about pass-through at the issuer level. Long-run responses are extremely mixed. However, in the short-run all issuers respond weakly to changes in the base rate. This is perhaps because they are able to alter other prices and interest rates such as cost of balance transfers, the length of opening offers on purchases and balance transfers.

No evidence of asymmetric pricing is found in the UK credit card market, which suggests that credit card issuers respond to base rate increases and decreases at the same speed. However this appears to be an area which requires further research, due to the complexity of how credit cards are priced, this will be discussed in chapter seven.

To complete this comprehensive review of competition in the UK credit card market, the next chapter of this thesis investigates price leadership.

CHAPTER 6
PRICE LEADERSHIP IN THE UK CREDIT CARD MARKET

6.1 Introduction

Despite a wave of new entrants into the UK credit card market over the last decade, extremely high profits, fees and interest rates of credit card issuers indicate that the market structure of the credit card industry is oligopolistic rather than fully competitive. This conclusion is supported by the findings of chapter four as well as being consistent with the very large market shares currently held by the top five and top ten credit card issuers, 66% and 91% respectively (Mintel, 2004).

Traditionally, competition in markets is tested in a structure-conduct-performance setting. This paradigm states that market structure influences the performance of banks. More concentrated markets facilitate collusive agreements, increase market power and thus the profitability of the banks. The relative-efficiency hypothesis argues that efficient firms have relatively higher profits and are able to increase their market share (de Haan and Sterken, 2006). This leads to a concentration of profitable firms.

This chapter analyses competition between the top ten issuers in the UK credit card market. More specifically, it investigates two aspects of competition: price leadership and competitive pricing. Therefore, the research undertaken in this chapter aims to answer the following research questions: (1) is there a price leader amongst these ten issuers and (2) what the consequences does this have for competition between issuers. The methodology adopted in this chapter is as follows: firstly, monthly price setting behaviour of the ten issuers using a Vector Error Correction Model (VECM) framework. Causality tests within this framework provide insights into any potential price leadership. Secondly, discrete choice analysis is undertaken to enable the questions of whether and how each of the ten issuers' monthly decisions to raise, keep unchanged, or lower the interest rates depends on the interest rates charged by their competitors.

The remainder of this chapter is structured as follows. Section two provides an overview of price leadership theories and models. The UK credit card market is examined in section three. In addition interest rate data and pricing behaviour of the

issuers is discussed, as well as a brief review of the studies which investigate competition in the UK credit card market. In section four, the pricing behaviour of a sample of issuers in the UK is investigated using a vector error correction model. Section five estimates a discrete choice model to investigate how individual issuers respond to each other when faced with a change in the cost of funds. Section six summaries and concludes this chapter.

6.2 Price Leadership

Given that the UK credit card market is predominantly dominated by five credit card issuers, there is a possibility that one of these issuers acts as a price leader. In this situation one firm within the industry announces a price change in advance of the data at which the new price will take effect. The new price and date are swiftly matched by the other firms within the industry. Even if one of the issuers acts as a price leader it does not necessarily imply that other issuers, the followers, do not set their interest rates competitively. Price leadership is a widely observed if not somewhat imperfectly understood pattern of industrial behaviour (Scherer, 1980). Various types of price leadership have been discussed and presented by economists such as Forchheimer (1908), Nichol (1930), Stigler (1947b), Markham (1951), Lanzillotti (1987) and Bain (1960). Markham (1951) attempted to explain the various details which comprise the phenomenon of price leadership by identifying three distinct forms: dominant, barometric and collusive price leadership. These three types of price leadership will be discussed below in greater detail.

6.2.1 Barometric Price Leadership

The term barometric leadership first appeared in a paper by Stigler (1947). Barometric price leadership refers to a situation in which a price leader acts as a barometer to prevailing market conditions for other firms in the industry (Cooper, 1996). Although barometric leadership draws its name from the information-sharing which occurs, there are a number other features which are considered to characterise this type of phenomenon.

Markham (1951) suggests that there are two types of barometric price leadership: the competitive type and the monopolistic type. The monopolistic type is often referred to

as collusive price leadership in the literature. The competitive form of barometric price leadership is characterised by:

- Frequent changes in the identity of the leader;
- No immediate, uniform response to price changes and, as a consequence followers take their time to consider the suitability of a price change implemented by the leader; and
- Variations in market share.

On the other hand, collusive price leadership is characterised by:

- A small number of firms, all relatively large in size;
- Substantial barriers to entry;
- Limited product differentiation, which reinforces awareness of firm interdependence;
- Low elasticity if demand, which deters price-cutting; and
- Similar cost functions.

According to Markham (1951: 898), "The barometric firm possesses no power to coerce the rest of the industry into accepting its price ... it simply passes along information to the "Big Three" or "Big Four".

6.2.2 Dominant Price Leadership

The dominant price leadership model, assumes that there is one large dominant firm, and a competitive "fringe" which comprises of a large number of smaller firms. The dominant firm is the price leader and consequently sets the market price. All the other firms in the market are price followers. In other words, these firms are price takers, and each faces a perfectly elastic demand function at the price set by the dominant firm. An assumption of this model is that the dominant firm has complete information with respect to its own demand and cost functions, as well as those of its smaller competition.

6.2.3 Collusive Price Leadership

As previously mentioned, collusive price leadership was introduced by Markham (1951) in order to support the monopolistic solution to the oligopolist's pricing

coordination problem. Scherer and Ross (1990) argue that it is not possible to clearly distinguish between collusive and barometric price leadership.

6.2.4 Price Leadership in the Banking Sector

Price leadership is a perennial problem for competition regulators. In many industries pricing is characterised by price leadership: one of the firms announces a price change in advance of the date at which the new price will take effect and the new price and date are swiftly matched by the other firms in the industry (Rotemberg and Saloner, 1993). Often price changes are matched pence for pence, even if the products are differentiated. Also it is common for a long period of time to elapses between price changes. Sterken (2006) argues that price leadership is not itself a bad thing, as it may be caused by corresponding changes to marginal cost, mixed strategies, and product heterogeneity. However, if price leadership signals collusive agreements, then it is a serious task for the anti-trust authorities.

Banks usually move together, whether it is to introduce free banking or to restrict it. When the movement is to the customer's advantage, few complain. However, when changes disadvantage the consumer, it can look suspicious and cause complaints to be made. Searjeant (2002) argues that this type of behaviour does not necessarily mean that the banks are colluding; it could simply mean that they are all facing the same cost issues and are waiting for someone to take an unpopular lead.

Rotemberg and Saloner (1990) observe that barometric and dominant firm models are often inappropriate for industries in which equal-sized players sell differentiated products. In such an industry, it would be expected that all players would engage in strategic behaviour. For instance, if one credit card issuer possesses superior information about demand, the less informed issuers might find it more profitable to follow the leader. It is likely that price leadership leads to price stickiness (Sterken, 2006). Motta (2004) argues that collusion is more likely to occur in concentrated markets, especially when players have the same strength.

De Haan and Sterken (2006) have tested for price leadership in the Dutch mortgage market, using data for both 5- and 10-year maturity mortgage contracts of the four

largest banks. Based on both an impulse-response analysis of a Vector Error Correction Model (VECM) and a probit analysis of infrequent rate changes, they find clear evidence of price leadership by one of the banks. Given the fact that interest rates change infrequently, but in most cases in rather short time intervals, the results appeal to the theories of dominant and collusive price leadership. In addition, de Haan and Sterken (2006) also use the data set with the addition of market share information to estimate a conjectural variation model.

6.3 Data

The empirical analysis is conducted using monthly posted interest rates by the top ten issuers for the period October 1999 to May 2007. Posted credit rate data was collected on a monthly basis from Moneyfacts magazine, the data set has been discussed in detail in section four of Chapter Five. The top ten issuers have approximately 90 percent of the credit card market. The UK credit card market was reviewed in detail in Chapter Three; this section provides a brief recap of the market. In addition this section, introduces the issuers which will be included in this investigation and make some suggestions about how these issuers interact and react to each other.

6.3.1 The Market

In the early 1990s, the UK credit card market was dominated by the large high-street banks; Barclays, Lloyds TSB, the Midlands (now HSBC) and NatWest. Typically all banks would charge cardholders an interest rate in the region of 22%, in addition to an annual fee of approximately £10. Consumers had very little choice and cards were barely differentiates. Indeed there was an absence of competition with respect to both pricing and product characteristics, that is, the majority of credit cards offered similar terms and conditions as well as charging similar rates of interest. The changing nature of the UK credit card market has been discussed in Chapter Three.

The market is dominated predominantly by five issuers (Barclaycard, HSBC, Lloyds TSB, MBNA and the Royal Bank of Scotland) who had a combined market share of approximately 67 percent in 2004 (Mintel, 2004). By the end of 2004, the top ten issuers in the UK had a combined market share of approximately 90% (Mintel, 2004).

Table 6.1: Information on Issuers

Issuer	Code	Market Operating in	Market Share[1]	Ranking According to Market Share
Barclaycard	A	Initial Standard Student Gold Platinum	15.7%	2
MBNA	B	Standard Gold Platinum Co-branded Affinity	9.4%	5
HBOS	C	Standard Student Gold Platinum Co-branded Affinity	7.8%	6
HSBC	D	Standard Student Gold Platinum	14.8%	3
RBS	E	Black Standard Gold Platinum Co-branded Affinity	15.8%	1
Nationwide	F	Standard Gold	1.6%	10
Co-operative Bank	G	Standard Gold Platinum Co-branded Affinity	2.3%	9
Egg	H	Standard	2.8%	8
Lloyds TSB	I	Standard Gold Platinum	9.7%	4
Capital One	J	Initial Standard Platinum	3.8%	7

[1] European Payment Cards 2004-05

Instead of simply focusing on the top five issuers this study will consider the pricing behaviour of the top ten credit card issuers in the UK. The reason for this is not all issuers participate in all market segments, thus it is possible that within a particular market segment an issuer may behave differently to different issuers. Analysing the

top ten issuers means it is possible to consider the impact of the firm structure on price changes. Table 6.1 provides some summary information on the ten issuers which are included in this study.

6.3.2 Leadership Behaviour in the UK Credit Card Market

There are many examples of leader-follower behaviour in the UK credit card market. An example of leader-follower behaviour with respect to annual fees is presented in Table 6.2. Following, Barclaycards announcement of their intention introduce an annual fee in February 1989, Lloyds followed suit in August of the same year. Following Lloyds implementation of the annual fee in February 1990, Barclaycard, Midland and NatWest subsequently follow suit.

Table 6.2: An Example of Leadership in the UK Credit Card Market

Date	Event
Feb 1989	Barclaycard considered introducing an annual fee
Aug 1989	Lloyds announces annual fee, Barclays wait
Feb 1990	Annual Fee takes effect; Lloyds estimates loss of 10% of its credit card customers
Mar 1990	Lloyds loses 20% of its customers; Lloyds credit card profits declined substantially relative to other banks
Apr 1990	Barclays announces annual fee, to take effect in June
During 1991	Midland and NatWest also introduce annual fees

Product innovations within the credit card are often quickly replicated by rival issuers as are changes in pricing structures. For example, following the wide spread adoption of free zero percent balance transfer offers by issuers, Barclaycard "threw down a gauntlet" in August 2004 by introducing a two percent fee on the amount transferred on to the card, up to a maximum of £35. MBNA quickly followed Barclaycard in September 2004. This was followed by RBS in January 2005, who introduced a fee of two percent with a minimum of £5 and a maximum £40. At the time of Mint announcing the introduction of a balance transfer fee, Stuart Glendinning, director of credit cards at moneysupermarket.com stated "Barclaycard is the UK's biggest credit card provider and their decision to implement a fee did, in my opinion, trigger others to follow. I expect other providers will take the lead by Barclaycard, MBNA and Mint and start charging for balance transfers, especially for periods of nine months and over" (Glendinning, 2005). In 2005 more than 50 cards were available with fee-free

balance transfers, however by June 2009 this had fallen to just one (This is Money, 2009). What is clear is that once issuers observe their competitors making changes to their terms and conditions, pricing structures and card offerings they are quick to follow suit, suggesting that there is leader-follower type behaviour in the credit card market. While leader-follower behaviour can be clearly seen in areas such as product innovations, responses to OFT rulings and changes to fees, it is unclear whether leader-follower behaviour occurs in the setting of interest rates and thus it is the aim of the subsequent qualitative and quantitative work undertaken in this chapter to investigate the behaviour of credit card issuers with respect to each other and to examine leader-follower behaviour.

6.3.3 The Pricing Behaviour of Issuers

Table 6.3 gives the date changes made by credit card issuers to their credit card portfolio, that is, changes made to the average interest rate charged on their card portfolio. The datings clearly show clustering. However Table 6.3 does not provide any indication to the size of the changes. Figure 6.1, therefore shows the monthly time series of the credit card portfolio of each of the issuers in the sample together with the monthly cost of funding. No clear pattern can be detected in Figure 6.1; however one interesting feature of this figure is that the average interest rate charged by Capital One increases dramatically in August 2006. The explanation for this is that Capital One decided to refocus its product portfolio so that it offered cards at different ends of the product spectrum, the platinum and starter card segments. In general, this figure illustrates the same story as Table 6.3. Most of the time issuers choose not to change their prices; over the period 1999(11) to 2007(5) prices remain the same approximately 83 percent of the time. When price movement is observed in the credit card market, 38% percent of the time a price change is made by a single issuer. On no single occasion do all of the top ten issuers change their prices simultaneously. On two occasions, five issuers have simultaneously changed prices. On average, issuers made 16 changes to their interest rates over the sample period. On average, seven of these price changes have led to a price increase and nine of these a price decrease. The Co-operative Bank has altered its prices on 37 occasions, while Egg PLC made only seven changes.

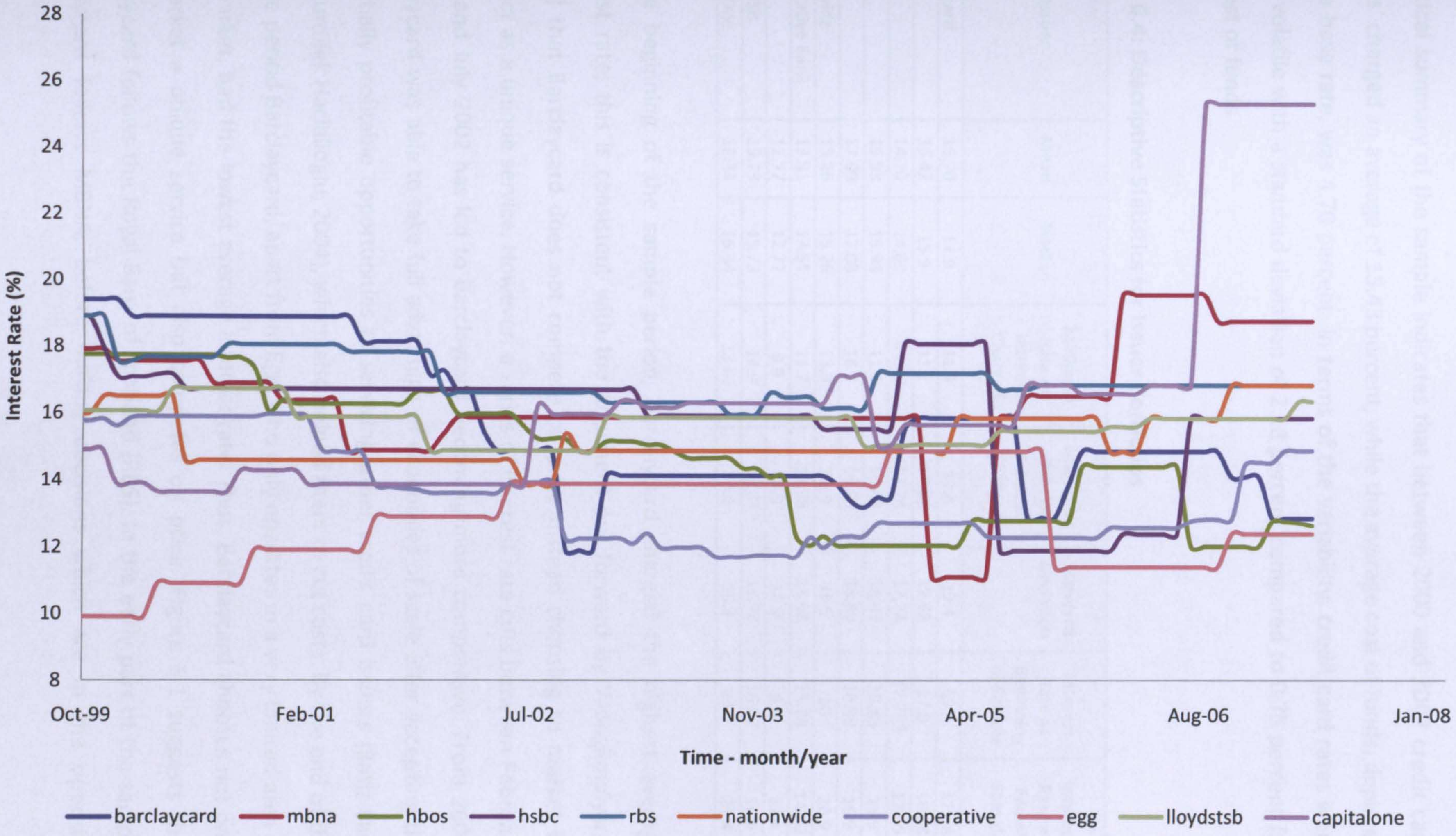
Table 6.3: Date Changes

Year	Months Interest Rates Changed									
	Barclaycard		MBNA		HBOS		HSBC		RBS	
	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease
1999								December	October	
2000		February		January August		September December	April	January June	March September	January
2001		July December		January June	January November	February				June November
2002	January	February April May October	January February			February July August November				January
2003	January				January	April June November		April		January October
2004	September November December	June July August			May	January March April June	November	May	January September	February May
2005	November December	August	June August	January	April December			June	September	June
2006		November	March	October		August	March August			
2007		February			February	April May				

Table 6.3: Date Changes Cont.

Year	Months Interest Rates Changed									
	Nationwide		Co-operative		Egg		Lloyds TSB		Capital One	
	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease
1999	December		December	October November						
2000		June	February March December	January	April November		May		October	January April
2001				March April May June August September October November December	August			February December		March
2002	October	July November	June	October	June				August	September
2003			April December	March May September			January		February July	April
2004			April June July September	March May	October		December	September	June November	September
2005	March			May June		October	June		August	December
2006	May November	February	February August September December		November		February May		May September	
2007			January March				April			

Figure 6.1: Average Interest Rate Charged by Top Ten Issuers on Outstanding Balances



Some descriptive statistics of the interest rate data are provided in Table 6.4. Credit card issuers mostly change interest rates in small increments on an infrequent basis. A statistical summary of the sample indicates that between 2000 and 2007 credit card issuers' charged an average of 15.43 percent, while the average cost of funds, depicted by the base rate, was 4.70 percent. In terms of the variability, credit card rates were more volatile with a standard deviation of 2.18 percent compared to 0.75 percent for the cost of funds.

Table 6.4: Descriptive Statistics for Issuer Portfolios

Issuer	Mean	Median	Minimum Rate of Interest Charged	Maximum Rate of Interest Charged	Standard Deviation	Interest Rate at Beginning of Sample	Interest Rate at End of Sample
Barclaycard	15.70	14.9	11.9	19.4	19.4	19.4	12.88
MBNA	16.42	15.9	11.1	19.62	19.62	17.9	18.83
HBOS	14.70	14.69	12.03	17.74	17,74	17.735	12.65
HSBC	15.93	15.93	11.9	18.83	18.83	18.83	15.9
RBS	17.09	17.08	16.0	18.89	18.89	18.89	16.9
Nationwide	15.26	15.26	13.9	16.9	16.9	16	16.9
Co-operative Bank	13.51	13.51	11.7	15.98	15.98	15.78	14.92
Egg	12.77	12.77	9.9	14.9	14.9	9.9	12.4
Lloyds TSB	15.73	15.73	14.9	16.73	16.73	16.07	16.4
Capital One	16.34	16.34	13.65	25.4	25.4	14.9	25.4

At the beginning of the sample period, Barclaycard charged the highest average interest rate; this is consistent with the argument put forward by Wonglimpiyarat (2005) that Barclaycard does not compete on price instead choosing to market its product as a unique service. However, a series of interest rate cuts between February 2001 and July 2002 has led to Barclaycard becoming more competitive. From 2003, Barclaycard was able to take full advantage of economies of scale after accepting the potentially profitable opportunities of servicing other credit card issuers (Batiz-Lazo and Nurdilek Hacialioglu, 2004), which also helped them to cut costs. By the end of the sample period Barclaycard, apart from Egg, who only operates in a very limited area of the market, had the lowest average interest rate. Thus, Barclaycard chooses not only to market a unique service but also competes on price. Figure 6.1 suggests that Barclaycard follows the Royal Bank of Scotland (RBS). In the early part of the sample Barclaycard follows MBNA, before making decisions which are in the opposite

direction to MBNA. In addition it appears that Barclaycard chooses to ignore the Nationwide Building Society.

The personal loan specialist, MBNA, has a higher interest rate at the end of the sample compared to the beginning of the sample period. Only Capital One charges a higher than average interest rate than MBNA at the end of the sample period. MBNA makes a number of steep interest rate changes between April 2005 and August 2006, very small declines in interest rates are made at the start of the sample. Halifax Bank of Scotland (HBOS) in November 1999 had an average interest rate which was higher than Nationwide, the Co-operative Bank, Egg, Lloyds TSB and Capital One. Like Barclaycard, a declining in the average interest rate is witnessed. From Figure 6.1, it appears that HBOS follows the pricing decisions of the Co-operative Bank in the middle of the sample, and does the opposite to Egg between October 1999 and November 2003, however in general it appears that they do not really follow the pricing behaviour of any of the other issuers in the market.

With regards to HSBC, Figure 6.1 shows that for large periods of time interest rates remained unchanged; however there has been some interest rate movements that means the average interest rate has declined over the sample period. Some large interest rate changes are observed between December 2004 and August 2006.

Both RBS and the Co-operative begin and end the sample period with charging approximately the same rate of interest. RBS charged the second highest average rate of interest behind Barclaycard at the start of the sample period, however by the end of the sample period only Capital One had a higher average rate of interest. Interestingly, Lloyds TSB and Nationwide had altered their interest rates over the course of the sample period so that they were very similar to that of RBS. According to Figure 6.1, RBS does not appear to follow anyone, but having made changes to its average interest rate it does appear that other issuers make changes subsequently, thus it is possible that RBS acts as a price leader. Nationwide charges a higher average interest rate at the end of the sample period compared to the beginning. Figure 6.1 suggests that Nationwide do not follow any of the other issuers in sample, choosing to make their

own decisions with respect to interest rate changes. However the building society does appear to move in the opposite direction to both Egg and Capital One.

Egg entered into the market in October 1999, charging an extremely low interest rate of 9.9 percent. However through a number of interest rate increases, its average interest rate was significantly higher in May 2007. The introduction of a second product in June 2005, led to a sharp decline in the average rate of interest charged. Egg appears to ignore the pricing behaviour of the other nine issuers, even choosing to increase interest rates when the base rate has declined. This suggests that Egg entry strategy was to price below its competitors in order to gain market share, once it had gained a slice of the market, it increased its interest rate. Thus, decisions to alter interest rates may not simply be down to a change in market conditions (e.g. increased competition) or changes in the cost of funds, decisions to alter interest rates may be made for other reasons. For example, Egg entered into the market in 1999, with an extremely low APR of 9.9%, which suggests they priced low in order to capture market share. Egg incurred start-up costs of approximately £500 million and made £150 million lost in the first two years of trading. Thus Egg may have been unable to maintain such a low rate of interest and had to increase its interest rates to enable it to become a profitable enterprise. Out of the seven changes made to the interest rate only one decision was made to lower the portfolio interest rate by Egg and this was as a consequence of introducing a new standard credit card product in October 2005. Capital One had the lowest average interest rate at the start of the sample and the highest at the end of the sample. From Figure 6.1 there appears to be a general upwards trend in Capital One's pricing strategy. This reflects a change in the markets in which Capital One have chosen to operate in. Capital One made the decision to increase the interest rate on their standard credit card in order to be able to offer it to a wider range of customers, such as those with no or an extremely poor credit rating. These individuals are deemed to be a higher risk and thus interest rates have to be increased to reflect this and compensate for the additional risk that the issuer must take on. In summary, six out of the ten issuers included in this study have slashed their interest rates over the sample period. Barclaycard, MBNA, HBOS, HSBC, RBS and the Co-operative Bank all have an average interest rate which is lower at the end of the sample than at the beginning of the sample. This is reflected by the fact that out of the

117 decisions made by these issuers to change their prices, 71 of the decisions made were to reduce interest rates. Nationwide, Lloyds TSB, Egg and Capital One all had higher interest rates at the end of the sample period. In total, these four issuers made 42 price changes over the sample period with 27 of these being to increase interest rates.

Various types of credit card products are available in the United Kingdom, targeting a wide range of different audiences from students through to individuals who have poor credit ratings. As can be seen from Table 6.1 the majority of credit card issuers operate within three main product segments; standard/classic, gold and platinum. Therefore in addition to examining the behaviour of credit card issuers at the issuer level, this chapter will also analyse issuer behaviour at the product level. The standard/classic, gold and platinum credit card markets are examined in detail below.

- **Standard/Classic Credit Cards**

Standard credit cards are usually available to any individual over the age of 18, subject to the application being accepted. All of the top ten issuers offer at least one standard credit card product, however only one standard credit card is examined for each issuer, this card has been selected on the basis that it is available to new customers throughout the sample period.

Table 6.5: Descriptive and Summary Statistics for Standard Credit Cards

Issuer	Mean	Median	Minimum Rate of Interest Charged	Maximum Rate of Interest Charged	Standard Deviation
Barclaycard	16.35	15.9	11.9	19.9	3.22
MBNA	16.68	15.9	14.9	18.9	1.11
HBOS	17.16	17.9	14.9	19.9	2.14
HSBC	17.01	15.9	13.9	20.1	1.85
RBS	17.40	16.9	16.9	23.2	1.00
Nationwide	14.92	14.6	13.9	17.9	1.20
Co-operative Bank	15.45	14.9	13.8	18.9	1.02
Egg	13.81	13.9	9.9	16.9	1.90
Lloyds TSB	18.04	17.9	17.4	19.9	0.12
Capital One	25.85	29.9	17.9	34.9	6.33

Figure 6.2: Interest Rates Charged by Top Ten Issuers on Standard Credit Cards

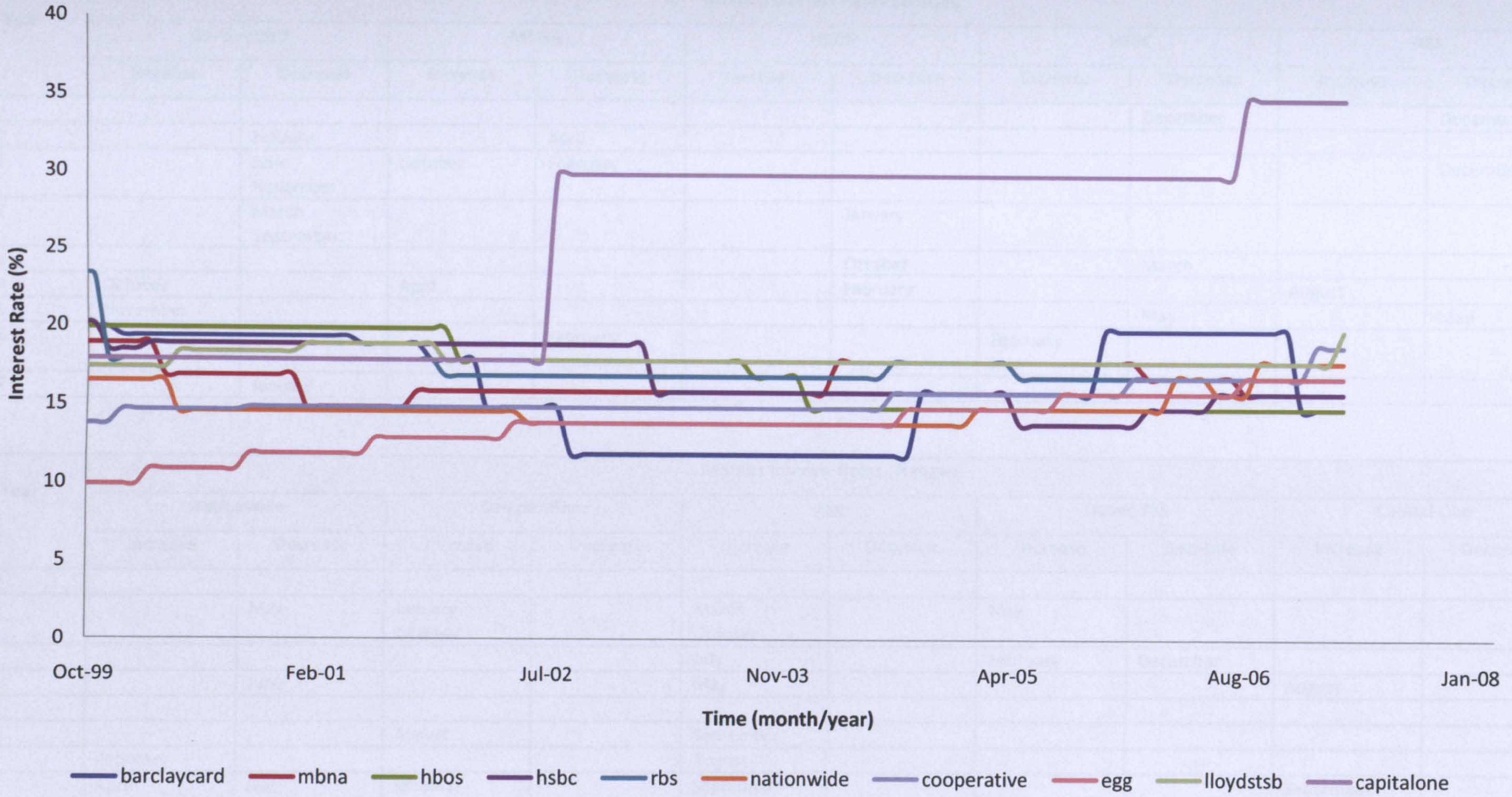


Table 6.6: Date Changes on Standard Credit Cards

Year	Months Interest Rates Changed									
	Barclaycard		MBNA		HBOS		HSBC		RBS	
	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease
1999								December		December
2000		January		April						
2001		June November	October	February						December
2002		March September				January				
2003						October		March		
2004	October		April			February			August	
2005	November							May		May
2006				February September			February July			
2007		January								

Year	Months Interest Rates Changed									
	Nationwide		Co-operative		Egg		Lloyds TSB		Capital One	
	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease
1999										
2000		May	January October		March October		May			
2001					July		February	December		
2002		June			May				August	
2003										
2004			August		September					
2005	February				August					
2006	April October	July	January		September				September	
2007			February				April			

Table 6.5 provides some descriptive statistics on the standard credit card interest rate data. Interest rates have ranged from 9.9 percent (Egg) to 34.9 percent (Capital One) over the sample period. On average the highest interest rate on a standard credit card is 25.85 percent, which is offered by Capital One and the lowest interest rate is 13.81 percent which is offered by Egg.

Table 6.6 details the dates of interest rate changes made by issues on standard/classic credit cards. Barclaycard have made the greatest number of changes to their interest rates, with eight changes being made over the period November 1999 to May 2007. The least number of rate changes have been made by Capital One, who made only two increases to their rates. Four out of the ten issuers have only made changes in one direction. All interest rate decisions made by the Co-operative Bank, Egg PLC and Capital One have been to increase the interest rate, while HBOS has made the decision to decease interest rates.

Figure 6.2 illustrates the monthly time series of the standard interest rates advertised by issuers. Barclaycard began the sample period charging an interest rate which was lower than RBS and HSBC, the same as HBOS and higher than the other six issuers included in the analysis. The interest rate charged on standard credit cards declined over the sample period by approximately five percent, this is partially due to a number of interest rate cuts at the beginning of the sample period. It appears that Barclaycard follows RBS.

MBNA at the beginning of the sample period charged an interest rate on its standard credit card product which was lower than HBOS, HSBC, Barclaycard and RBS, however by the end of the sample period only HBOS charged a higher interest rate. Over the course of the sample period, the interest rate charged on a standard credit card by MBNA has declined by approximately three percent. Towards the end of the sample period it appears that MBNA is following the pricing decisions of Nationwide. At the end of the sample period MBNA appears to making pricing decisions which are opposite to that of the Co-operative.

All interest rate changes made by HBOS have been to decrease the interest rate they charge on their standard credit card product, over the sample period the rate of interest has declined by around five percent. HSBC at the start of the sample period has one of the highest interest rates, however over the course of the sample period this has declined by approximately three percent. From Figure 6.2 it appears towards the end of the sample, HSBC follows the Co-operative.

The RBS charged the highest rate of interest on a standard credit card at the beginning of the sample period. By the end of the sample period the interest rate had fallen by eight percent, with approximately six percent of this decrease occurring around November 1999. RBS appears to be the last issuer to remove the annual fee, and as this is incorporated into the APR, it is possible that the large decrease in 1999 was due to the removal of the annual fee. In general the interest rate charged by RBS has remained almost constant with a small blip between February 2004 and April 2005. Figure 6.2 indicates that some of the changes made by RBS have been matched by other issuers in the market, which would again suggest that RBS acts a price leader.

Nationwide offered one of the most competitive interest rates on their standard credit card product at the beginning of the sample, only beaten by Egg and the Co-operative. Over the sample period the interest rate charged by Nationwide had increased by around two percent, however interest rates remained constant for large periods of time, which suggests that the building society only changed interest rates as a last resort. Figure 6.2 indicates that towards the end of the sample period Nationwide began to follow the Co-operative. Also it appears that Nationwide ignores the interest rate changes of Lloyds TSB.

The Co-operative Bank has increased the interest rate charged on standard credit cards by approximately four percent. Changes to interest rates have been undertaken in discrete steps. Towards the end of the sample period it appears that the Co-operative Bank may be interacting with Egg.

Egg has made a series of interest rate increases over the sample period, which has meant that the interest rate charged on a standard credit card has increase by around

five percent. Egg appears to ignore the interest rate decisions of the other issuers and the other issuers ignore the pricing decisions of Egg. The interest rate charged by Lloyds TSB is pretty constant over the sample period; this is consistent with the summary statistics presented in Table 6.5 which state that the standard deviation is 0.12.

Capital One made two clear interest rate increases during the sample period, which led to the rate of interest charged on a standard credit card increasing by around 20 percent. None of the other credit card issuers operating within the standard credit card market appear to follow the pricing decisions of Capital One.

In summary, the behaviour of credit card issuers in the standard credit card market has been mixed. In general the newer entrants into the UK credit card market have increased their interest rates over the sample period, while the interest rates of incumbent issuers have declined over the sample period. There appears to be some leader-follower behaviour, but it does not appear that one single issuer leads the prices up or down.

- **Gold Credit Cards**

Gold and platinum cards are both classed as premium products. Premium cards have typically been perceived as "status symbol" cards aimed at high earners. Some premium cards charge an annual fee and often have other financial services included (e.g. free foreign exchange and travel insurance). The gold credit card was the first status card being offered to valued customers on an invitation only basis. Individuals, who are offered such cards, are considered to have relatively low default risks due to the associated higher minimum age and income requirements.

The descriptive statistics related to the gold credit card data is presented in Table 6.7. From Table 6.7 it is observed that not all of the top ten issuers in the UK actively participate in the gold segment of the credit card market. HSBC, Egg and Capital One did not issue any gold credit cards within the sample period. MBNA exited the market in December 2000, with HBOS and Barclaycard following in February and June of 2004

respectively.[53] Only RBS, Nationwide, the Co-operative Bank and Lloyds TSB offered a gold credit card product throughout the whole sample period.

With respect to the average rate of interest charged by each issuer on the gold product, it is found that the interest rate charged by RBS, Nationwide and Lloyds TSB is less than the interest rate charged on their corresponding standard credit card product. Interestingly, the Co-operative Bank charges the same rate of interest on both its standard and gold credit card products. This would suggest that in terms of price there are no benefits to holding a gold credit card to a standard credit card. The standard deviations associated with gold cards are lower than their standard card counterparts, suggesting that interest rates on gold cards are less likely to change.

Table 6.7: Summary of Gold Credit Cards

Issuer	Period Active	Mean	Minimum Interest Rate Charged	Maximum Interest Rate Charged	Standard Deviation
Barclaycard	10/99 – 06/04	17.94	11.9	19.9	1.99
MBNA	10/99 – 12/00	17.3	16.9	17.9	0.51
HBOS	10/99 – 02/04	16.50	14.9	17.9	1.10
HSBC	-	-	-	-	-
RBS	10/99 – 05/07	17.29	16.9	17.9	0.49
Nationwide	10/99 – 05/07	14.70	13.9	16.5	0.79
Co-operative	10/99 – 05/07	15.45	13.8	18.9	1.02
Egg	-	-	-	-	-
Lloyds TSB	10/99 – 05/07	16.24	15.4	17.9	0.69
Capital One	-	-	-	-	-

Details of the month in which interest rate changes are made by issuers are provided in Table 6.8. Barclaycard made a series of interest rate decreases before it exited the market which suggests that it was not profitable for it to continue offering a gold credit card product. RBS, the Nationwide, the Co-operative Bank and Lloyds TSB made between three and five changes to the interest rates on gold credit card products. All changes made to the interest rate by the Co-operative Bank are to increase the interest rate charged.

[53] Barclaycard is back operating in the gold segment of the credit card market; however this appears to be more like a standard product.

Figure 6.3: Interest Rates Charged on Gold Credit Cards

Table 6.8: Date Changes on Gold Credit Cards

Year	Months Interest Rates Changed									
	Barclaycard		MBNA		HBOS		HSBC		RBS	
	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease
1999										
2000		February		April						
2001		July December				February July				
2002		May October				July November				January
2003	January				March	June				
2004		June							September	
2005										June
2006										
2007										

Year	Months Interest Rates Changed									
	Nationwide		Co-operative		Egg		Lloyds TSB		Capital One	
	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease
1999	December									
2000		June	January November				May			
2001							February	December		
2002		July								
2003										
2004			September							
2005	March									
2006	August		February				August			
2007			March							

In addition the Co-operative also changes interest rates on gold and standard credit card products simultaneously. The other issuers do not change rates on products simultaneously.

The monthly time-series of the interest rates charged on gold credit card products are illustrated in Figure 6.3. RBS appears to have an equilibrium interest rate for its gold credit card. At the beginning of the sample period RBS charges the highest rate of interest, this is probably for the same reasons stated above for the standard product, however by the end of the sample there has been a one percent decrease, with only Nationwide offering a lower interest rate. Nationwide started and finished the sample charging the same interest rate. Consistent with the date changes, the Co-operative Bank ended the sample period charging an interest rate which is approximately four percent higher. Over the sample period Lloyds TSB increased its interest rate by approximately two percent.

In summary, the gold credit card market appears to be disappearing, with credit card issuers preferring to issue platinum credit cards instead. In addition interest rates associated with gold credit cards are less likely to be changed to those associated with standard credit cards.

- **Platinum Credit Cards**

Platinum cards were first introduced by credit card issuers in the late 1990s and have overtaken gold credit cards as the premium product. Similar to gold products, platinum products to begin with were offered to an issuer's most valuable customers by invitation, however now individuals can choose to apply for a platinum credit card directly from the issuer providing that they meet the minimum age and income criteria. Similar to the standard credit card market, issuers typically offer a range of credit cards within the platinum market segment, for example, Barclaycard as of August 2009, has two different platinum cards available to consumers. One platinum credit card is chosen for each issuer, where there is more than one platinum product is available, the one which has similar attributes and terms to cards offered by other issuers in the market is chosen.

Table 6.9 provides some summary statistics relating to platinum credit cards. Only Barclaycard, MBNA and Capital One have issued platinum credit cards throughout the sample period November 1999 to May 2007. This possibly provides a reason for why MBNA and Barclaycard exited the gold credit card market early on in the sample period. Nationwide and Egg have not entered into the platinum credit card market. Nationwide offers standard and gold card products, while Egg chooses to concentrate only in the standard segment of the credit card market. Both HBOS and HSBC have entered and exited during the course of the sample period. The Co-operative Bank and Lloyds TSB entered into the market segment in August 2001 and December 2002 respectively. Over the course of the sample period platinum rates have ranged from 9.8 percent to 17.9 percent. On average the cheapest platinum card has been provided by Capital One and the most expensive by RBS. All issuers charge on average a lower rate of interest on their platinum credit cards compared to that on their standard and, if they offer them, gold credit cards. The differential between standard and platinum credit cards varies between issuers. On average platinum credit cards issued by the Co-operative Bank have interest rates which are approximately one percent lower than the rate that they charge on their gold and standard counterparts, while platinum credit cards issued by Barclaycard are on average nearly two percent cheaper than their standard credit cards.

Table 6.9: Summary of Platinum Credit Cards

Issuer	Period Active	Mean	Minimum Interest Rate Charged	Maximum Interest Rate Charged	Standard Deviation
Barclaycard	10/99 – 05/07	15.76	11.9	17.9	1.29
MBNA	10/99 – 05/07	15.97	14.9	16.9	0.47
HBOS	09/00 – 02/04	15.64	12.9	16.9	1.45
HSBC	12/99 – 04/04	15.9	15.9	15.9	$1.43e^{-14}$
RBS	10/99 – 05/07	16.3	14.9	16.9	0.80
Nationwide	-	-	-	-	-
Co-operative	08/01 – 05/07	14.51	13.9	15.9	0.73
Egg	-	-	-	-	-
Lloyds TSB	12/02 – 05/07	14.57	13.9	15.9	0.80
Capital One	10/99 – 05/07	11.53	9.8	15.9	1.95

The date changes for platinum credit cards are presented in Table 6.10. Platinum credit card rates appear to be stickier than that of their standard counterparts. Again

Barclaycard makes the highest number of changes to its interest rate, nine in total, three increases and six decreases. The Co-operative Bank and Lloyds TSB both make two increases in their interest rates. It appears that RBS and MBNA make decisions which are opposite to each other. It also appears that Capital One follows the pricing decisions of the Co-operative Bank with regards to decisions to increase the interest rate.

The monthly time series plot of platinum interest rates is presented in Figure 6.4. In common with the other market segments and the portfolio, Barclaycard is the most expensive platinum credit card on offer, however by the end of the sample it has become the cheapest available credit card in this segment, with a number of interest rate decreases which has led to a three percent decline in the overall interest rate charged on outstanding balances. It appears that Barclaycard follows RBS with respect to decisions regarding increasing price. RBS is the most expensive issuer in this segment of the market, charging a rate of 16.9 percent at in May 2007. Figure 6.4 suggests that Barclaycard, Lloyds TSB and the Co-operative Bank follows the rate changes made by RBS, particularly from late 2003 onwards. It appears that Barclaycard does not pay attention to the price changes made by MBNA.

At the end of the sample period MBNA, the Co-operative Bank, Lloyds TSB and Capital One all charge the same rate of interest. MBNA has the same interest rate at the start and end of the sample period. MBNA makes very little changes to the interest rate it charges on its platinum product. Both the Co-operative Bank and Lloyds TSB have increased their interest rates by two percent over the sample period. From Figure 6.4 there appears to be some interaction between the Co-operative Bank and Lloyds TSB. Capital One has generally priced lower than its competitors and has been extremely reluctant to change the interest rate of its platinum product. However, when Capital One makes changes to interest rates, they are made in large "steps". Thus, Capital One has gone from being the cheapest issuer in the market segment to offering a card with an interest rate comparable to that of MBNA, the Co-operative Bank and Lloyds TSB by increasing interest rates by approximately four percent.

Figure 6.4: Interest Rates Charged on Platinum Credit Cards

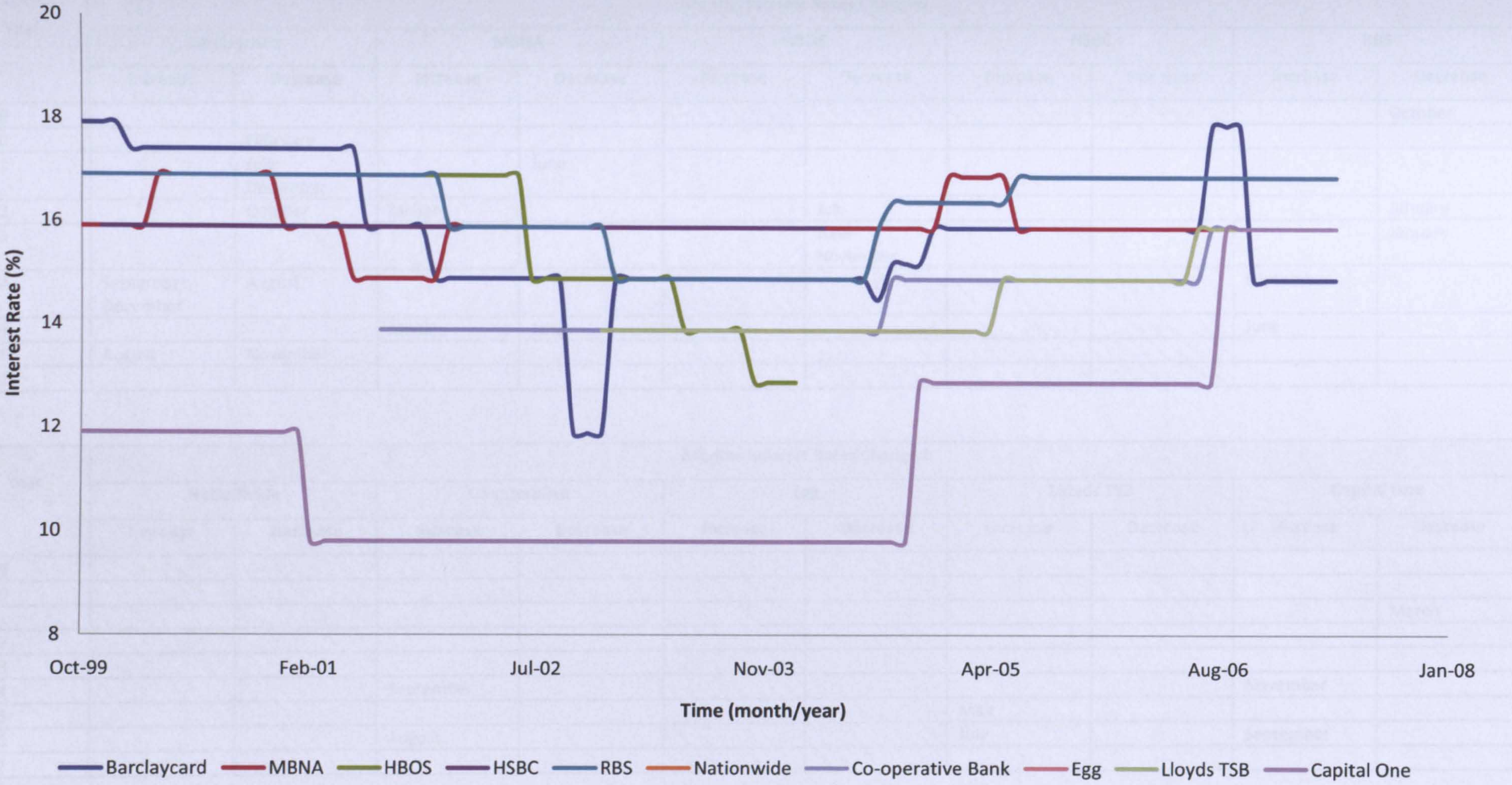


Table 6.10: Date Changes on Platinum Credit Cards

Year	Months Interest Rates Changed									
	Barclaycard		MBNA		HBOS		HSBC		RBS	
	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease
1999										October
2000		February								
2001		July December		June						
2002		October	January			July				January
2003						June November				January
2004	September December	August							September	
2005			January	June					June	
2006	August	November								
2007										

Year	Months Interest Rates Changed									
	Nationwide		Co-operative		Egg		Lloyds TSB		Capital One	
	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease	Increase	Decrease
1999										
2000										
2001										March
2002										
2003										
2004			September						November	
2005							May			
2006			August				July		September	
2007										

In summary, all platinum credit cards are pitched with an interest rate of approximately 15.9 percent. Platinum interest rates appear to be extremely sticky, and issuer's make fewer changes to these prices than they do to their standard credit card products. Also, it appears that each issuer has an equilibrium interest rate to which they return to after a temporary shock to the system.

6.4 Methodology

A number of approaches have been used to measure competition in the banking sector (Ashton, 1999). According to Ashton (1999), these approaches may be broadly divided into the Structure Conduct Performance (SCP) paradigm and New Economic Industrial Organisation (NEIO) approaches.[54] Traditionally, competition in markets has been tested in a SCP setting. The SCP paradigm considers how the observable characteristics of a market or an industry may affect the conduct and performance of participants within the market (Ashton, 1999). Market structure influences the performance of banks, more concentrated markets facilitate collusive agreements, increased market power and hence increases the profitability of banks. An alternative to the SCP paradigm, the relative-efficiency hypothesis argues that more efficient firms are able to earn relatively higher profits and are able to in increase their market share.

A number of different NEIO techniques have been employed to measure the form of competitiveness or the closely related concept of contestability (Ashton, 1999). These more modern methods focus on a structural description of banking markets as it is hard to identify the true structural model relating to profitability and competition. NEIO techniques include conjectural variation models and the Panzar-Rosse (1987) statistic. The Panzar-Rosse statistic is based on the empirical observation of the impact on firm-level revenues of variations in factor input prices (Goddard and Wilson, 2006). The Panzar-Rosse statistic may be used to test for long-run competitive equilibrium, monopoly and monopolistic competition. The Panzar-Rosse H-statistic is the sum of the elasticities of a firm's total revenue with respect to its factor input prices. If firms' pricing policies are consistent with the textbook model of monopoly then the H-statistic will be negative. H will be positive and less than unity if firms' operate in

[54] See Bresnahan, 1989

monopolistic competition and H will be unity under perfect competition. The Panzar-Rosse and Bresnahan-Lau methods require a substantial amount of information on quantities sold, costs, prices set, and likely candidates to identify quantity and price equations (de Haan and Sterken, 2006).

Competition in the UK credit card market is analysed by considering how issuers operating within the credit card market respond to each other when setting interest rates on purchases. This chapter aims to investigate whether there is a price leader within the market, and if a leader exists, what impact does this have for competition between issuers. The methodology in this chapter is twofold.

First, the monthly price setting behaviour of credit card issuer's is investigated using a vector error correction model (VECM) framework. Price leadership can be investigated within this framework using causality tests. Under perfect competition the VECM should not yield any evidence of any systematic causal price response between any of the issuers. This framework is discussed in greater detail in section five.

Second, a discrete choice framework, similar to that of de Haan and Sterken (2002) and Allen and McVanel (2009), is used to look for evidence of price leadership, or whether some banks systemically react to changes in input costs more than others. Berger (1995) argues that dominant banks are able to set prices less competitively, which in turn may manifest into higher, more rigid, and asymmetric prices. Potentially, it is in the best interests of other issuers to follow the dominant issuer's pricing strategy. Under perfect competition, the discrete choice model should not suggest that the pricing decision of one of the issuers has a unilateral influence on the pricing decisions of the other issuers. The discrete choice model is outlined in section six.

6.5 Modelling Price Leadership using a VECM

The monthly price setting behaviour of the top ten largest issuers in the UK is investigated using a Vector Error Correction (VECM) framework. Before estimating the VECM, all interest rates must be tested with respect to their statistical properties. Using Augmented Dickey-Fuller and Phillips-Perron tests, all interest rates are found to be stationary after first differencing, the results can be found in Appendix C. In

addition, all credit card rates are found to be co-integrated with the base rate. A summary of lag length and the co-integrating rank suggested by Johansen's Trace test can be found in Table 6.11; detailed results from undertaking Johansen's tests for co-integration can be found in the Appendix C. For the portfolio, the Johansen test indicates a co-integrating rank of six, indicating that a VECM can be estimated with six cointegrating vectors. For the standard credit card sector, the Johansen-test indicates that there are nine cointegrating relationships and thus a VECM with nine cointegrating relationships can be estimated. A VECM with four cointegrating relationships can be estimated for the gold credit card sector, as the Johansen-test indicates that there are four cointegrating relationships. No cointegrating relationships were found for the platinum credit card and therefore it is not possible to estimate a VECM for platinum credit cards.

Table 6.11: Lag Length and Rank

Model	Suggested Lag Length	Rank
Portfolio	4	6
Standard – *excludes capital one*	7	9
Gold	9	4
Platinum	*No-Cointegrating Relationship*	

Lag length based on the Akaike's Information Criterion (Akaike, 1973)

As a consequence of the preliminary investigation of the time series properties of the data, the eleven interest rates under consideration span a two-dimensional space and thus can be represented in the long-run by six linear combinations at the portfolio level. Ten standard card interest rates plus the base rate are considered and are represented by nine linear combinations in the long-run. Finally, the four gold credit card rates plus the base rate are considered and in the long-run are represented by four linear combinations. According to de Haan and Sterken (2006) these equations can both be interpreted as a mark-up relation on costs. Given the independent nature of credit card issuers it seems plausible to have alternative mark-up mechanisms. Table 6.12 presents the restricted co-integrated relationship for the portfolio, standard and gold credit cards. The coefficients restrictions have been based on statistical significance.

From the restricted cointegrating vectors relating to the issuer portfolios, it can be seen that all issuers enter into one or more of the long-run equations. With respect to the standard restricted cointegrating vectors, all issuers within the sample are only concerned with the base rate in the long run. In the gold credit card market only Nationwide and Lloyds TSB appear in the long-run equation.

Table 6.12: Restricted Co-integration Vectors

Market Segment	Equations
Portfolio	$R_M = 2.26R_F + 0.53R_G - 0.60R_H - 2.43R_I$ $R_A = 1.98R_F - 1.56R_H - 1.62R_I - 0.28R_G$ $R_B = -1.22R_F + 0.74R_H + 3.08R_I$ $R_C = -7.60R_F + 2.08R_H + 10.59R_I - 0.97R_J$ $R_D = -3.72R_F + 4.00R_H + 8.98R_I - 0.87R_J$ $R_E = 1.08R_F - 0.79R_H - 1.72R_I$
Standard	$R_A = 6.89R_M$ $R_B = 0.58R_M$ $R_C = 3.26R_M$ $R_D = 2.13R_M$ $R_F = -1.11R_M$ $R_G = -1.11R_M$ $R_H = -2.85R_M$
Gold	$R_F = -0.204R_I$
Platinum	Problem of Co-linearity – VECM could not be fitted

From Table 6.12 it can be seen that there are six alternative mark-up mechanisms in the credit card market and that all ten issuers enter into one or more of the long-run equations. Thus at the portfolio level, all interest rates commove in the long-run.

In the standard credit card market, Barclaycard (R_A), MBNA (R_B), HBOS (R_C), HSBC (R_D), Nationwide (R_F) and the Co-operative Bank (R_H) and the Base Rate (R_M) are all found to commove in the long-run. However the RBS and Egg do not enter into any of the long-run equations. This implies that the RBS's interest rate setting policy on standard credit

cards only has short-run consequences for the interest rate setting mechanisms of other issuers operating in the standard credit card market. The interest rate setting policy of Egg only has short-run consequences for the pricing mechanisms of other issuers. This is not surprising given that in section 6.3.3, given that Egg chose to increase its interest rate despite the actions of the Bank of England or its competitors.

For gold credit cards, both Nationwide (R_F) and Lloyds TSB (R_l) enter into the long-run equations thus suggesting that these rates commove in the long-run. RBS and the Co-operative Bank do not enter into the long-run equations. This implies that the interest rate setting policy of RBS and the Co-operative Bank only have short-run consequences for the other interest rate setting mechanisms. The base rate also does not appear in the long-run equation for gold cards. This suggests that the base rate does not influence the long-run interest rate setting mechanisms of issuers.

Due to the problem of co-linearity it was not possible to fit a VECM for platinum credit cards. This is not surprising given that interest rates in the platinum segment of the UK credit card market have been extremely sticky and that the majority of issuers charge the same interest rate.

6.5.1 Granger Causality

Granger (1969) was the first to investigate the direction of causality between different variables, and hence the term Granger causality. Granger causality really implies a correlation between the current value of one variable and the past values of another; it does not indicate that changes in a variable are caused by changes in another. A variable y_t is said to be Granger-caused by a variable x_t if the predictions of y_t can be improved by including the history of x_t in the information set used for the prediction of y_t. This is not necessary causation, it may well mean that another variable z, correlated with both x and y was omitted from the model, this is referred to as a spurious causal relation.

The vector of endogenous variables is divided into two sub-vectors, y_{1t} and y_{2t}, with dimensions R_1 and R_2 respectively, so that the total dimension is $R = R_1 + R_2$. Sub-vector y_{1t} is Granger-causal to y_{2t} if it contains useful information for predicting the latter.

First, a vector autoregressive model is estimated in levels. If the model contains $p + 1$ lags of the endogenous variables, then the test is based on a model with $p + 2$ lags of the endogenous variables.

$$\begin{bmatrix} y_{1t} \\ y_{2t} \end{bmatrix} = \sum_{i=1}^{p+2} \begin{bmatrix} a_{11i} & a_{12i} \\ a_{21i} & a_{22i} \end{bmatrix} \begin{bmatrix} y_{1,t-i} \\ y_{2,t-i} \end{bmatrix} + CD_t + \begin{bmatrix} u_{1t} \\ u_{2t} \end{bmatrix} \quad (6.1)$$

Where D_t is a set of exogenous variables with parameters C. The null hypothesis states that y_{1t} is not granger-causal to $y_{2t,}$ and is tested by checking the null hypothesis a_{21i} = 0, i = 1, 2, ..., p+1. To test for granger-causality, the VAR model is considered in levels without exogenous variables.

Table 6.13 to 6.15 present the results of the causality analysis. The tables clearly show that the hypothesis of no Granger causality at the five percent significance level cannot be rejected in all cases. Examining the portfolio, which is presented in Table 6.13, it can be seen that the base rate Granger-causes Barclaycard, as does the interest rates of HSBC, the Co-operative Bank, Lloyds TSB and Capital One. In the case of MBNA, the null hypothesis of no Granger causality can be rejected in the case of Barclaycard, HBOS, HSBC, the Co-operative Bank and Egg. The interest rate chosen by Egg Granger-causes the interest rate chosen by HBOS. MBNA granger-causes HSBC.

The null hypothesis that base rate does not Granger cause RBS is rejected. The null hypothesis of no granger causality with Barclaycard, Nationwide, the Co-operative Bank or Lloyds TSB and RBS can be rejected in all cases. Lloyds TSB is found to Granger-cause Nationwide as is Capital One. The interest rate charged by Capital One is Granger-caused by the Co-operative. The null hypothesis that the base rate does not Granger-cause Egg can be rejected. The null hypothesis can also be rejected for does Barclaycard, HBOS, HSBC, RBS and Nationwide. The null hypothesis that the base rate does not Granger-cause Lloyds TSB interest rate can be rejected. The interest rates of both HBOS and the Co-operative Bank granger-cause the interest rate of Lloyds TSB. With respect to Capital One all tests reject the null hypothesis of no granger-causality with the exception of the Co-operative Bank.

Table 6.13: Causality Tests - Card Portfolio

Excluding	Equation											
	Base Rate		Barclaycard		MBNA		HBOS		HSBC		RBS	
	Chi2	Prob > Chi2	Chi2	Prob > Chi2	Chi2	Prob > Chi2	Chi2	Prob > Chi2	Chi2	Prob > Chi2	Chi2	Prob > Chi2
Base Rate	-	-	10.44	0.03	4.44	0.35	8.67	0.07	0.44	0.98	42.78	0.00
Barclaycard	6.79	0.45	-	-	18.57	0.00	4.46	0.35	3.31	0.51	11.00	0.03
MBNA	3.79	0.44	.93	0.57	-	-	7.22	0.13	37.92	0.00	6.27	0.18
HBOS	10.29	0.04	3.82	0.43	11.20	0.02	-	-	2.79	0.59	7.77	0.10
HSBC	10.72	0.30	27.76	0.00	11.12	0.03	2.02	0.73	-	-	4.44	0.35
RBS	5.45	0.24	4.67	0.32	5.44	0.25	7.82	0.10	2.10	0.72	-	-
Nationwide	2.50	0.64	6.73	0.15	9.36	0.05	5.46	0.24	1.80	0.77	16.51	0.00
Co-operative	10.69	0.03	15.60	0.00	12.89	0.01	2.40	0.66	1.54	0.82	10.20	0.04
Egg	8.47	0.08	3.40	0.48	32.95	0.00	18.20	0.00	4.51	0.34	4.62	0.33
Lloyds TSB	7.20	0.13	10.86	0.03	4.76	0.31	2.44	0.66	3.17	0.53	11.31	0.02
Capital One	10.95	0.03	20.29	0.00	7.25	0.12	0.74	0.95	5.27	0.26	8.97	0.06
All	56.23	0.05	2006.11	0.00	145.72	0.00	68.85	0.00	78.42	0.00	114.02	0.00

	Equation									
	Nationwide		Co-operative		Egg		Lloyds TSB		Capital One	
	Chi2	Prob > Chi2	Chi2	Prob > Chi2	Chi2	Prob > Chi2	Chi2	Prob > Chi2	Chi2	Prob > Chi2
Base Rate	8.01	0.09	2.92	0.57	11.64	0.02	19.89	0.00	12.62	0.01
Barclaycard	7.15	0.13	8.08	0.09	14.23	0.01	9.66	0.05	12.79	0.01
MBNA	5.80	0.22	4.11	0.39	3.97	0.41	4.73	0.32	12.75	0.01
HBOS	5.54	0.24	4.83	0.31	10.85	0.03	24.68	0.00	53.25	0.00
HSBC	3.60	0.46	4.74	0.32	65.25	0.00	4.33	0.36	28.73	0.00
RBS	4.35	0.36	2.08	0.72	27.14	0.00	5.71	0.22	16.03	0.00
Nationwide	-	-	3.83	0.43	15.31	0.00	5.08	0.28	18.29	0.00
Co-operative	9.39	0.05	-	-	2.07	0.72	21.55	0.00	2.65	0.62
Egg	6.81	0.14	2.42	0.66	-	-	5.98	0.20	15.98	0.00
Lloyds TSB	14.70	0.01	2.41	0.66	5.41	0.25	-	-	17.25	0.00
Capital One	36.58	0.00	26.80	0.00	9.47	0.05	14.47	0.01	-	-
All	116	0.00	106.28	0.00	234.58	0.00	103.21	0.00	206.92	0.00

Table 6.14: Causality Test - Standard Cards

Excluded	Equation									
	Base Rate		Barclaycard		MBNA		HBOS		HSBC	
	Chi2	Prob > Chi2	Chi2	Prob > Chi2	Chi2	Prob > Chi2	Chi2	Prob > Chi2	Chi2	Prob > Chi2
Base Rate	-	-	10.15	0.12	13.81	0.03	15.25	0.02	20.17	0.00
Barclaycard	14.19	0.03	-	-	10.31	0.11	3.26	0.78	8.44	0.21
MBNA	14.23	0.03	24.06	0.00	-	-	23.28	0.00	7.33	0.29
HBOS	39.94	0.00	12.99	0.04	48.81	0.00	-	-	6.03	0.42
HSBC	18.85	0.00	12.67	0.05	4.40	0.62	21.81	0.00	-	-
RBS	27.60	0.00	24.73	0.00	15.22	0.02	16.90	0.01	3.71	0.72
Nationwide	18.50	0.01	17.70	0.01	9.76	0.14	8.27	0.22	11.28	0.08
Co-operative	8.76	0.19	17.61	0.01	10.94	0.09	7.53	0.28	15.75	0.02
Egg	32.62	0.00	48.81	0.00	14.47	0.03	1.94	0.93	5.59	0.47
Lloyds TSB	21.13	0.00	14.75	0.02	11.79	0.07	54.77	0.00	5.93	0.43
All	205.97	0.00	282.29	0.00	196.34	0.00	196.34	0.00	61.93	0.21

Excluded	Equation									
	RBS		Nationwide		Co-operative		Egg		Lloyds TSB	
	Chi2	Prob > Chi2	Chi2	Prob > Chi2	Chi2	Prob > Chi2	Chi2	Prob > Chi2	Chi2	Prob > Chi2
Base Rate	21.70	0.00	38.56	0.00	118.32	0.00	17.24	0.01	106.94	0.00
Barclaycard	12.43	0.05	13.45	0.04	26.40	0.00	11.13	0.08	32.76	0.00
MBNA	15.24	0.02	14.78	0.02	59.95	0.00	12.57	0.05	56.04	0.00
HBOS	21.07	0.00	20.05	0.00	26.34	0.00	22.12	0.00	21.53	0.00
HSBC	3.73	0.71	24.29	0.00	24.56	0.00	12.55	0.05	24.18	0.00
RBS	-	-	47.34	0.00	42.30	0.00	20.97	0.00	50.14	0.00
Nationwide	2.34	0.89	-	-	98.98	0.00	17.93	0.01	43.58	0.00
Co-operative	3.31	0.77	36.73	0.00	-	-	8.02	0.24	127.9	0.00
Egg	23.87	0.00	18.65	0.01	76.34	0.00	-	-	42.30	0.00
Lloyds TSB	3.64	0.73	18.94	0.00	48.50	0.00	20.23	0.00	-	-
All	142.35	0.00	410.42	0.00	736.5	0.00	147.62	0.00	870.85	0.00

The causality analysis for standard credit cards is presented in Table 6.14. As with the case of the portfolio, the null hypothesis of no Granger-causality cannot be rejected at the five percent level. The null hypothesis that the base rate does not Granger-cause individual issuers interest rates is rejected at the five percent level for all individual issuers except for Barclaycard in which case the null hypothesis is accepted. With respect to Barclaycard, with the exception of the base rate, the null hypothesis is rejected in every case. HBOS, RBS and Egg are followed to granger-cause MBNA. MBNA, HSBC and Lloyds TSB are found to granger-cause HBOS. The Co-operative is found to granger-cause HSBC. MBNA, HBIS and Egg are found to Granger-cause RBS. In the case of Nationwide, the Co-operative Bank and Lloyds TSB the null hypothesis of no Granger-causality is rejected in every instance. HBOS, RBS, Nationwide and Lloyds TSB are found to granger-cause Egg.

The causality analysis relating to the four issuers who compete in the gold segment of the credit card market are presented in Table 6.14. In all cases the base rate is found to granger-cause the individual issuers' rates. Nationwide is found to granger-cause RBS. On an individual basis RBS, the Co-operative Bank and Lloyds TSB are found to granger-cause Nationwide. The null hypothesis that RBS, Nationwide or Lloyds TSB Granger-causes the Co-operative Bank's rate of interest cannot be rejected. The null hypothesis of no Granger-causality is rejected in all cases with regards to Lloyds TSB.

The base rate is included in equation (6.1) to test the mechanism by which it affects retail interest rates. If the Bank of England attempts to tighten monetary policy by increasing the borrowing rate and this is not passed on to consumers in the form of higher credit card rates, then the transmission mechanism is said to be weak or non-existent.

Table 6.15: Causality Test Results - Gold Cards

Excluded	Equation									
	Base Rate		RBS		Nationwide		Co-operative		Lloyds TSB	
	Chi2	Prob > Chi2	Chi2	Prob > Chi2	Chi2	Prob > Chi2	Chi2	Prob > Chi2	Chi2	Prob > Chi2
Base Rate	-	-	38.04	0.00	40.57	0.00	88.78	0.00	22.11	0.01
RBS	10.39	0.32	-	-	40.73	0.00	78.90	0.00	35.79	0.00
Nationwide	33.00	0.00	20.03	0.02	-	-	67.53	0.00	23.53	0.01
Co-operative	22.20	0.01	7.90	0.55	551.43	0.00	-	-	94.97	0.00
Lloyds TSB	26.74	0.00	9.90	0.36	31.64	0.00	178.84	0.00	-	-
All	73.92	0.00	90.88	0.00	1165.3	0.00	369.48	0.00	145.05	0.00

6.5.2 Impulse Response Functions

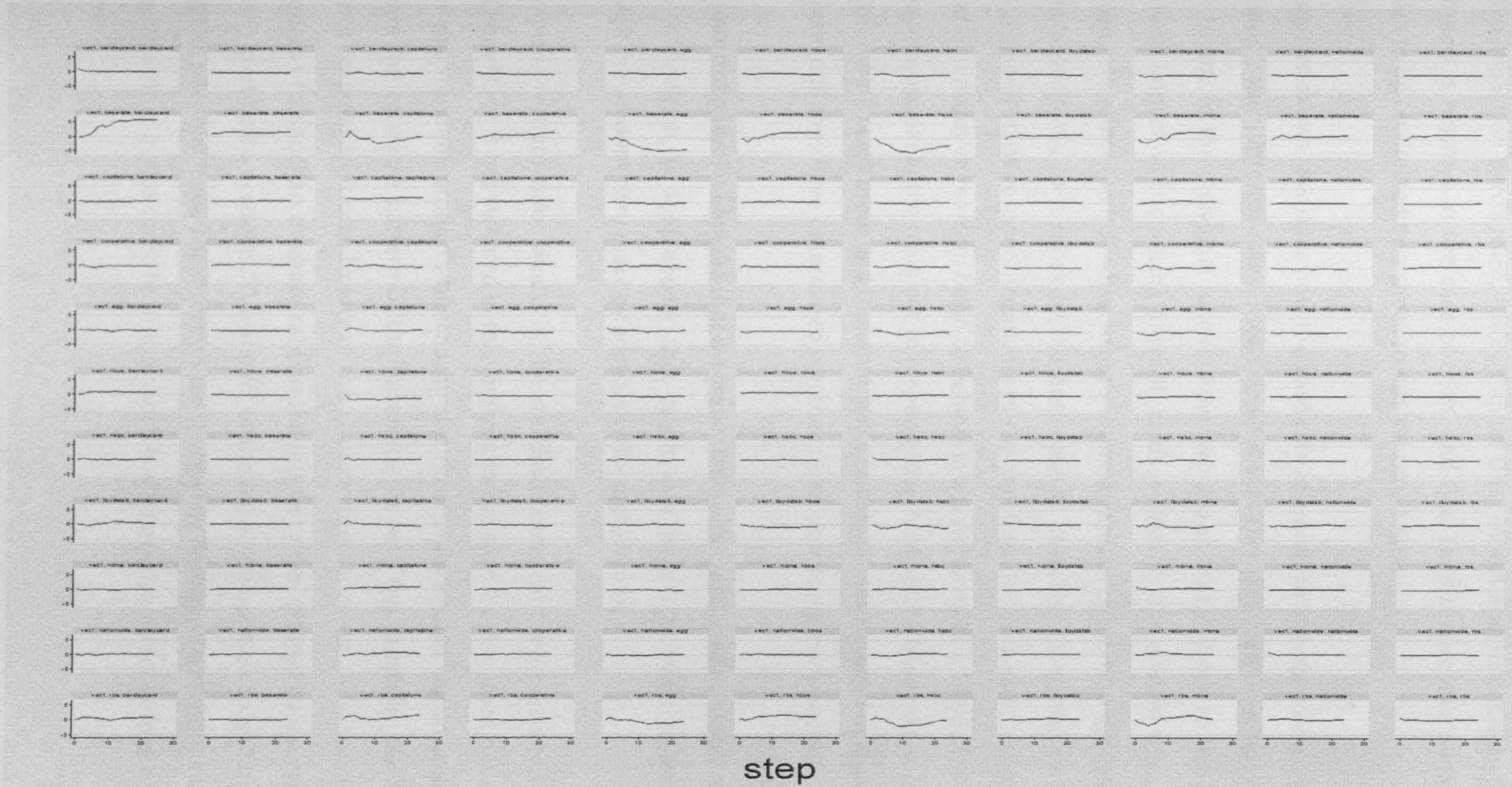
An impulse-response function (IRF) describes how the *K* endogenous variables react over time to a one-time shock to one of the *L* disturbances. Impulse-response functions reveal the implied dynamics of the VECM, that is, how does a shock to a particular interest rate affect the other interest rates? If there is a market leader present in the credit card market, then the pricing decisions of this particular issuer, is likely to have a substantial and persistent impact on the pricing behaviour of its competitors.

Figure 6.5 presents the impulse-responses for shocks to issuer's portfolio interest rate. Overall, it is evident that changes to the base rate do not have a significant impact on the individual issuer's interest rates. Monetary policy has very little impact on credit cards interest rates, instead credit card issuers respond to each other. This finding supports the findings of Chapter Five which finds credit cards are sluggish to respond to changes in the base rate. This implies that the market is competitive. This finding also suggests that the market environment is extremely important in the terms of price setting.

Figure 6.5 presents the impulse-responses for shocks to issuer's portfolio interest rate. The title provides the file name, the name of the impulse variable and the name of the response variable. So for example, the first column of Figure 6.5, illustrates how Barclaycard responds to a shock to itself, how Barclaycard responds to a shock to the base rate and so on. With respect to rows, the first row of Figure 6.5, illustrates how the other issuers in the sample respond to a shock to Barclaycard's interest rate. Rows one, three, four, five, six, seven, eight; indicate that shocks to the interest rates of Barclaycard, Capital One, the Co-operative Bank, Egg, HBOS, HSBC and MBNA only have a very small impact on the interest rates of other issuers.

The tenth row shows that shocks to Nationwide's interest rate leads to a very slight positive impact. Column ten presents the response pattern of Nationwide. It can be seen that Nationwide in the main does not respond to any other the other issuers.

Figure 6.5: Impulse Response Function - Portfolio



Graphs by irfname, impulse variable, and response variable

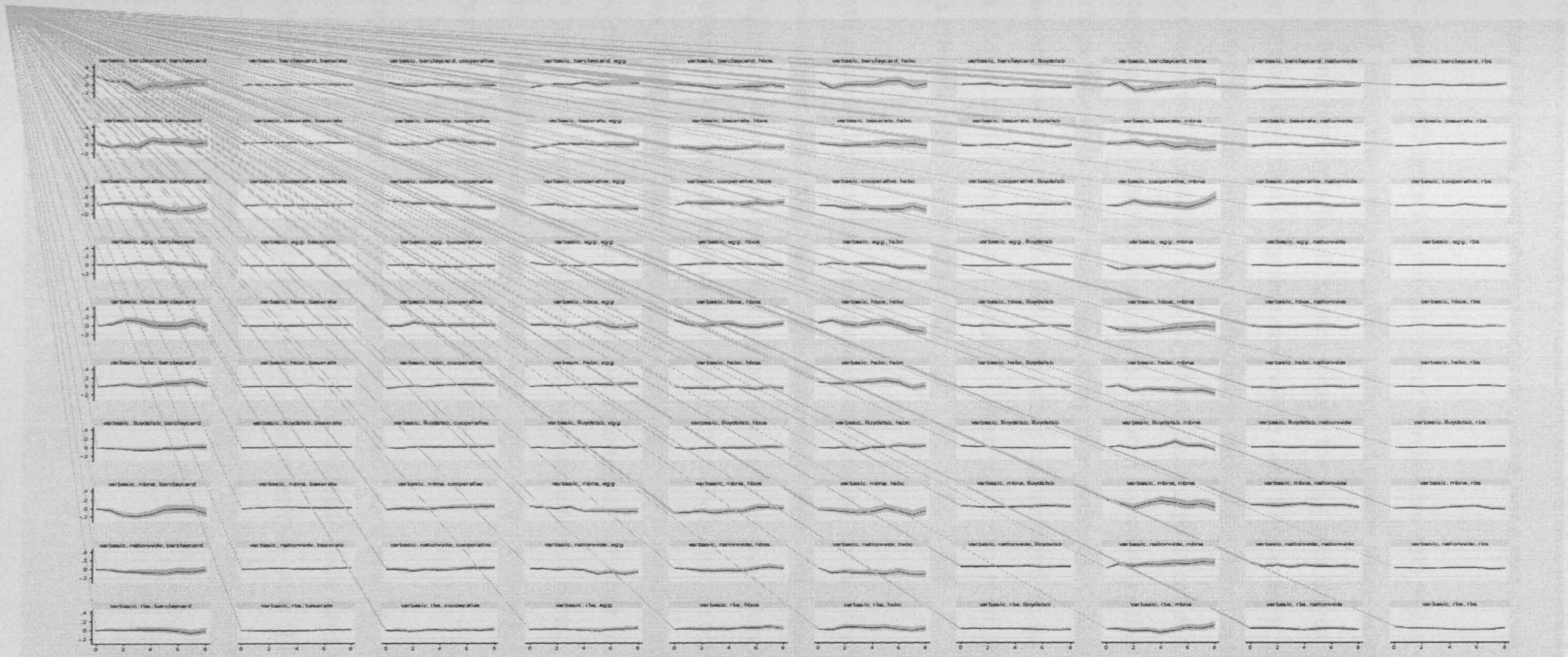
It can be seen from the eleventh row that a shock to RBS's interest rate impacts on all of the interest rates of the other issuers. A shock to RBS's interest rate has a long-run positive impact on Barclaycard, HBOS, Capital One, MBNA and Nationwide. However, the impact is negative in the case of HSBC and Egg. The Co-operative's interest rate appears to be unaffected by a shock to RBS's interest rate.

Column two shows illustrates how the base rate responds to a shock to each of the ten individual issuers interest rates. It can be seen that the base rate does not react to a shock to any of the individual issuers. Row two shows that a shock to the base rate does have impact on the pricing of credit cards. However, it is evident that shocks to the base rate affect the individual issuer's interest rates in different ways. Barclaycard responds positively to a shock to the base rate as does the Co-operative Bank and HBOS. Egg and HSBS respond negatively to the shock to the base rate, although HSBC does after a negative reaction begin to behave in a positive manor. Lloyds TSB, RBS and Nationwide appear in the main not to respond to a shock to the base rate. It is possible that smoothing takes place and thus that some issuers do not respond to shocks to the base rate until they have determined whether these shocks are permanent or not.

At the portfolio level it appears that monetary policy has some impact upon credit card rates. In addition, it does appear that credit card issuers to react to each other, although the amount they react by appears to be rather small.

The impulse-responses for shocks in the standard credit card are presented in Figure 6.6. Capital One is not included in this analysis as the card it offers does not appear to match the standard products offered by the other nine issuers. Again, column two presents the response pattern of the base rate. As with the portfolio, the base rate does not respond to shocks to any of the issuer's interest rates. Row two illustrates the impact of a shock to the base rate on the interest rates offered by issuers on their standard credit card products. The impact of the base rate appears to be far less than that at the portfolio level. The interest rate charged by Barclaycard responds to a shock to the base rate, in the short-term the shock has a negative affect before it becomes positive.

Figure 6.6: Impulse Response Functions - Standard Credit Cards



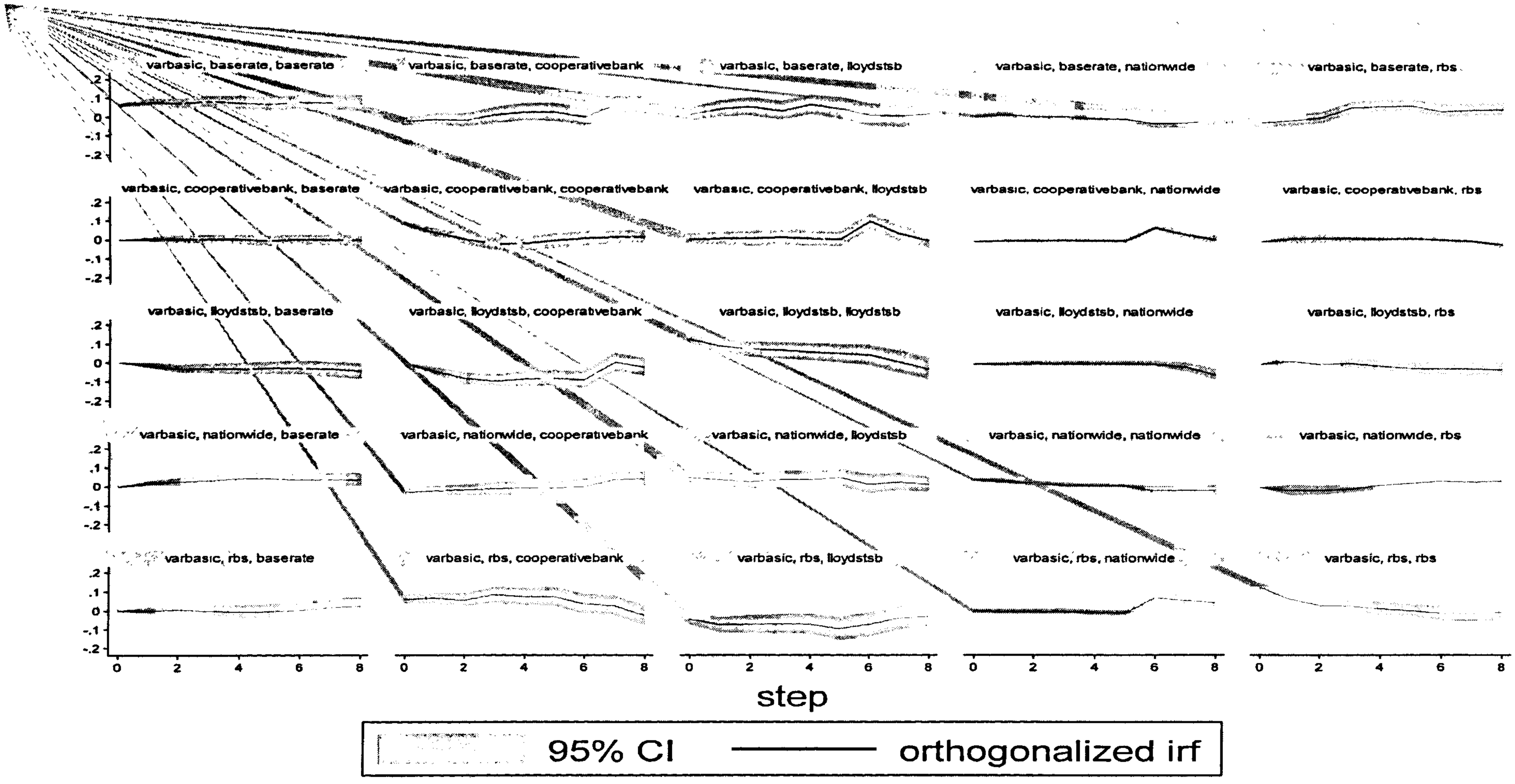
The shock to the base rate impacts negatively on MBNA's interest rate. However, in general standard credit card interest rates do not respond to a shock to the base rate.

The first column of Figure 6.6 indicates that Barclaycard sets prices competitively as it responds if to its rivals if they suffer a shock. Column three suggests that the co-operative Bank responds to all issuers except for Egg and Lloyds TSB. However the reaction is only very small. Egg appears not to take into account shocks to its rival's interest rates, this may be due to the finding in section 6.3.3 that in the main its pricing decisions were the opposite of its rivals; this is illustrated in column four. Column five illustrates how HBOS responds to its rivals. Column six indicates that in the main HBOS responds positively to the shocks that its rivals experience. Column seven illustrates the response pattern of Lloyds TSB, who does not respond to its rivals. The eighth column shows that if the other issuers suffer shocks to their interest rates, that MBNA's interest rates are affected.

The ninth column depicts how the Nationwide Building Society responds to shocks to the interest rates of its rival issuers. The Nationwide does not appear to respond to its rivals. Its interest rates are not affected by shocks to its rival's interest rates. Perhaps this is unsurprising due to Nationwide being the only building society to issue credit cards. As discussed in Chapter Four, the managers of a building society are likely to have different objectives to that of their plc counterparts. By not responding to shocks straight away, the Nationwide chooses to smooth interest rates. The tenth column illustrates the response patterns of RBS to shocks to its rival's interest rates. RBS appears to very unresponsive to its competitors.

In the case of the standard segment of the UK credit card market, monetary policy has very little impact on credit cards interest rates. Instead credit card issuers respond to each other. This suggests that the market is competitive. Also this finding indicates that the market environment is extremely important in the terms of price setting.

Figure 6.7: Impulse Response Functions - Gold Credit Cards



Graphs by irfname, impulse variable, and response variable

The impulse-response diagrams for gold credit cards are presented in Figure 6.7. A shock to any of the gold credit card interest rates does not affect the base rate. A shock to the base rate does have a slight impact on each of the issuers as shown in row one. From the second column it can be seen that a shock to the base rate has a positive effect on the Co-operative Bank. The third row indicates the effects of a shock to the interest rate charged by Lloyds TSB to the other issuers. A shock to Lloyds TSB impacts on the Co-operative Bank's interest rate but does not affect the interest rates of Nationwide or RBS. The fourth row shows that a shock to Nationwide's interest rate does not affect the other interest rates. RBS appears to be immune to shocks to other issuers' interest rates. The fifth row shows the effects of a shock to RBS's interest rate on the other issuers. In most cases a shock to RBS leads to more competitive pricing by the other issuers.

In summary, the analysis undertaken here indicates that the credit card market is competitive with issuers choosing to respond to interest rate shocks of their rivals. The base rate is included in the model to test the transmission mechanism. If the Bank of England attempts to tighten monetary policy by increasing the borrowing rate and this is not passed on to consumers in the form of higher credit card rates, than the transmission mechanism is weak or even non-existent. The transmission mechanism appears to be quiet weak, thus supporting the findings in Chapter Five.

6.6 A Discrete Choice Model of Price Leadership

The competitive price behaviour of UK credit card issuers is further investigated by the means of a discrete choice model. Using discrete choice analysis it is possible to consider how a credit card issuer's decision to raise, keep the same or lower their interest rates depends on the interest rates of their competitors. As can be seen from Figures 6.1 to 6.4 decisions to change interest rates are taken on a much more infrequent basis than decision to leave the interest rate unchanged. Like de Haan and Sterken (2006), the following model is used to describe the code pattern of each issuer, *i*, at period *t*.

$$c_{i,t} = \alpha r_{i,t-1} + \sum_{j \neq i} \beta_j r_{j,t-1} + \lambda r_{m,t-1} \qquad i,j = A,B,\dots,I,J \tag{6.2}$$

where $c_{i,t} \in (-1, 0, 1)$ is the dependent variable and is coded into a value of -1 if the interest rate is lowered, 0 if the interest rate is left unchanged and 1 if the interest rate is decreased. R_m is the issuers market rate, r is the interest rate charged on outstanding balances by credit card issuer, i. The market rate is intended to capture the cost of funding for issuers. If the cost of funding increases (decreases), banks will increase (decrease) the rate at which they will lend.

Equation (6.2) relates the interest rate decision of issuer, i, today, the interest rate it charged the previous month, the interest rate of their competitor's and to the cost of funds. De Haan and Sterken (1996) envisaged that $\alpha < 0$ and $\lambda > 0$; however there is a range of possible outcomes for β. If $\beta=0$, then the issuer does not pay any attention to the actions of another bank, if $\beta>0$ then the issuer follows its competitor and finally, if $\beta<0$ then interest rate changes are made contrary to the decision of its competitor.

The market interest rate is included so that the mechanism in which they affect administrated interest rates can be tested. If the central bank attempts to tighten monetary policy by increasing the borrowing rate and this is not passed on to consumers in the form of higher interest rates, then the transmission mechanism is said to be weak or non-existent. If interest rate changes follow market rates then the coefficient on λ should be positive.

Table 6.16 presents the results of estimating equation (6.2) using the average interest rate charged on the portfolio. Following the work of de Haan and Sterken (2002) and Allen and McVanel (2009), only the coefficients from estimating the ordered probit model are presented, however the marginal effects for this model are presented in Appendix C. The dependent variable, $c_{i,t}$ runs horizontally across the Table 6.16, therefore the first dependent variable is Barclaycard, the second MBNA and so on. The first vertical column of Table 6.16 presents the independent variables. Thus, looking at the second column in Table 6.16 it is possible to see how Barclaycard reacts to its competitors and the base rate. The coefficient on α is significant and negative. The suggestion made previously in section 6.3.3, that Barclaycard follows RBS is confirmed, as the coefficient of RBS_{t-1} is significant and positive.

Table 6.16: Ordered Probit Results - Card Portfolio

Issuer	Barclaycard	MBNA	HBOS	HSBC	RBS	Nationwide	Co-operative	Egg	Lloyds TSB	Capital One
$Barclaycard_{t-1}$	**-0.85**	0.18	0.02	-0.6	0.05	0.06	0.01	-0.66	0.01	0.07
$MBNA_{t-1}$	0.07	**-0.82**	-0.16	0.12	0.10	-0.08	**0.26**	-0.67	0.29	**0.32**
$HBOS_{t-1}$	0.24	0.39	**-0.34**	0.15	-0.01	**-0.60**	-0.17	-0.66	**0.66**	-0.16
$HSBC_{t-1}$	0.13	**-0.63**	-0.06	**-0.30**	-0.04	0.03	**0.18**	**1.14**	0.11	0.02
RBS_{t-1}	**2.05**	-1.00	**0.79**	-0.60	**-1.44**	0.97	**-1.69**	-1.13	-0.08	0.11
$Nationwide_{t-1}$	-0.15	**0.73**	0.09	**-0.71**	0.14	-0.34	0.19	**-4.03**	0.60	-0.10
$Co\text{-}operative_{t-1}$	**-0.84**	0.48	0.08	-0.19	0.19	0.71	-0.27	-1.09	**-1.37**	-0.12
Egg_{t-1}	-0.14	-0.08	-0.30	-0.13	-0.02	-0.07	-0.30	**-4.45**	0.14	0.37
$Lloyds\ TSB_{t-1}$	-0.33	-0.93	-0.24	**-1.41**	-0.23	0.46	-0.41	**-5.57**	**-2.88**	0.53
$Capital\ One_{t-1}$	-0.15	0.11	-0.05	0.06	-0.08	-0.11	**-0.18**	0.07	0.16	-0.13
$Base\ Rate_{t-1}$	**1.38**	-1.25	-0.37	**1.51**	0.95	-1.46	**1.22**	**4.67**	**2.78**	-0.03
Threshold 1	10.29	-36.94	-3.64	-43.10	-20.51	8.11	-33.23	-242.41	-25.27	12.28
Threshold 2	13.81	-31.10	-0.96	-38.80	-17.21	12.36	-31.09	-224.71	-20.08	15.34
Pseudo R-sq	0.28	0.38	0.12	0.24	0.16	0.17	0.20	0.43	0.31	0.10
Observations	92	92	92	92	92	92	92	92	92	92

Notes: The dependent variable is the monthly decision to lower, leave unchanged or raise the interest rate charged on outstanding balances (-1, 0, 1)
The base rate is used as a proxy for the cost of funds
All results in bold are significant at the 5 percent level

Barclaycard makes decisions which are in the opposite direction to the Co-operative Bank. As the coefficient on *Base Rate*$_{t-1}$ is significant and positive, it can be concluded that Barclaycard makes changes to its interest rates following a change in the market rate.

MBNA follows the pricing decisions of Nationwide but does the opposite to that of HSBC. The coefficient on *Base Rate*$_{t-1}$ is not significant and thus changes made by MBNA to its interest rates do not occur after a change in the base rate. HBOS like Barclaycard follows RBS. However, changes to its portfolio are not made following changes in the base rate. HSBC acts in the opposite direction to both Nationwide and Lloyds TSB. As the coefficient on *Base Rate*$_{t-1}$ is significant and positive, it can be concluded that HSBC makes changes to its interest rates following a change in the market rate. The coefficient of α is negative and significant for RBS. RBS does not interact with any of the other issuers in the market. The coefficient on *Base Rate*$_{t-1}$ is not significant; therefore changes by RBS do not follow base rate changes. Nationwide does the opposite to HBOS. The coefficients on α and λ are not significant. The Co-operative Bank follows MBNA and HBOS but moves in the opposite direction to RBS and Capital One. Changes to the portfolio are made following changes to the base rate. Egg follows the pricing decisions of HSBC, but does the opposite to Nationwide and Lloyds TSB. Lloyds TSB follows HSBC but does the opposite to the Co-operative Bank. Changes made to interest rates by Lloyds TSB follow changes in the base rate. Capital One follows MBNA, like MBNA the coefficient on *Base Rate*$_{t-1}$ is found not to be significant.

6.6.1 Price Leadership when Cost of Funding is Declining or Increasing

In many industries, empirical studies have shown that the identity of the leader tends to vary, see for example, Scherer and Ross (1990), Nicholls (1951) and Markham (1961). Scherer and Ross (1990) point out that one of the "distinguishing characteristics" of price leadership in industries that do not have a dominant firm is that the identity of the leading firm changes from time to time. As has been seen in Chapter Five, it is possible that firms behave differently when interest rates are rising and falling. This sub-section therefore aims to investigate whether issuer behave differently during periods when the base rate is increasing to periods when the base

rate is decreasing. In other words, does one issuer lead prices upwards and another downwards? Chapter Five of this thesis found that building societies tended to lag behind banks in passing rate changes on to their credit card rates.

Table 6.12 presents the results of estimating equation (6.2) using the average interest rate charged on the portfolio, over the period March 2000 to July 2003 when the base rate is declining. It should be noted that convergence was not achieved when the equation (6.1) is estimated for MBNA, RBS, Egg and Lloyds TSB. Nevertheless, the values are reported in Table 6.17 for completeness; however, discussion of these coefficients will not be included here.

Interestingly, the coefficient on *Base Rate*$_{t-1}$ is not significant for any of the top ten issuers. Barclaycard is found to follow the pricing decisions of MBNA and RBS. Both HBOS and HSBC make pricing decisions which are contradictory to Egg and Nationwide. Nationwide is found to follow Capital One. The Co-operative Bank makes pricing decisions which are the reverse of RBS.

The results of estimating equation (6.2) over the period August 2003 and May 2007 when the base rate is increasing is presented in Table 6.18. Increased costs of funds means that credit card spreads are eroded as are profit margins. Convergence was not achieved for the estimation of equation (6.2) for MBNA, Nationwide, Egg and Lloyds TSB. For completeness the estimated coefficients are included in Table 6.18, however as the standard errors are questionable no conclusions can be drawn from these estimates.

The coefficient on *Base Rate*$_{t-1}$ is not significant for any of the issuers except for Capital One. Barclaycard makes decisions relating to pricing which are opposite to that of Lloyds TSB. HBOS follows Barclaycard and the Co-operative Bank but does the opposite to HSBC. RBS does not interact with any of its rivals. The Co-operative Bank follows MBNA but does the opposite to RBS. Capital One follows MBNA, RBS, Egg and Lloyds TSB but does the opposite to Nationwide.

Table 6.17: Ordered Probit Results - Declining Cost of Funds

Issuer	Barclaycard	MBNA•	HBOS	HSBC	RBS•	Nationwide	Co-operative	Egg•	Lloyds TSB•	Capital One
$Barclaycard_{t-1}$	-0.70	1.27	-0.0003	-1.30	231.21	5.93	-0.34	-90.87	15.59	-0.64
$MBNA_{t-1}$	**1.68**	-51.31	0.10	-6.76	-712.13	2.48	-0.05	-73.94	29.35	0.63
$HBOS_{t-1}$	1.10	53.96	**-1.73**	-0.84	620.45	-0.37	0.75	52.51	-0.96	-0.65
$HSBC_{t-1}$	-1.61	23.01	-0.26	**-4.13**	19977.55	10.37	0.55	-30.91	29.34	0.80
RBS_{t-1}	**4.16**	-32.16	1.06	-13.06	-3362.50	-9.68	**-1.60**	67.69	-42.76	0.23
$Nationwide_{t-1}$	-0.38	-2.13	-0.04	**-8.72**	-447.27	-11.18	-0.20	-72.35	-8.86	-0.82
$Co\text{-}operative_{t-1}$	-1.88	-9.12	-0.52	1.18	711.61	-9.14	-0.12	103.06	-76.67	-0.62
Egg_{t-1}	0.98	11.58	**-1.24**	**-17.03**	-45.13	-1.38	-0.36	-119.31	4.60	-0.36
$Lloyds\ TSB_{t-1}$	-1.25	-34.25	-0.23	-7.74	528.51	-6.14	0.03	-163.95	-59.25	2.20
$Capital\ One_{t-1}$	-0.12	29.90	-0.44	1.12	537.27	**4.95**	-0.12	24.43	-13.21	**-1.90**
$Base\ Rate_{t-1}$	1.98	45.29	-0.001	2.50	721.72	12.42	0.86	35.55	113.94	-0.77
Threshold 1	44.12	-47.12	-47.21	-869.22	-1417.00	-147.30	-21.44	-4241.14	-1312.22	-17.63
Threshold 2	49.03	42.92	-44.21	-845.95	1307.30	-129.35	-19.33	-	-1228.81	-13.04
Pseudo R-sq	0.40	0.94	0.18	0.57	0.95	0.82	0.22	1.00	0.92	0.30
Observations	48	48	48	48	48	48	48	48	48	48

Notes: The dependent variable is the monthly decision to lower, leave unchanged or raise the interest rate charged on outstanding balances (-1, 0, 1)
The base rate is used as a proxy for the cost of funds
All results in bold are significant at the 5 percent level
• Convergence not achieved – standard errors questionable

Table 6.18: Ordered Probit Results - Cost of Funds Rising

Issuer	Barclaycard	MBNA•	HBOS	HSBC	RBS	Nationwide•	Co-operative	Egg•	Lloyds TSB•	Capital One
$Barclaycard_{t-1}$	**-1.26**	-35.86	**0.79**	-0.70	-0.67	-46.24	0.02	22.38	1.33	0.20
$MBNA_{t-1}$	0.49	-44.27	-0.12	0.20	0.64	-5.37	**0.33**	-34.95	2.26	**2.45**
$HBOS_{t-1}$	0.48	48.52	**-1.71**	1.06	0.79	28.20	-0.27	-273.13	18.90	0.15
$HSBC_{t-1}$	0.52	-17.90	**-0.53**	-0.20	-0.29	39.12	0.19	-32.76	1.38	-0.22
RBS_{t-1}	1.23	-69.25	0.03	1.40	-12.80	663.88	**-3.61**	-154.65	11.93	**12.46**
$Nationwide_{t-1}$	1.89	-12.97	0.72	**-1.46**	-0.33	-580.61	0.70	-463.31	-2.52	**-8.32**
$Co\text{-}operative_{t-1}$	-0.12	-61.23	**2.08**	-0.22	-0.03	-184.34	-0.32	420.00	0.21	-0.66
Egg_{t-1}	0.53	-3.01	-0.53	0.23	0.16	4.74	-0.38	-202.86	3.12	**5.08**
$Lloyds\ TSB_{t-1}$	**-6.84**	119.23	-4.16	0.24	-12.25	978.80	-1.83	-36.13	-73.14	**31.50**
$Capital\ One_{t-1}$	-0.35	-4.55	0.05	-0.01	0.14	14.85	-0.14	-3.95	7.31	**-2.24**
$Base\ Rate_{t-1}$	-2.42	351.54	-6.23	3.46	6.63	691.13	1.45	-122.16	-16.93	**14.77**
Threshold 1	-81.23	177.88	-83.58	21.63	-374.59	18399.29	-80.19	-13186.14	-608.42	697.07
Threshold 2	-76.04	414.84	-79.84	27.09	-366.52	19064.82	-77.34	-12289.33	-542.16	709.00
Pseudo R-sq	0.52	0.93	0.36	0.35	0.53	0.73	0.26	1.00	0.69	0.49
Observations	44	44	44	44	44	44	44	44	44	44

Notes: The dependent variable is the monthly decision to lower, leave unchanged or raise the interest rate charged on outstanding balances (-1, 0, 1)
The base rate is used as a proxy for the cost of funds
All results in bold are significant at the 5 percent level
• Convergence not achieved, thus standard errors are questionable

Table 6.19: Ordered Probit Estimation Results - Size of Change

Issuer	Barclaycard	MBNA	HBOS	HSBC	RBS	Nationwide	Co-operative	Egg	Lloyds TSB	Capital One
$Barclaycard_{t-1}$	**-0.64**	0.09	-0.01	-0.08	0.05	0.35	-0.02	-0.66	-0.10	0.12
$MBNA_{t-1}$	0.003	**-0.83**	-0.22	0.21	0.10	0.10	**0.25**	-0.67	0.29	**0.32**
$HBOS_{t-1}$	0.23	0.37	**-0.40**	0.09	-0.03	-0.44	-0.05	-0.66	**0.71**	-0.21
$HSBC_{t-1}$	0.12	**-0.57**	-0.08	**-0.29**	-0.01	0.12	**0.21**	**1.14**	0.14	-0.01
RBS_{t-1}	**1.24**	-0.93	0.67	-0.49	**-1.58**	0.79	**-1.59**	-1.13	-0.11	-0.02
$Nationwide_{t-1}$	-0.16	**0.66**	0.09	-0.68	**0.05**	**-1.14**	**0.40**	**-4.03**	0.48	-0.04
$Co\text{-}operative_{t-1}$	**-0.74**	0.42	0.23	-0.09	0.12	-0.14	-0.46	-1.09	**-1.43**	0.03
Egg_{t-1}	-0.27	-0.18	**-0.40**	-0.07	-0.04	-0.26	-0.29	**-4.45**	0.12	**0.38**
$Lloyds\ TSB_{t-1}$	-0.56	-0.73	-0.31	-1.31	**-0.23**	-0.39	-0.45	**-5.57**	**-2.80**	0.51
$Capital\ One_{t-1}$	-0.11	0.12	-0.06	0.01	-0.08	0.21	-0.09	0.07	0.16	-0.14
$Base\ Rate_{t-1}$	**1.26**	-0.98	-0.50	1.33	**1.16**	-0.39	**1.37**	**4.56**	**3.04**	-0.23
Threshold 1	-6.26	-35.72	-10.18	-39.10	-25.38	-14.02	-29.80	-242.41	-27.46	10.54
Threshold 2	-5.67	-35.02	-9.06	-38.07	024.4	-13.61	-27.77	-224.71	-26.76	11.16
Threshold 3	-2.63	-29.60	-6.41	-33.76	-21.11	-9.13	-25.44	-	-21.66	14.22
Threshold 4	-2.12	-29.00	-5.37	-33.39	-20.16	-8.99	-23.63	-	-20.44	14.86
Pseudo R-sq	0.17	0.31	0.12	0.21	0.16	0.25	0.23	0.43	0.30	0.09
Observations	92	92	92	92	92	92	92	92	92	92

Notes: The dependent variable is the monthly decision to lower, leave unchanged or raise the interest rate charged on outstanding balances (-2, -1, 0, 1, 2)
The base rate is used as a proxy for the cost of funds
All results in bold are significant at the 5 percent level
• Convergence not achieved, thus standard errors are questionable

6.6.2 Does the Size of the Interest Rate Change Effect Issuer Behaviour?

Having examined whether issuer behaviour changes depending upon whether the cost of funds is increasing or decreasing, the dependent variable in equation (6.2) is recoded so that issuer behaviour can be examined in the context of how much an issuer decides to alter their interest rates by. The dependent variable $c_{i,t}$ is recoded so that into a value of -2 if the interest rate is lowered by more than one percent, -1 if the interest rate is lower by less than one percent , 0 if the interest rate remains the same, 1 if the interest rate is increased by no more than one percent and 2 if the interest rate is increased by more than one percent.

The empirical results are presented in Table 6.19. The coefficient on *Base Rate*$_{t-1}$ is found to be positive and significant for Barclaycard, RBS, the Co-operative Bank, Egg and Lloyds TSB; which suggests that all pricing decisions made by these issuers follows a change in the base rate. The coefficient on α is negative and significant for issuers except the Co-operative Bank and Capital One. Barclaycard follows RBS and does the opposite to the Co-operative Bank. MBNA follows Nationwide but does the opposite to HSBC. HBOS does the opposite to Egg. RBS follows the Nationwide and does the opposite to Lloyds TSB. The Co-operative Bank follows MBNA, HSBC and Nationwide but does the opposite to RBS. Egg follows HSBC but does the opposite to Nationwide and Lloyds TSB. Lloyds TSB follows HBOS but does the opposite to the Co-operative Bank. Capital One follows MBNA and Egg. HSBC and Nationwide does not react to any of the issuers.

6.6.3 Price Leadership in Different Sectors of the Credit Card Market

In this sub-section monthly interest rates advertised by the ten largest credit card issuers are used to investigate price leadership behaviour and issuer interaction within different sectors of the UK credit card market. From the data collected it has been possible to separate the credit card market into three sectors: standard/classic, gold and platinum.

6.6.3.1 Standard/Classic Credit Card Segment

All issuers except for Capital One have credit cards for offer in this segment of the market. Capital One has been excluded from this market segment as the card which it

classifies as a standard credit card fits the definition of an initial credit card. An initial credit card is one which has an extremely high typical APR and is designed for individuals who have no existing credit history, low annual income or have a poor credit history which they wish to improve. Capital One's standard credit card is more likely to compete with Barclaycard's initial credit card which has a typical APR of 27.9%.[55]

This analysis therefore considers only the top nine issuers in the UK. The results of estimating equation (6.2) for standard credit cards are reported in Table 6.20. The coefficient on *Base Rate*$_{t-1}$ is significant only for Lloyds TSB, while the coefficient α is negative and significant for Barclaycard, Nationwide and Egg. Barclaycard follows HBOS but does the opposite to HSBC and Nationwide. MBNA follows the pricing decisions of Nationwide and Egg; however, it does the reverse to HBOS. Egg tracks the Co-operative Bank. HBOS, HSBC, RBS, Nationwide, the Co-operative Bank and Lloyds TSB do not react to the price changes of any of their rivals in the standard segment of the credit card market.

6.6.3.2 Gold Credit Card Segment

Table 6.21 reports the results for gold credit cards. As discussed previously, only four of the top ten issuers compete in the gold credit card market; RBS, Nationwide, the Co-operative Bank and Lloyds TSB. Both Lloyds TSB and RBS do not react to their market rivals. Nationwide follows the Co-operative Bank. The Co-operative Bank does the opposite to RBS; however unlike its rivals it does make changes to its interest rates following a change in the Base Rate. In addition the coefficient on α is also negative and significant for the Co-operative.

[55]For more information on initial credit cards and more particularly the Barclaycard initial credit card see http://www.barclaycard.co.uk/personal-home/cards/initial/index.html (accessed 7th September 2009).

Table 6.20: Ordered Probit Model Results - Standard Credit Cards

Issuer	Barclaycard	MBNA	HBOS•	HSBC	RBS	Nationwide	Co-operative•	Egg	Lloyds TSB
$Barclaycard_{t-1}$	**-0.40**	-0.38	-1.24	0.30	-0.08	0.14	0.98	0.14	0.27
$MBNA_{t-1}$	0.26	-2.88	4.41	-0.42	-0.56	-0.10	17.45	0.32	-1.75
$HBOS_{t-1}$	**0.84**	**-1.49**	-1.05	0.54	-0.31	0.13	-28.26	-1.17	1.25
$HSBC_{t-1}$	**-1.26**	-1.47	3.12	-1.20	-0.16	-0.61	-36.01	0.07	1.15
RBS_{t-1}	0.91	1/89	12.77	-0.53	-0.53	0.48	-6.02	-0.80	0.78
$Nationwide_{t-1}$	**-1.26**	**2.97**	4.08	0.11	0.004	**-1.18**	57.12	-0.19	-4.71
$Co\text{-}operative_{t-1}$	1.46	-2.11	1.54	1.52	-0.87	0.60	-209.19	**2.78**	5.25
Egg_{t-1}	0.27	-2.81	2.96	-1.23	-0.16	0.42	38.47	**-2.85**	0.46
$Lloyds\ TSB_{t-1}$	-1.21	**6.26**	8.22	-0.75	-1.11	-0.94	146.58	2.56	-12.80
$Base\ Rate_{t-1}$	1.06	-4.39	-3.46	-1.41	-1.27	0.76	153.12	-1.86	**4.94**
Threshold 1	-6.50	-17.83	556.51	-37.71	-60.14	-8.11	757.81	15.51	-168.70
Threshold 2	1.66	-3.19	-	-30.64	-54.74	-3.23	-	-	-153.96
Pseudo R-sq	0.43	0.54	0.54	0.40	0.35	0.26	0.80	0.30	0.66
Observations	91	91	91	91	91	91	91	91	91

Notes: The dependent variable is the monthly decision to lower, leave unchanged or raise the interest rate charged on outstanding balances (-1, 0, 1)
The base rate is used as a proxy for the cost of funds
All results in bold are significant at the 5 percent level
• Convergence not achieved, thus standard errors are questionable

Table 6.21: Ordered Probit Results - Gold Credit Cards

Issuer	RBS	Nationwide	Co-operative	Lloyds TSB
RBS_{t-1}	-59.13	0.51	**-7.32**	-17.10
$Nationwide_{t-1}$	-23.20	-0.43	0.41	-15.18
$Co\text{-}operative_{t-1}$	-9.36	**0.60**	**-1.86**	20.64
$Lloyds\ TSB_{t-1}$	16.00	-0.70	0.11	-33.40
$Base\ Rate_{t-1}$	43.06	0.28	**3.82**	47.37
Threshold 1	-1094.42	-0.72	-126.51	-578.84
Threshold 2	-10008.56	3.64	-	-483.37
Pseudo R-sq	0.87	0.13	0.34	0.68
Observations	92	92	92	92

Notes: The dependent variable is the monthly decision to lower, leave unchanged or raise the interest rate charged on outstanding balances (-1, 0, 1)
The base rate is used as a proxy for the cost of funds
All results in bold are significant at the 5 percent level
- Convergence not achieved, thus standard errors are questionable

6.6.3.3 Platinum Credit Card Segment

The results from estimating equation (6.2) for platinum credit cards with the base rate are presented in Table 6.22. Due to entry and exit into this market segment, issuer interaction is analysed over the period December 2002 to May 2007. The sample for the platinum card issuers is shorter than that of the standard and gold issuers as the last entrant into the market did not enter until November 2007. The issuers which operate during this period are Barclaycard, MBNA, RBS, the Co-operative Bank, Lloyds TSB and Capital One. Barclaycard again follows the pricing decisions of RBS.

6.6.4 Discussion and Implications

Table 6.23 provides a summary of the findings from the ordered probit analysis. The variable *Base Rate*$_{t-1}$ was included to test the transmission mechanism. From the analysis undertaken above it can be concluded the transmission mechanism is non-existent at the card level. In other words, monetary policy has little impact on credit card interest rates. If the Bank of England attempts to tighten monetary policy by increasing the borrowing rate, this is not going to be passed on to credit cardholders in the form of higher interest rates on their outstanding balances.

Table 6.22: Ordered Probit Results Platinum Credit Cards

Issuer	Barclaycard	MBNA	RBS	Co-operative	Lloyds TSB	Capital One
$Barclaycard_{t-1}$	-0.22	22.90	10.03	6.26	-0.50	0.12
$MBNA_{t-1}$	-0.24	-85.84	14.48	9.50	6.72	1.97
RBS_{t-1}	**1.45**	-1.12	6.25	19.13	13.61	-2.51
$Co\text{-}operative_{t-1}$	-1.41	-75.44	-29.57	-31.16	13.37	10.13
$Lloyds\ TSB_{t-1}$	-0.07	-28.00	10.45	17.30	-8.23	3.21
$Capital\ One_{t-1}$	-0.05	22.76	-4.49	-9.99	0.28	-3.42
$Base\ Rate_{t-1}$	0.30	0.46	37.05	1.04	-30.14	-0.69
Threshold 1	-6.79	-2331.65	287.33	251.82	274.92	150.83
Threshold 2	-2.68	-2244.69	334.71	-	-	-
Pseudo R-sq	0.17	1.00	0.90	0.89	0.36	0.84
Observations	54	54	54	54	54	54

Notes: All results in **bold** are significant at the 5 percent level
Dependent variable is the monthly decision to lower, leave unchanged or raise the interest rate on outstanding balances (-1, 0, 1)

Table 6.23: Summary of Ordered Probit Analysis

	Portfolio				Decreasing				Increasing				Size Change			
	-α	+λ	Follows	Opposite	-α	+λ	Follows	Opposite	-α	+λ	Follows	Opposite	-α	+λ	Follows	Opposite
Barclaycard	*	*	RBS	Co-op			RBS MBNA		*			Lloyds TSB	*	*	RBS	Co-op
MBNA	*		Nationwide	HSBC	*Convergence not Achieved*				*Convergence not Achieved*				*		Nationwide	HSBC
HBOS	*		RBS		*			Nationwide Egg	*		Barclaycard Co-op	HSBC	*			Egg
HSBC	*	*		Nationwide Lloyds TSB	*			Nationwide Egg				Nationwide	*			
RBS	*				*Convergence not Achieved*								*	*	Nationwide	Lloyd TSB
Nationwide				HBOS			Cap One		*Convergence not Achieved*				*			
Co-op		*	MBNA HSBC	RBS Capital One				RBS			MBNA	RBS		*	MBNA HSBC Nationwide	RBS
Egg	*	*	HSBC	Nationwide Lloyds TSB	*Convergence not Achieved*				*Convergence not Achieved*				*	*	HSBC	Nationwide Lloyds TSB
Lloyds TSB	*	*	HBOS	Co-op	*Convergence not Achieved*				*Convergence not Achieved*				*	*	HBOS	Co-op
Capital One			MBNA		*					*	MBNA RBS Egg Lloyds TSB	Nationwide			MBNA Egg	

Table 6.23: Summary of Ordered Probit Analysis Continued

	Standard				Gold				Platinum							
	-α	+λ	Follows	Opposite	-α	+λ	Follows	Opposite	-α	+λ	Follows	Opposite	-α	+λ	Follows	Opposite
Barclaycard	*		HBSO	HSBC Nationwide								RBS				
MBNA			Nationwide Lloyds TSB	HBOS												
HBOS																
HSBC																
RBS																
Nationwide	*						Co-op									
Co-op					*	*		RBS								
Egg	*		Co-op													
Lloyds TSB		*														
Capital One																

At the portfolio level the coefficient on *Base Rate*$_{t-1}$ is positive and significant for Barclaycard, HSBC, the Co-operative Bank, Egg and Lloyds TSB, which suggests these issuers follow the Bank of England's base rate. Unsurprisingly, US credit card providers MBNA and Capital One does not follow the base rate. HBOS, RBS and Nationwide do not follow the base rate. With respect to Nationwide, who is the only building society to issue credit cards, it is possible that this issuer is engaging in smoothing. If an issuer believes that a change to the base rate is only temporary, they are likely to smooth over changes, thus increasing stability. As credit card issuers responds to each other rather than to the base rate, this suggests that the market environment is more important in the terms of price setting.

No single issuer acts as a price leader. It appears that issuers look for key rivals instead of tracking the market as a whole. The key rival to any issuer varies depending on factors such as the market segment, whether the base rate is increasing or decreasing and the size of interest rate changes.

At the portfolio level, issuer behaviour is examined over the whole sample period, which is then split into two sub-periods, one of increasing cost of funds and one of declining cost of funds as well as examines the impact of the size of an interest rate movement. At the portfolio level it is seen that all issuers apart from RBS interact in some way with at least one of their rivals.

No evidence was found to sort the idea that one issuer leads the price level upwards, while another issuer leads the price level downwards. However, issuers do interact differently when the cost of funds is rising to when the cost of funds is declining.

At the product level, monetary policy has a minimal impact on credit card interest rates. In addition credit card issuers appear to set their rates independently of each other. Barclaycard sees RBS as its main rival in all areas of the credit card market choosing to follow the majority of interest rate decisions of RBS. However, Barclaycard appears not see RBS a rival in the standard credit card market.

6.7 Conclusion

This chapter has analysed the pricing behaviour of credit card issuers in the UK, by examining how they react to changes in the base rates and changes to each other's interest rates. Using monthly observations of the interest rates charged on outstanding balances, this chapter has examined the pricing behaviour of the top ten issuers in the UK credit card market. These ten largest credit card issuers in the UK, who have a combined market share of approximately 90 percent. Firstly, the monthly price setting behaviour of issuers was investigated using a Vector Error Correction Framework. Using causality tests it is possible to gain insights into price leadership. Under perfect competition, the VECM results should not yield evidence of any systematic causal price responses between any of the banks. The adoption of vector autoregressive methods offers a number of potential advantages to the investigation of price leadership, not least of which is that it provides the opportunity to investigate a number of prices as a system rather than in pairs.

By applying an ordered probit model to a sample of card issuers in the UK, it has been possible to gain some insight into how card issuers interact with each other both at the issuer level and at the product level. Interestingly, it has been found that at the product level, the majority of issuers set interest rates independently of each other, however, at the issuer level there is much more interaction between firms. In addition, at the product level interest rate changes do not follow market rates, but the majority of changes at the issuer level do.

This study opens up a number of avenues for future research and these will be discussed and explored in the final chapter of this thesis. Therefore, the subsequent and final chapter provides an overview of the research which has been undertaken, not only highlighting the key findings of this work but also the limitations as well as shaping the direction of future investigations into pricing a competition in the UK credit card market.

CHAPTER 7

CONCLUSION

7.1 Introduction

The main aim of this thesis was to present a study into the factors which influence price and competition in the UK credit card market. Thus, this chapter will bring together the strands which have been developed throughout the previous chapters of this thesis, illustrating the extent to which the major objectives of this study have been achieved and to explore the possible implications of the empirical work.

Credit cards have long been an especially dynamic and profitable segment of the banking industry. While the pricing of credit cards is established independently by a number of lending institutions, several studies have found evidence of supra-competitive pricing and profitability (Ausubel, 1991; Calem and Mester, 1995; Shaffer, 1999). However, other studies have reported evidence that the higher pricing is commensurate with the greater risk associated with credit card lending. Notwithstanding the historically large net interest margins, the volume of credit card lending has grown rapidly over the years and still retains the potential for substantial future growth. The industry's large size, rapid growth, high profitability, a high risk constitute the primary motivations to study credit card lending (Kulasekaren and Shaffer, 2002).

The rapid growth in the UK credit card market over the last decade has meant that it has attracted considerable attention amongst researchers and policymakers. The UK credit card market has proved to be interesting to investigate for a number of reasons. Firstly, interest rates have become much more disperse with interest rates ranging from 6.8% (Barclaycard Simplicity) to 51.8% (NatWest Black). Secondly, credit card products have become more complex. Credit card pricing involves a large number of elements including annual fees, cash advances and over-the-limit fees to name a few. Thirdly, the UK is one of the most credit-card-intensive countries in the world, with 67 million credit cards for a population of 59 million people (APACS, 2009). Fourthly, the

arrival of several new issuers into the UK market has led to a slight reduction in interest rates and an attempt by issuers to differentiate their products.

With respect to presenting a summary and conclusion to the findings of this research and to how this work has made a positive contribution to the literature, this chapter is divided into the following sections. Section two provides a summary of the research structure. A summary of the research findings is presented in section three. The contribution of this research to the literature is presented in section four. Section five contains a discussion of the limitations of this work. Section six indicates the direction of future research. The last section provides the final conclusion of this research.

7.2 Summary of Research Structure

This section provides a brief summary of the research undertaken within this thesis. The credit card market has grown markedly since the first credit card was introduced in 1966. In the UK by the end of 2007, there were 67.3 million credit cards in circulation, held by 30.8 million cardholders, with an average of 2.4 cards per person (APACS, 2008). Spending on credit cards in the UK was £133.2 billion in 2007, with the average value of a credit card transaction being £63.22 (APACS, 2008). In the early 1990s, the UK credit card market was dominated by the major banks, Barclays, Lloyds, the Midland, the National Westminster (NatWest) and the Royal Bank of Scotland. Typically all banks would charge cardholders an interest rate in the region of 22%, in addition to an annual fee of approximately £10. Consumers had very little choice and cards were barely differentiated. Indeed, there was an absence of competition with respect to both pricing and product characteristics (i.e. cards offered similar terms and conditions as well as charging similar rates of interest).

Chapter one raised a number of important questions with respect to pricing and competition. A survey of the existing literature is provided in chapter two. The literature related to credit cards is not only large and growing, but it is also remarkably diffuse. Researchers have examined credit cards in the context of a large and varied range of sub-disciplines including banking, macroeconomics, consumer behaviour and network economics. From chapter two, it is clear that a significant amount of research has already been undertaken on credit cards, but that there was still a large number of

issues and puzzles which still needed to be resolved. Thus, the review of the literature uncovered a number of gaps in the existing literature, a number of which were beyond the scope of this research, but are issues which can be addressed in the future. An overview of credit cards with particular focus on the UK was presented in Chapter Three. This chapter examined the credit card as a product and looked at the advantages and disadvantages of credit cards. It also introduced the credit card market, by examining how the UK credit card market has evolved since the introduction of the first credit card in 1966 by Barclaycard in the terms of competition and pricing.

US evidence using data from the 1980s and 1990s suggested that credit card prices are sticky due to a variety of reasons including: customers choosing credit cards without taking into consideration the high probability they will be charged interest on any outstanding balances (Ausubel, 1991), tacit price collusion (Knittel and Stango, 2003), and switching costs (Calem *et al.*, 2006; Stango, 2002). The introduction of variable rate cards increased competition and helped to drive prices down (Stango, 2000). Previous UK evidence from Heffernan (2002) focused on how industry characteristics (i.e. the number of firms and the benchmark wholesale money market interest rate (LIBOR)) impact on *issuer-level* pricing. Thus, Chapter four sought to contribute to the understanding of credit card pricing by determining and quantifying the impact of card, organisation and consumer attributes on price.

Both Chapters Five and Six consider price movements in the UK credit card market using industry and individual issuer rates. Chapter Five examines short- and long-run pass-through from the market interest rates, in particular the Bank of England's base rate to interest rates charged on outstanding balances. Chapter Six documents tendencies in price leadership in different segments of the credit card market.

Chapter Five focused on credit card lending rate adjustments following changes in an underlying interest rate. In addition, Chapter Five illustrated that these responses are asymmetric in the sense that the credit card rate is more rigid downward than upward. An increase in the underlying interest rate is passed on to on to the credit card rate faster than a decrease is. This finding is not unique to the UK credit card market, other

empirical studies have found similar results in the mortgage market (Toolsema and Jacobs, 2007; de Haan and Sterken, 2005, Hoffman and Mizen, 2004), deposit and loan markets (Hannan and Berger, 1997), this suggests that the phenomenon of asymmetric price adjustments is widespread. A variety of explanations for asymmetric price adjustments in general and have discussed their validity for the credit card rate in particular. Asymmetric credit card rates may be explained by tacit collusion, consumer search or switching costs, or varying mark-ups over the business cycle.

Chapter six focuses on credit card issuer behaviour. A discrete choice framework, similar to that of de Haan and Sterken (2006) and Allen and McVanel (2009) was used in chapter six to examine the behaviour of credit card issuers and to investigate whether there is any evidence of price leadership.

7.3 Summary of Research Findings and Research Contributions

This research started with the overall objective of providing a detailed insight into pricing and competition in the UK credit card market. Since their introduction in June 1966, the growth in the number of credit cards in circulation has been remarkable. Until the Monopolies and Mergers Commission report in the late 1980s, the UK credit card market was dominated by two main players – the Access Group and Barclaycard – who between them issued eight out of ten cards in circulation (Rowlingson and Kempson, 1994). After the report a number of other issuers entered into the market, and a wide range of products and interest rates are now on offered. This meant that cards were still issued under the payment umbrella of either Visa or MasterCard but now consumers had more issuers to choose from. This is still the case there are around 1500 credit cards on offer, issued by approximately twenty issuers all provided under the umbrella of Visa and MasterCard. A small number of cards are now issued on the AMEX payment network. The rate of growth slowed down in the early 1990s, due in part to consumer caution during the recession and in part to the wider availability of debit card and the introduction of annual fees. While this research has only scratched the surface, a number of interesting conclusions, which are summarised below, can be drawn. In addition, the research undertaken has also made a significant contribution to knowledge at both the academic and at a practical level. This research undertaken in this thesis had the following aims:

- To determine and quantify the factors which influence the interest rate which credit card issuers charge consumers on outstanding balances;
- To revisit the issue of switching costs and paying consumers to switch;
- To analysis how official changes in the base rate are passed on to retail credit card rates;
- To analyse issuer interaction within the market as a whole and within sub-markets of the sector;
- To determine and quantify if any of the top ten issuers in the market act as a price leader.

The existing credit card literature is remarkably diverse, covering a wide range of topic areas. This thesis has provided a comprehensive review of competition in the UK credit card market, by studying issues from three different perspectives: price leadership, pricing asymmetries and long-run pass-through of capital market rates to typical annual percentage rates on purchases. Each of these measures has provided some insight into how UK credit card issuers set prices.

Credit cards have evolved a great deal with the introduction of new credit card characteristics that have increased the range of product offerings to consumers. This, however, has increased product complexity making it difficult for consumers to make choices when the characteristics which determine prices are opaque. Making use of a rich data set, the determinants of credit card pricing were examined. Many characteristics neglected in previous work have an impact on prices. In particular, higher prices observed (or customers are prepared to pay) for cards with the following characteristics: initial and student card types, introductory offers on balance transfers, an annual fee, a longer interest free period, Airmiles, purchase discounts, and a charity donation of purchases.

By using a simple hedonic pricing model, the analysis in Chapter four sought to determine and quantify the impact of card and institution level characteristics on price. In summary, the following observations were drawn from this analysis: (1) card characteristics such as: introductory offers on balance transfers, the interest free period, and loyalty schemes have a positive association with price; (2) cards that select

consumers with lower risk characteristics have a negative association with price; (3) there is issuer price heterogeneity; and (4) supplier characteristics such as affinity and co-brand have a positive association with price. Thus, the analysis undertaken in Chapter Four, illustrates what credit card characteristics consumers are paying for, which would otherwise remain unknown because consumers choose a bundle of characteristics when selecting a credit card. By quantifying, the value of individual characteristics that are not separately tradable, an insight has been offered into the cost/price differentiation on an individual characteristic which is only available to the consumer as part of a bundle. These findings potentially offer some explanation to the Department for Trade and Industry's finding that consumers could save £1.9 billion a year in interest rate payments alone by switching to cheaper credit cards (DTI, 2003). However, it appears that UK credit card customers' are reluctant to switch credit cards. The remaining empirical work undertaken in Chapter Four concentrated on finding explanations as to why consumers were reluctant to switch one card to another. The OFT has found that almost 70% of individuals do not shop around for the cheapest deal and that those who choose an average priced credit card rather than the cheapest option are losing an average of £137 a year (Which? News, February 2008). A hedonic model was estimated with a two-level error component structure, this allowed unobserved heterogeneity at the issuer and card levels to be controlled for. The key findings suggested that (1) the airmile loyalty scheme and annual fee creates switching costs and customer lock-in allow issuers to charge higher prices and (2) issuers pay customers to switch using introductory offers on purchases. However, no evidence is found to support the notion that default charges are used to subsidise lower prices. Finally, customers do not pay a premium for using different payment networks.

Official interest rates have been the main instrument of choice for central banks, whether they are focused on achieving specific inflation targets or not, for at least the last two decades (Fuertes, Heffernan and Kalotychu, 2006). In order to influence future spending and the inflation rate, official interest rate changes must prompt similar changes in short money market instruments and retail rates. Much research has been undertaken to investigate the pass-through of official interest rate changes to retail rates, such as deposit and mortgage products. However, the credit card market has been ignored.

Interestingly, credit card interest rates appear to have become more responsive to changes in the cost of funds in the 1990s (Evans and Schmalensee, 1999). Variable-rate credit card plans were of minor importance up until the early 1990s (Stango, 2002); however, by the mid-1990s variable-rate deals outnumbered the fixed-rate offerings and accounted for a greater proportion of cards in circulation (Evans and Schmalensee, 1999). While credit card rates do respond to base rate changes they are slow to respond, which is consistent with the findings of Calem and Mester (1995). This would suggest that competition in the UK credit card market is imperfect and that credit card rates are indeed sticky. The Bank of England relies on the assumption that financial institutions tend to drift towards a long-run equilibrium rate changes with every rise or fall in the policy rate.

In summary, the majority of the evidence found six suggests that the UK credit card market is reasonably competitive. More specifically, no evidence is found that one issuer acts as a dominant price leader. Pass-through of official interest rates is mixed.

7.4 Limitations of the Research

The researcher acknowledges that despite the significant advantages of the research undertaken within this thesis the research does suffer from a number of limitations. Firstly, while the research undertaken within this thesis, contributes significantly to the existing literature, it only partially addresses the gap in the literature concerning how credit card interest rates are determined and the factors which affect the quoted interest rate. The penultimate section of this chapter will address this limitation in more detail be suggesting additional areas for research with respect to pricing and competition.

An important caveat of the analysis undertaken in this thesis is that individual transaction rate, that is, the rate that individual customers are charged or pay on their outstanding balances, are not used. Only two-thirds of customers are charged the headline interest rate (typical APR) by credit card issuers. This means that one-third of customers may be charged a rate of interest which is higher or lower than that

advertised. This means that important characteristics may be missing from the analysis.

In addition, one tradition of hedonic pricing models relates price to a consumer's willingness to pay for a particular characteristic. Therefore, it would be realistic to assume that different individuals will prefer different bundles of attributes. For example, consumers could be split into growth depending upon whether they revolve debt or not. However due to data limitations it is not possible to do this.

In their super-complaint put forward to the Office of Fair Trading (OFT), Which? argued that APRs cannot be trusted and should not be used for like-for-like comparisons. Alena Kozakova, Principal Economist for consumer body Which? stated that: "People believe that APRs are a dependable way of comparing credit cards, but our research shows that APR cannot be relied upon for true comparisons." (Which? News, April 2007). According to Which? (2007), the top twenty credit card issuers in the UK, use at least twelve different methods to calculate interest rates. Thus, a limitation of the research is that, due to a lack of information, these different calculations methods could not be included.

A second, potential short-coming of chapter four is that for convenience users the APR is largely irrelevant. Convenience users do not incur interest rate charges because they pay their outstanding balance in full before the end of the current billing cycle. While the chapter has addressed some of the issues which are faced by revolvers it has not addressed any issues which relate to convenience users. In addition, convenience users could alternatively use debit cards instead of credit cards. As this is the case, is APR a sensible price for convenience users? Chakravorti (2003) argues, that issuers may offer convenience users payment services below their marginal cost because such a pricing strategy improves the risk of their credit portfolios, increases market share, or increases revenue from those convenience users that may choose to borrow in the future. If convenience users do choose to borrow in the future than using the APR as a measure of potential cost may be useful.

A major short-coming of most past-through estimates is that they are derived from reduced-form regressions of bank lending rates on the money market rate (de Bondt, Mojon and Valla, 2005). This modelling approach provides a good summary evaluation of the sluggishness of retail interest rates to changes in the money market interest rate; however this modelling approach fails to explain how banks price their products. Therefore, further work is required to develop a more detailed and complex mode of bank pricing. De Bondt, Mojon and Valla (2005) propose a model of bank pricing, where banks apply a mark-up with respect to a "cost" that depends on short- and long-run market conditions.

As previously discussed in chapter five, there are a number of theoretical reasons for non-linear adjustment of bank interest rates. Using aggregate prices may mask demographic heterogeneity. For example, older customers may face higher switching costs. A more thorough analysis of asymmetry would require actual transaction prices (Allen and McVanel, 2009).

7.5 Direction for Future Research

The limitations of this thesis, outlined in the previous section, naturally make suggestions for future research. The literature review in chapter two and the work subsequently undertaken in this thesis suggests that the credit card market in the UK still warrants future research. The research undertaken in this thesis concentrates on one element of pricing.

7.5.1 Pricing

"Credit card pricing, however involves [elements other than interest rates], including annual fees, fees for cash advances, rebated, minimum finance charges, over-the-limit fees, and late payment charges. In addition, the length of the 'interest-free' grace period, if any, can have an important influence on the amount of interest consumers pay when they borrow on their credit cards."

Federal Reserve Board, 1998: 4

As mentioned previously, one of the major limitations of this thesis with respect to pricing and competition, that it focuses only on one pricing parameter, the price

associated with borrowing money to pay for purchases – the typical annual percentage rate (APR) for purchases. As the quote above demonstrates that credit card pricing is extremely complex. Evans and Schmalensee (1999) list a number of dimensions in which credit cards can differ. Credit cards can differ on the following dimensions:

- Method of calculating interest rate changes
- Amount of credit provided
- Service fees
- Interest Rates
- Special Card features

These are issues which may relate to pricing of a credit card. Chapter four has attempted to address some of these issues; however there is still a long way to go until these issues have been resolved.

Methods used to calculate interest charges vary substantially from one card programme to another. The most important areas of variation include the length of the grace period, the method for calculating the outstanding balance, the type of compounding used for calculating finance charges, and the way the effective date of a transaction is defined (Evans and Schmalensee, 1999).

7.5.2 Convenience Users

Credit cards provide consumers a secure, reliable and convenient means of payment (Chakravorti, 2003). As demonstrated in chapters two and four, consumers receive incentives to use their credit cards such as dispute resolution services, frequent-use rewards, and interest-free short-term loans if no balances are carried between billing periods. In addition, credit cards also provide various security features and limit consumer liability in the event of fraudulent use. Credit cards, in general, are used by two types of consumers; revolvers and convenience users. Industry estimates of convenience users range from 30 to 40 percent of all credit cardholders (Chakravorti, 2003). A limitation of the research is that the APR is irrelevant for convenience users. In addition, convenience users could simply choose to substitute their credit card for a debit card. An interesting question would be to ask why individuals choose to use credit cards rather than debit cards. Chakravorti (1997) concluded that based upon the

underlying incentives versus other payment instruments, consumers should always use their credit cards to make payments and payoff their balances in full by the due date.

7.5.3 Competition

The credit card industry, offers a variety of products, with a range of features and pricing strategies to consumers with different demands. Therefore, competition is about more than who can offer the lowest price. All cards carry with them a whole system of prices (i.e. perhaps an annual fee and, one or more interest rates, along with rules for when interest is charged) as well as fees or such things such as late payment and cash advances.

The UK credit card market has been subjected to structural changes over the past two decades. This has pushed them to search for more efficient organisational solutions, greater variety of the offered services and stronger exploitation of scale economies. The last of these phenomena has taken place partially due to increasing consolidation of UK banks and the increasing number of joint ventures in the market. For example, since this research has been undertaken, HBOS and Lloyds TSB merged to form the Lloyds Banking Group. Thus, it is crucial to assess whether such modifications have had an impact on the degree of competition characterising the UK credit card market as the consolidation process increases the potential for monopoly power to occur. Further research is required to evaluate the degree of competition in the credit card market. Thus a future research objective is to investigate whether a small number of large issuers use their dimension and market leadership to act as a colluding oligopolist.

7.5.4 Regulation

Regulatory pressure on the consumer credit market continued unabated throughout 2006. The Office of Fair Trading (OFT), the Competition Commission (CC) and the Financial Services Authority (FSA) are all pursuing separate investigations into the practices that exist within the sector. Recent investigations have included credit card charges, interchange fees, credit card cheques and how interest is charged on credit card products.

Furletti (2003a) found that late fees (not including overlimit fees) are the third largest revenue stream for card providers after interest revenue and revenues received from merchants. A Hammer survey found that penalty fees accounted for around 30 percent of credit card income in 2004 (Furletti and Ody, 2006). Meanwhile, a cardweb.com study cited by the Wall Street Journal indicated that in 2001, 58 percent of cardholders paid a late fee. It is clear that credit card penalty fees are of substantial importance for both banks and their credit card borrowers.

However, despite the significant public policy interest in credit card penalty fees as well as the large money magnitudes involved, Massoud *et al*, (2008) was the first paper in the literature to focus specifically on their determinants of penalty charges. Indeed until now, the credit card literature has focused almost exclusively on credit card interest rates (e.g. Ausubel, 1991; Brito and Hartley, 1995; Stango, 2000). Thus more work is required in this area. As mentioned in section 3.12 of chapter three, the OFT is involved in a series of investigations into the level of default charges. In July 2005, the OFT issued its provisional findings on its investigations into the credit card default charges. The OFT stated that charges, usually in the range of £20 to £25, were "disproportionate" and "unfair". After further research the OFT concluded that a fair default charge should not exceed the level of administrative costs usually associated with default. However, despite the positive responses from lenders to the recommendations made by the OFT, there are still some unanswered questions, these questions include; (1) Is £12 still overpriced, considering the actual cost to the provider? (2) Is £12 too low to be a deterrent for consumers to work within their agreed limits? (3) What are the methods which providers will implement in order to attempt to recoup their losses? (4) What will the effects of this legalisation over time?

A European directive published on 5th December 2007, has led to the FSA taking over from the FSA and the Banking Codes Standards Board. The Payment Services Directive (PSD, 2007/64/EC) is a regulatory initiative from European Commission which will regulate payment services and payment service providers throughout the European Union and European Economic Area. The purpose of this directive is to increase pan-European competition and participation in the payments industry, as well as to provide

for a level playing field by harmonising consumer protection and the rights/obligations for payment providers and users (Martin and Schchloenvoight, 2008).

7.5.5 The Effects of the "Credit Crunch"

"Credit Cards are the next Credit Crunch"

Meredith Whitney, 2009.

When this thesis was started toward the end of 2005, it was impossible to envisage the financial and economic crisis which would hit the UK. The arrival of the credit crunch, coupled with extreme competition, an economic downturn, increasing bad debts, and government regulations has led credit card companies to re-evaluate their position. An example of this is Egg, the online issuer of credit cards who was bought by the City Group in 2008. Egg decided to release approximately seven percent of its customers. Officially, Egg stated that the release of these customers was due to a credit risk review. However, if the rumours in the financial press are to be believed then many of the customers released by Egg were those who repaid their outstanding balances in full each month. If these rumours are true then Egg effectively dumped those customers who were not profitable (77Finance, 2009). Barclaycard has responded to recent changes in the financial climate by reducing the credit limits and restricting ability to make cash withdrawals of those customers whose credit data indicated that they have become financially over-stretched.

Table 7.1: The Impact of the Credit Crunch on Credit Cards

Observation	September 2007 – November 2007	April 2008 – July 2008	August 2008 – November 2008
	No. of Cards	No. of Cards	No. of Cards
Increased APR	3	19	16
Increased Cash per Annum Rates	25	14	12
Increased Balance Transfer Fees	10	5	11
Increased Cash Advance Fees	69	8	7
Reduced Number of Interest Free Days	-	-	7
Increased Foreign Usage Fees	18	3	4
Increased PPI	-	2	-
Reduced Minimum Repayment Reductions	-	2	-
Increased Account Fee	-	1	-

Source: Moneyfacts

Increasingly providers have withdrawn their most competitive deals, while charging more for cash withdrawals and/or purchases made abroad. Credit card rates are at their highest level for over two years following widespread rate increases. This is despite the Bank of England slashing the base rate from 4.75% to 0.5% over the same period. Table 7.1 illustrates how the credit crunch and the resulting financial crisis have impacted not only on the purchase APR but a whole range of other aspects of credit card pricing.

According to the price comparison website www.MoneyExpert.com, individuals now pay on average 1.1 percent more in annual interest compared to what they did two years ago. Outstanding balances in the UK currently stand at £64.8 billion, with the average consumer having an outstanding balance in excess of £2,000. The study found that, on average, customers will now pay 0.95% more on purchases, 0.7% more on balance transfers and 1.7% more on cash advances compared to two years ago.

Table 7.2: Impact of the Credit Crunch on Individual Credit Cards

Card Name	Purchase Rate 1st August 2008	Purchase Rate 12th November 2008	Increase (%)
Abbey Credit Card MasterCard/Visa	15.9	18.9	+3.0
Bank of Ireland (UK) MasterCard	16.9	17.9	+1.0
Bank of Ireland (UK) Moneyback MasterCard	16.9	17.9	+1.0
Bank of Ireland (UK) Moneyback Gold MasterCard	16.9	17.9	+1.0
Capital One Platinum MasterCard	15.9	16.9	+1.0
Egg Money MasterCard	14.9	16.9	+2.0
MINT	7.9	12.9	+5.0
NatWest Credit Card MasterCard/Visa	14.9	16.9	+2.0
NatWest Gold MasterCard/Visa	15.9	16.9	+1.0
NatWest Platinum MasterCard/Visa	15.9	16.9	+1.0
Royal Bank of Scotland Classic MasterCard/Visa	15.9	16.9	+1.0
Royal Bank of Scotland Gold MasterCard/Visa	15.9	16.9	+1.0
Royal Bank of Scotland Platinum MasterCard/Visa	15.9	16.9	+1.0
Sky MasterCard	16.9	17.9	+1.0
Virgin Money MasterCard	15.9	16.6	+0.7

Source: Moneyfacts

Table 7.3: The Impact of the Credit Crunch on Cash APRs

Card Name	Cash Rate 1st August 2008	Cash Rate 12th November 2008	Increase (%)
Abbey Credit Card MasterCard/Visa	22.9	27.9	+5.0
Abbey Zero MasterCard	25.9	27.9	+2.0
Bank of Ireland (UK) MasterCard	21.04	24.942	+3.902
Bank of Ireland (UK) Moneyback MasterCard	20.94	24.942	+4.002
Bank of Ireland (UK) Moneyback Gold MasterCard	20.94	24.942	+4.002
Bank of Ireland Gold MasterCard	21.04	24.942	+3.902
Egg Money MasterCard	7.9	24.942	+9.0
John Lewis Partnership MasterCard	18.9	23.9	+5.0
M&S Money MasterCard	21.9	23.9	+2.0
Nationwide BS Classic Visa	22.9	27.9	+5.0
Nationwide BS Gold Visa	22.9	27.9	+5.0
Virgin Money MasterCard	24.9	27.9	+3.0

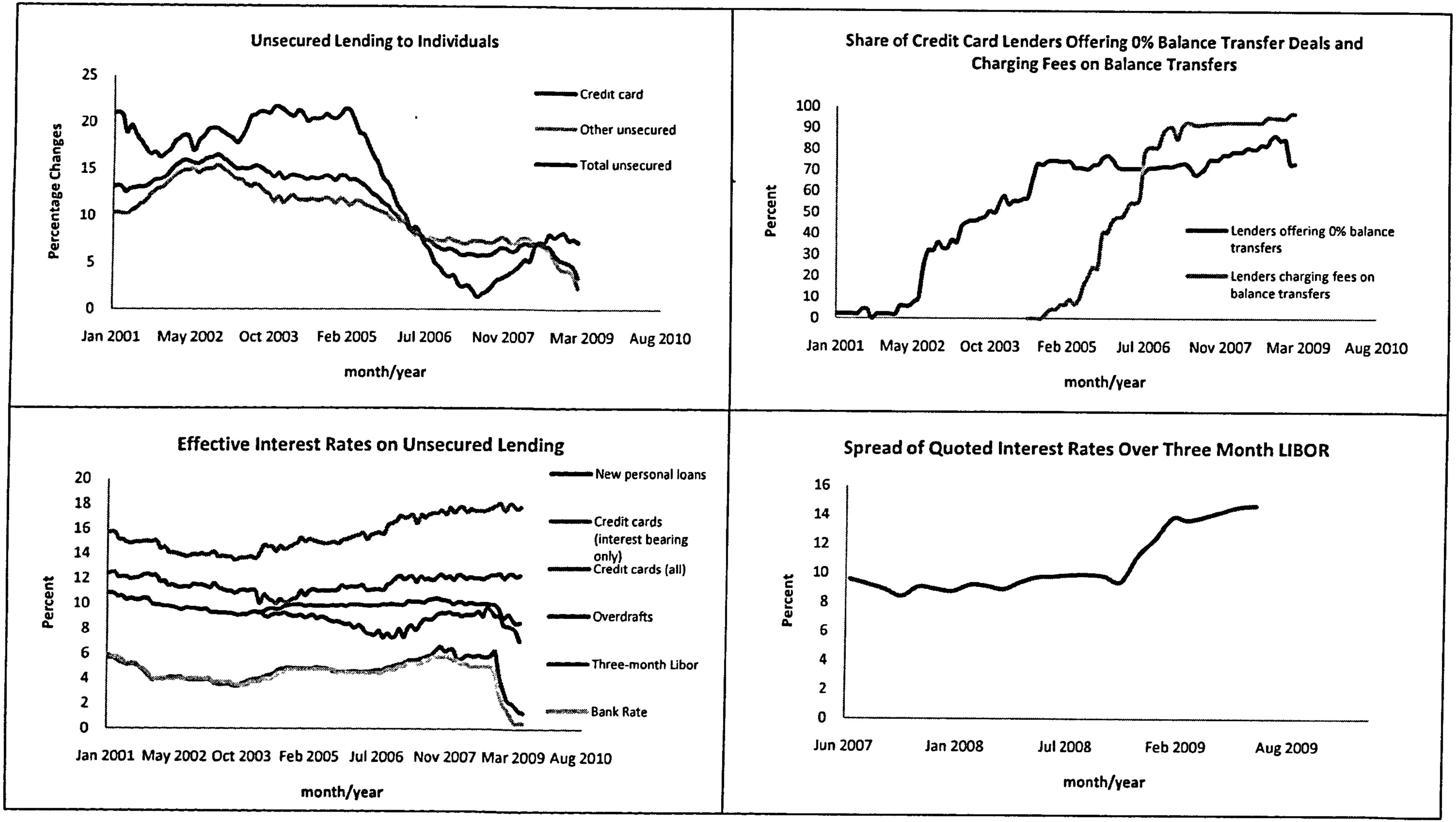
Source: Moneyfacts

Furthermore, research undertaken by Moneyfacts.co.uk has shown that the average interest rate charged on purchases on 4th June 2009 was 18.1 percent. The figure the previous month was 17.9% and two years ago it was 16.3%. Tables 7.2 and 7.3 provide some specific examples of how the credit crunch has impacted on credit card interest rates.

Figure 7.1 provides some insight into how the UK credit card market has evolved since the start of the credit crunch. Consumer credit comprises of credit card debt, overdrafts and other loans and advances, such as personal loans and hire purchase agreements. Panel A of Figure 7.1 shows that growth in consumer credit was extremely rapid during the first half of this decade and credit cards accounted for approximately one quarter of all outstanding debt. Net credit card lending has been subdued for some time, following a significant tightening in availability in response to an increased number of write-offs in 2005. As part of this tightening, credit card lenders have increasingly charged fees on balance transfers, where previously these had been offered on a zero percent interest rate and no-fee basis, see panel B.

Effective interest rates on overdrafts and personal loans have fallen in recent months, though by much less than the Bank of England Bank Rate and LIBOR; however, interest rate on credit cards have remained broadly unchanged, at levels well above pre-2005

Figure 7.1: The Effects of the Credit Crunch on the UK Credit Card Market



levels (see panel C). The recent widening in spreads reported in part reflects lenders' perceptions of heightened credit risk on unsecured lending. Write-offs on consumer credit continue to remain high and lenders expect arrears and write-offs to increase if unemployment rises further.

The credit crunch is a crisis that has been caused by banks being too nervous to lend money to consumers, firms and as well as each other. If they do decide to lend, this comes at a cost of higher rates of interest to cover the perception of higher risk. Essentially, this has meant that mortgages have become more expensive, credit cards dearer, and in the worst case scenario repossessions and bankruptcy.

Chapter five examined the "pass-through" of monetary policy induced interest rates to credit card "borrowers". Given the above discussion this is of course a contentious issue and would suggest that more research needs to be undertaken in this area. For example what is the relationship between interest rates and credit card default rates and bankruptcy laws? Is there any relation to house prices?

7.5.6 Pass-Through Revisited

An analysis of credit card interest rate pass-through should consider whether credit card pass-through is likely to be similar/different from bank loan pass-through. As this thesis focused simple on credit cards this issue was ignored, however future work should make comparisons between these products. There are also a number of other issues which need to be considered, which are discussed below.

7.5.6.1 Structural Change

One of the limitations of the research undertaken in Chapter Five is that structural change is not considered. Not controlling for structural change could lead to an underestimation of the speed of adjustment from money market changes to retail rate changes.

7.5.6.2 Panel Models

Using a panel error correction model (ECM), it is possible to estimate the effects of credit card market competition on the long-run equilibrium pass-through of issuer interest rest rates to changes in the corresponding market interest rates.

7.5.6.3 Modelling Pass-Through Using Non-Linear Models

Non-linearity is broadly defined as any departure away from the conventional linear error correction model (ECM) which is typically used to characterise the dynamics of retail interest rates, as presented in section 5.4. More specifically, different types of nonlinear responses may arise from switching costs, menu costs and uncertainty. Section 5.7 look briefly at asymmetric pricing in the credit card market, however there is still much work to be undertaken.

According to Fuertes, Heffernan and Kalotychou (2009), detecting nonlinear behaviour in the way in which financial institutions react to policy rate revisions is important for a number of reasons. First, it can provide useful insights into the practical operation of economic mechanisms. Second, by focusing on a class of models that are close to the true data generating process, significant policy implications may follow. The magnitude and nature of the adjustment speeds of financial institutions following changes in the policy rate are a fundamental element of the transmission mechanism. Nonlinearities have important implications for how the central bank models the relationship between policy rates and retail rate changes, and consequently how they exercise monetary policy. Third, nonlinearities in the propagation of policy shocks can pose unique difficulties when attempting to forecast economic variables. Further research into these issues can help in explaining how and when the marcoeconomy react to them.

Complex models need to be developed which consider aspects such as continuous time-variation, regime switching and curvature. Conditional continuous variation in the context of pass-through refers to an adjustment speed which is proportional to the size of the policy rate change instead of being constant over time. Regime-switching relates to asymmetric adjustment to policy rate changes which widen or narrow the current disequilibrium gap, whilst controlling for the size of the policy rate change.

Finally curvature refers to nonlinearity in the "catch-up" mechanism towards the long-run path and implies a size-of-gap effect.

In addition, credit cards have a range of prices and interest rates attached to them. Further research should look at how these prices and interest rates change in response to a change in the base rate. Interest rate stickiness in the credit card market, could be due to credit card issuers deliberately not changing the interest rate charged on outstanding balances, in favour of changing another aspect of pricing which will not lead to high menu costs or attracting a riskier pool of borrowers.

7.5.7 Entry and Exit

The majority of the entry and exit literature focuses almost exclusively on firm-level decision, excluding an important aspect of firm behaviour: whether to introduce new products while the firm produces similar goods, and where to locate them in the existing product space, taking into account own models and the possibility of new entry (Starvins, 1995). The credit card industry contains many multi-product firms which allows for analysis of entry and exit of particular products, and of the strategic behaviour of issuers.

Product differentiation provides issuers with the ability to shelter their products from price competition through strategic product location in the presence of inter-issuer rivalry. Issuers can extend the degree of product differentiation by dispersing the quality (vertical differentiation) and style (horizontal differentiation) of their products to capture sales beyond their immediate locale. Alternatively, issuers can choose to replace their products or compete internally by cannibalising the products under each firm umbrella while mitigating the damaging impacts of within firm competition by differentiating and dispersing the full set of products marketed.

As demonstrated in Chapter Four, credit cards are differentiated by many attributes. To analyze spatial location decisions, a comparison needs to be made between the various credit cards available. According to Starvins (1995) products which are differentiated vertically or horizontally, can be placed in a product space by using an imaginary line or circle.

7.6 Policy Implications

In 2007, the OFT announced that a new programme of work with the credit card industry and consumer bodies to make the cost of credit cards easier for consumers to understand. The research undertaken in chapter four considers credit card attributes and how they impact on the price of credit. With approximately 70 percent of all active credit card accounts incurring interest charges every month it is important that credit card holders are able to choose credit cards while understanding fully all the issues that affect the cost of the card. It is therefore important any new work undertaken with regards to credit cards explore the issues which surround the cost of credit including purchases, cash advances, introductory offers and payment allocation. The DTI estimated that consumers could save over £1.9billion in interest payments if they switched credit cards. The FSA and other regulators and government bodies need to think about how to improve the information given to consumers by credit card issuers. In addition improvements should be made to consumer education about the benefits of shopping around for a credit card and considering whether a particular characteristic is necessary especially if this is going to increase their monthly payments by a significant amount.

In chapter five, credit card rates were found to adjust extremely slowly to the changes in the cost of funds and the base rate. In addition chapter six found that in the majority of cases credit card issuers do not respond to changes in the base rate, which suggests that credit card companies may not lower rates due to a lower cost of funds or increase rates when the cost of funds increases. As credit cards appear to be almost unresponsive to changes in the base rate, this will pose a greater challenge for policymakers conducting monetary policy. Regulatory efforts to reduce credit card interest rate could help revolving credit card users to decrease their debt burden. With around £64million pounds currently outstanding it is important that every effort is made to decrease consumer debt. Thus, regulators need to consider how to make the monetary transmission mechanism more effective so that consumers can enjoy lower interest rates. In addition, the monetary transmission mechanism needs to work more effectively so that increases in the base rate are passed on to consumers, potentially discouraging some from borrow excessive amounts.

7.7 Conclusion

Credit cards are a key feature of the modern society and have provoked much discussion over recent years. Credit cards have often been attributed with encouraging the growth in consumerism and consumer borrowing which occurred in the 1980s (Rowlingson and Kempson, 1994). However the greatest concern of all lies in the belief that they encourage individuals to live far beyond their means, buying consumer goods and services which they can ill afford.

The objective of the concluding chapter was to briefly explain the research which has been conducted throughout the thesis and the motivation for undertaking it. The research undertaken in this thesis has fulfilled its objectives in the terms of (1) examine and quantifying card, consumer and issuer characteristics, (2) investigating loyalty schemes as a form of switching cost, (3) examining base rate pass-through and (4) analysing interaction between credit card issuers.

However, while this research could claim to have made a considerable and positive contribution to the understanding of how credit cards are "priced"; equally it has been shown that there is a considerable amount of work still to be undertaken in order to make important strides in understanding how credit cards are priced and their overall impact on the economy.

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Appendix A

Additional Information Related to Chapter 4

Appendix A1: Heffernan's Model Revisited
Appendix A2: List of Credit Card Issuers
Appendix A3: List of Credit Cards in Study
Appendix A4: The Summary Box
Appendix A5: Complete List Credit Card Attributes

Appendix A1: Heffernan's Model Revisited

This appendix updates the work undertaken by Heffernan in 2002 with respect to credit cards, which looked at competition in this sector between 1993 and 1999. Heffernan's model has been discussed in detail in Chapter Four.

Unlike Heffernan who only analyse competition at the provider level, this analysis also considers competition at the card level. The evolution of the UK credit card market is investigated by estimating the model on a year by year basis at the firm level. Finally, for completeness a comparison is made between the period 1992-1999 and 2000-2007.

A1.1 Competition between Providers

To begin with Heffernan's model is estimated at the provider level, the key results of the regression are presented in Table A.1, while the results of the bargains and rip-offs are presented in Table A.2. The constant term is both positive and significant suggesting that there is a large mark-up. This is consistent with the findings of Ausubel (1991) who finds that the credit card market is highly profitable due to the substantial premiums involved in credit card portfolio sales.

Table A.1: Estimation Results for Providers

Explanatory Variable	Coefficient	T-Ratio
CONSTANT	**20.548**	102.46
TREND	**-0.021**	-26.52
FIRM	**-0.053**	-25.80
FEE	**0.073**	12.22
LIBOR t	-0.240	-2.08
LIBOR t-1	0.211	1.05
LIBOR t-2	-0.208	-1.04
LIBOR t-3	**0.711**	6.30
R^2	0.836	

Table A.2: Best and Worse Card Providers

Top Five "Best Buys"		Top Five "Worst Buys"	
Firm	**Deviation from Default Provider**	**Firm**	**Deviation from Default Provider**
Cahoot	-6.11	Vanquish Bank	21.19
Northern Rock	-5.71	Standard Charter	9.90
BMW	-5.58	Asda	7.84
Express	-5.15	Capital Bank	7.53
Intelligent Finance	-4.81	Allied Irish	5.42

The trend coefficient is significant and suggests that the interest rates on credit cards have been declining over time. The decline in interest rates is partially due to the substantial decrease in the cost of funds as previously demonstrated the base rate has declined by 38.5% throughout the sample and in addition by the early 1990s interest rates became much more flexible as credit card issuers switched to variable interest rates. By all accounts the market had also become more competitive. Increased

competition has led to the more established issuers to remove annual fees and to slash their interest rates so that they are in line with those offered by new entrants. This is supported by the empirical study undertaken in Chapter Five, which graphically and numerically demonstrated that the average interest rate on credit cards has substantially declined over the sample period. A possible explanation for the change experienced, is that technological change allowed more efficient credit scoring to be undertaken be large credit card issuers.

Providers to respond to changes in the base rate, however credit card providers are slow to respond to changes. Credit card providers on average take three months to respond to changes in the cost of funding. This finding is consistent with Heffernan. However, changes in the base rate are not fully passed through to customers within three months.

The coefficient on the firm variable is negative and significant, thus as the number of credit card providers has increased, the interest rate charged on outstanding balances has deceased. New entrants have entered into the market, forcing the incumbent firms to lower their interest rates, to prevent their market share being eroded.

Similar to Heffernan, the fee coefficient is found to be positive and significant. Naturally, this implies that as the annual fee increases so does the interest rate paid on outstanding balances. This is to be expected as the annual fee is a component which is factored into the APR calculation.

Using Heffernan's bargain and rip-off strategy it is possible to rank credit card providers with respect to each other. Interestingly none of the top five issuers appear in the top ten for bargains or rip-offs. There is a spread of 27.3% between the best and worse provider. The Vanquish Bank on average offers interest rates which are 21.2% higher than that of the Royal Bank of Scotland. Cahoot appears to offer the best deals with the average interest rate on their credit card products being 6% lower than the default bank.

A1.2 Competition between Cards

This section investigates competition at the card level. The regression results are presented in Table A.3. The constant term is significant and positive, thus indicating that there is a substantial mark-up. Again this supports the observation that the credit card sector is highly profitable (Ausubel, 1991; Park, 1997). The trend term is significantly negative, which suggests that credit card rates have been falling over the time, which is expected due to previous findings, the same explanations apply here. LIBOR is significant; however, it takes on average three months for credit card products to react to changes. The card coefficient is both negative and significant which that the APR falls, as the choice of credit cards available to consumers increases.

There is a large dispersion of bargains and rip-offs relative to the default card. The results of the bargain/rip-off analysis are reported in Table A.4, however due to space restrictions only the top ten best and worse buys are reported. As mentioned previously the significance of the t-ratio is testament to the persistence of a cards position over time. It is discovered that there is a difference of 47.8% between the relative worst and best buy in the credit card market. It is found that the Morgan Stanley i24 card is the worse buy, charging an interest rate which is 36% higher than that of the default card, while the Simplicity Platinum card issued by Barclaycard is the best buy with an interest rate which is 11.86 percent cheaper than the default.

Table A.3: Estimation Results for Cards

Explanatory Variable	Coefficient	T-Ratio
CONSTANT	**21.316**	20.96
TREND	**-0.007**	-8.74
FIRM	**-0.023**	-26.47
FEE	**0.011**	3.18
LIBOR t	-0.378	-4.08
LIBOR t-1	0.193	1.21
LIBOR t-2	-0.192	-1.23
LIBOR t-3	**0.798**	8.97
R^2	0.874	

Table A.4: Best and Worse Cards Available

Top Five "Best Buys"		Top Five "Worst Buys"	
Card	**Deviation from Default Card**	**Card**	***Deviation from Default Card***
Barclaycard Simplicity Platinum	-11.86	Morgan Stanley – i24	36.08
85	-11.61	Vanquish Bank - Abacus	27.64
Egg Money	-11.41	Vanquish Bank - Blue	28.94
Co-operative Bank Gold Base Rate	-10.59	MBNA Travel Card	11.65
Co-operative Bank Platinum Flat Rate	-9.64	Vanquish Bank - Gold	8.18

While a card may appear to be a relative bargain or relative rip-off compared to the Royal Bank of Scotland Classic credit card it is important to consider why a card is ranked where it is. Unfortunately this extremely simple pricing model does not provide any insight into why a card maybe a relative bargain or rip-off, instead it ranks cards on the basis on the interest rate charged on outstanding balances. It may be the case that a card which maybe ranked as a relative rip-off is in fact deemed as a bargain by the individual who holds that particular card. Take for example, the Vanquish Bank, who specialise in providing credit cards to individuals who have little or no credit rating, have had credit problems in the pass or have an income which is below average. Therefore, it is possible to conclude that to an individual who has an extremely poor credit rating and a low income that is able to apply successful for this card then it is not a rip-off and indeed to them is a good purchase. Another example is the Morgan Stanley i24 credit card, which in this analysis was found to be the worse buy on the market. This particular credit card has been dubbed as an "ultra-premium" credit card by some observers. The typical APR is 57.8%, based largely on the annual £275 fee. To compare credit cards, the i24 offers a rate of 13.9 per cent on purchases. For the £275 the cardholder receives a number of additional services which include a 24/7 concierge service providing 'discovery' and 'recovery' functions, the promise to arrange everything from forgotten anniversary presents to restaurant bookings and even finding a translator at 04:00 am on the other side of the world, access to over 450 airport lounges through the priority pass membership, comprehensive multi trip travel insurance, emergency travel assistance and an additional card for partners and family members. In addition, the cardholder benefits from receiving 1% cashback on all purchases and not being charged a foreign exchange fee.

Likewise, while a card may appear to be a relative bargain, it is only a relative bargain to an individual, if the card meets an individual's needs and characteristic requirements. Credit cards have different characteristics.

In conclusion while this simple analysis provides insight into the type of competition in the UK credit card market and is able to rank credit cards according to the interest rate charged on outstanding balances it is unable to provide any insight into why credit cards charge a particular interest rate. What is clear is that no two credit cards are identical. Credit cards are characterised by different features. Therefore it is important that the actual features of credit cards are analysed. It is impossible for an individual to make an informed decision based on whether a card is class as a good or bad buy, instead they need to take into account their own needs and circumstances.

A1.3 Has Competition Evolved?

This sub-section investigates how the UK credit card market has evolved over time. The sample period May 1992 to May 2007 covers a period of 16 years, and as seen previously in Chapter Four, the UK credit card market has experience a significant amount of change during this period. To investigate how competition has evolved over the sampling period, the model set out by equation (4.1)

$$Rl_{it} = \alpha_0 + \sum_j \beta_j Libor_{t-j} + \gamma t + \delta_i D_i + \varphi n_i + \eta_i f_{it} + \varepsilon_{it} \qquad (4.1)$$

is estimated on a year by year basis. The estimation results and the top five bargains and rip-offs the results of which can be found at the end of this section.

An extremely obvious observation to make is that the number of providers in the market has dramatically increased. The sample contains 166 different providers, the number of providers in each sub-sample ranges from 40 to 94.

Throughout the sample the constant remains positive and significant. In 1992, the constant suggests that on average the mark-up on credit cards was approximately 22.96%, the mark-up has fallen as low as 10.42% in 2006, however by 2007 this had risen to 16.22%. The Office of Fair Trading (OFT) concluded in 2006 that credit card default chargers were too high. It ruled that credit card companies should charge an amount that was a reasonable estimate of administration costs incurred for dealing with transactions and warned that it would consider taking legal action against companies who charged more than 12 pounds. Since the introduction of this ruling card companies have found other ways of recouping lost revenue. According to Moneyfacts, credit card issuers have increased the average interest rate on purchases from 14.9% in April 2006 to 17.7% in August 2008m while over the same period the Bank of England has only increased the base rate by 0.5% (Naylor, 2008). This statement supports the findings of this study and suggests one potential explanation for the sudden rise in mark-up is in response to new regulations imposed on card issuers.

In 1992, the coefficient on the FEE was positive and significant, which suggests that as the annual fee on a credit card rises, so does the annual fee. This is not a surprising finding as the majority of credit cards in this period had an annual fee attached. This finding is supported throughout the sample period with only one or two exceptions. In 1993, 1995 and 2004, the coefficient on the FEE was negative and significant. Possible explanations for this include reactions to new entrants, the introduction of premium rate products. Often premium rate products are associated with large annual fees, as cardholders are paying for a number of complementary services which are bundled together with credit card product.

When the coefficient on the TREND variable is significant and negative, it suggests that over the time period under consideration, the APR has declined. Generally, it has been found that APR are generally vary stable over a period of a year, which suggests that credit card prices are sticky and are slow to respond to changes in the cost of funds and to changes in the competitive environment. However this analysis does not provide any insight in to whether or not The TREND coefficient in 1993 suggests that credit card rates were declining; this corresponds with MBNA entering the market. The TREND coefficient also suggests that interest rates declined over the year in 1999, this probably due to the emergence of a number of internet providers, who had lower costs than more traditional providers.

A1.4 Has Competition Changed Since the 1990s?

The UK credit card market has undergone a significant amount of change. In this section the sample it split into two sections, 1992 to 1999 and 2000-2007, to allow the two periods to be compared. Over the period 1992 to 1999, there were 24 card

providers who were active throughout the whole period compared to 47 in the period 2000-2007.

The results for the period 1992-1999 are provided in Table A.5. The adjusted R^2 for the model is 0.74, which suggesting that the overall model is a good fit. The trend coefficient is significant and negative, which suggests that credit card rates are declining through the estimation period, 1992-1999. The constant term is significant and the coefficient is large and positive, 20.44.

The corresponding results for the period 2000-2007 are presented in Table A.6. Again the adjusted R^2, 0.73, suggests that the overall fit of the model is good. The trend coefficient estimated is significantly negative, and is approximately the same value as the previous period, which suggests that credit card rates are declining at a relatively constant rate across the two periods. The constant term is significant positive, however is larger in this period.

Providers to respond to changes in the LIBOR rate, however credit card providers are slow to respond to changes however the amount at which they respond is less in the second period. After 3 months, credit card providers have passed on 74% of the change in cost of funds during the 1990s, however during the 2000s only 5% of the change in cost of funds has been passed on. There are a number of potential reasons as to why changes in the cost of funds are passed on more slowly to consumers. Credit card rates perhaps have become stickier. Credit card issuers are now less reliant on the base rate as a source of funds. Firms no longer complete on price alone but also compete on non-price characteristics.

The following tables relate to the discussion in A1.3:

Table 1.A: 1992

Variable	Coefficient	Standard Error
CONSTANT	22.962**	9.047
TREND	0.023	0.146
FIRM	0.029	0.378
FEE	0.227**	0.104
R^2	0.915	
Number of Providers	40	

Table 1.B: 1992

Top Five Best Buys		Top Five Worse Buys	
Card Provider	Deviation from the Default Provider	Card Provider	Deviation from the Default Provider
Lloyds	-7.11	Liberal Democrat	7.78
Coutts & Co	-5.78	RSPB	7.78
Bank of Cyprus	-4.72	Labour	7.78
NatWest	-2.04	Standard Charter	5.47
AIB	-1.95	Beneficial	5.47

Table 2.A: 1993

Variable	Coefficient	Standard Error
CONSTANT	21.133*	4.714
TREND	-0.107**	0.054
FIRM	0.133	0.082
FEE	-0.277*	0.107
R^2	0.720	
Number of Providers	43	

Table 2.B: 1993

Top Five Best Buys		Top Five Worse Buys	
Card Provider	Deviation from the Default Provider	Card Provider	Deviation from the Default Provider
Bank of Cyprus	-6.19	Bank of Ireland	4.68
N&P	-4.19	Standard Charter	4.01
	-2.76	Giro bank	3.64
Amnesty International	-2.70	Leeds Permanent	2.26
Yorkshire Bank	-2.32	AA	2.24

Table 3.A: 1994

Variable	Coefficient	Standard Error
CONSTANT	21.411*	1.502
TREND	-0.033	0.399
FIRM	-0.063***	0.032
FEE	-0.018	0.059
R^2	0.973	

Table 3.B: 1994

Top Five Best Buys		Top Five Worse Buys	
Card Provider	Deviation from the Default Provider	Card Provider	Deviation from the Default Provider
Robert Fleming	-4.858	Standard Charter	10.71
The Express Card	-4.796	The Arts Card	7.71
Lloyds TSB	-0.875	Carecard	7.71
MBNA	-0.820	National Trust	7.71
Royal Bank of Scotland	0	Bank of Ireland	7.69

Table 4.A: 1995

Variable	Coefficient	Standard Error
CONSTANT	21.094*	4.095
TREND	0.017	0.080
FIRM	-0.059	0.050
FEE	-0.076*	0.009
R^2	0.967	
Number of Providers	58	

Table 4.B: 1995

Top Five Best Buys		Top Five Worse Buys	
Card Provider	Deviation from the Default Provider	Card Provider	Deviation from the Default Provider
Skycard	-4.67	Standard Charter	10.96
Coutts & Co	-4.28	NWS	7.81
Robert Fleming	-3.72	AIB	7.26
The Express Card	-3.39	Allied Irish	7.26
CMSA	-2.12	The Arts Card	6.72

Table 5.A: 1996

Variable	Coefficient	Standard Error
CONSTANT	14.788*	3.833
TREND	0.013	0.036
FIRM	-0.028	0.020
FEE	0.086*	0.030
R^2	0.962	
Number of Providers	84	

Table 5.B: 1996

Top Five Best Buys		Top Five Worse Buys	
Card Provider	Deviation from the Default Provider	Card Provider	Deviation from the Default Provider
Coutts & Co	-4.27	Standard Charter	13.7
Pro71	-3.60	NWS	9.11
The Express Card	-2.81	First Trust	8.96
Skycard	-2.04	Allied Irish	8.88
National County	-1.63	AIB	8.76

Table 6.A: 1997

Variable	Coefficient	Standard Error
CONSTANT	16.893*	3.819
TREND	-0.006	0.040
FIRM	-0.020	0.047
FEE	0.0267**	0.047
R^2	0.957	
Number of Providers	93	

Table 6.B: 1997

Top Five Best Buys		Top Five Worse Buys	
Card Provider	Deviation from the Default Provider	Card Provider	Deviation from the Default Provider
Robert Fleming	-4.41	Standard Charter	12.51
Coutts & Co	-4.15	Capital Bank	8.26
The Express Card	-3.61	Allied Irish	8.00
The People's Bank	-2.80	First Trust	7.61
Skycard	-2.39	Pro72	5.96

Table 7.A: 1998

Variable	Coefficient	Standard Error
CONSTANT	18.389*	1.310
TREND	-0.002	0.003
FIRM	-0.004	0.020
FEE	0.034*	0.009
R^2	0.9937	
Number of Providers	89	

Table 7.B: 1998

Top Five Best Buys		Top Five Worse Buys	
Card Provider	Deviation from the Default Provider	Card Provider	Deviation from the Default Provider
Robert Fleming	-4.68	Standard Charter	11.78
The Express Card	-4.43	Capital Bank	7.54
Co-operative Bank	-2.62	Allied Irish	7.28
Pro66	-2.41	First Trust	6.88
Fizzell Bank	-2.29	RNLI	5.15

Table 8.A: 1999

Variable	Coefficient	Standard Error
CONSTANT	20.674*	2.077
TREND	-0.039**	0.016
FIRM	-0.035	0.025
FEE	0.092*	0.011
R^2	0.968	
Number of Providers	83	

Table 8.B: 1999

Top Five Best Buys		Top Five Worse Buys	
Card Provider	Deviation from the Default Provider	Card Provider	Deviation from the Default Provider
Egg	-7.94	Capital Bank	6.90
The Express Card	-5.18	Allied Irish	6.53
Smile	-4.93	First Trust	5.35
Co-operative Bank	-4.31	Associates	3.81
Hamilton	-3.58	Yorkshire Bank	3.09

Table 9.A: 2000

Variable	Coefficient	Standard Error
CONSTANT	12.988*	2.240
TREND	-0.030	0.022
FIRM	0.008	0.016
FEE	-0.004	0.011
R^2	0.952	
Number of Providers	97	

Table 9.B: 2000

Top Five Best Buys		Top Five Worse Buys	
Card Provider	Deviation from the Default Provider	Card Provider	Deviation from the Default Provider
Egg	-6.92	Capital Bank	8.14
Northern Rock	-6.77	Allied Irish	5.92
Smile	-4.84	AA	4.20
Capital One	-3.87	Associates	4.16
Hamilton	-3.24	NSPCC	4.00

Table 10.A: 2001

Variable	Coefficient	Standard Error
CONSTANT	16.168*	1.884
TREND	-0.028	0.027
FIRM	0.010	0.013
FEE	0.164*	0.009
R^2	0.985	
Number of Providers	90	

Table 10.B: 2001

Top Five Best Buys		Top Five Worse Buys	
Card Provider	Deviation from the Default Provider	Card Provider	Deviation from the Default Provider
Cahoot	-8.64	AA	3.61
Leopold Joseph	-6.96	NSPCC	3.41
Intelligent Finance	-6.85	Skycard	3.25
Northern Rock	-6.14	GM	3.25
Pro25	-5.43	HFC	3.25

Table 11.A: 2002

Variable	Coefficient	Standard Error
CONSTANT	16.334*	2.540
TREND	-0.032**	0.014
FIRM	0.032	0.052
FEE	0.069*	0.013
R^2	0.949	
Number of Providers	91	

Table 11.B: 2002

Top Five Best Buys		Top Five Worse Buys	
Card Provider	Deviation from the Default Provider	Card Provider	Deviation from the Default Provider
Cahoot	-8.51	NSPCC	4.83
Intelligent Finance	-7.28	Household Bank	3.75
Northern Rock	-5.68	Budgens	3.72
Smile	-4.48	Pro76	3.72
Co-operative Bank	-4.02	Bank of Cyprus	3.42

Table 12.A: 2003

Variable	Coefficient	Standard Error
CONSTANT	16.347*	1.661
TREND	-0.014**	0.007
FIRM	-0.023	0.019
FEE	0.212*	0.017
R^2	0.991	
Number of Providers	88	

Table 12.B: 2003

Top Five Best Buys		Top Five Worse Buys	
Card Provider	Deviation from the Default Provider	Card Provider	Deviation from the Default Provider
Leopold Joseph	-7.26	Vanquish	21.88
Cahoot	-6.91	Pro42	5.33
Intelligent Finance	-5.67	Skycard	5.33
Co-operative Bank	-5.24	HFC	5.28
Northern Rock	-4.73	Pro17	5.27

Table 13.A: 2004

Variable	Coefficient	Standard Error
CONSTANT	18.574*	2.933
TREND	0.012	0.0323
FIRM	-0.010	0.037
FEE	-0.087*	0.011
R^2	0.978	
Number of Providers	94	

Table 13.B: 2004

Top Five Best Buys		Top Five Worse Buys	
Card Provider	Deviation from the Default Provider	Card Provider	Deviation from the Default Provider
Northern Rock	-8.56	Vanquish	19.26
Cahoot	-7.38	Asda	11.63
Mint	-6.28	NSPCC	5.39
Intelligent Fiancé	-5.73	Leopold Joseph	5.05
Pro41	-5.32	British Airways	4.46

Table 14.A: 2005

Variable	Coefficient	Standard Error
CONSTANT	16.231*	5.159
TREND	-0.019	0.037
FIRM	-0.063	0.064
FEE	0.144*	0.011
R^2	0.9543	
Number of Providers	89	

Table 14.B: 2005

Top Five Best Buys		Top Five Worse Buys	
Card Provider	Deviation from the Default Provider	Card Provider	Deviation from the Default Provider
Northern Bank	-7.00	Vanquish	20.44
Wanadoo	-6.10	Asda	12.05
Co-operative Bank	-5.35	NSPCC	3.98
Airmiles	-4.06	Household Bank	3.90
American Express	-3.66	Laiki Bank	3.56

Table 15.A: 2006

Variable	Coefficient	Standard Error
CONSTANT	10.442*	3.248
TREND	0.014	0.032
FIRM	0.021	0.021
FEE	0.119*	0.035
R^2	0.938	
Number of Providers	82	

Table 15.B: 2006

Top Five Best Buys		Top Five Worse Buys	
Card Provider	Deviation from the Default Provider	Card Provider	Deviation from the Default Provider
Pro60	-7.48	Vanquish	19.54
BMW Amex	-7.11	Household Bank	3.00
American Express	-6.37	Pro21	2.75
Co-operative Bank	-5.53	Pro9	2.59
Egg	-5.33	Morrisons	2.00

Table 16.A: 2007

Variable	Coefficient	Standard Error
CONSTANT	16.224**	8.327
TREND	0.078	0.131
FIRM	0.046	0.177
FEE	0.227	0.261
R^2	0.990	
Number of Providers	70	

Table 17.B: 2007

Top Five Best Buys		Top Five Worse Buys	
Card Provider	Deviation from the Default Provider	Card Provider	Deviation from the Default Provider
Bank of Scotland	-7.00	Vanquish	19.54
BMW Amex	-7.00	Capital One	8.50
Intelligent Finance	-5.60	MBNA	2.00
Pro23	-5.08	Save the Children	2.00
Pro53	-4.57	Oxfam	2.00

A1.5 Summary

In this section a comprehensive study of competition in the UK credit card market has been presented for the period May 1992 to May 2007. It has been possible to see that there are a range of factors which has impacted on the market throughout the period under investigation.

Appendix A2: List of Credit Card Issuers

American Express
Bank of Ireland
Barclaycard
Capital One
Clydesdale Bank
Co-operative Bank
EGG (formerly known as Prudential Banking plc)
GE Money
HBOS*,***
HSBC
Lloyds TSB***
MBNA
Morgan Stanley
Nationwide
Royal Bank of Scotland**

* includes cards issued by the Bank of Scotland and Halifax.

** includes cards issued by the Royal Bank of Scotland and the National Westminster Bank (NatWest).

*** HBOS and Lloyds TSB merged together in 2009 to form the Lloyds TSB Banking Group. However this does not affect this any of the results in this study.

Appendix A3: List of Credit Cards used in this study

Abbey Balance Transfer
Abbey Cashback
Abbey Flat Rate
Abbey Shopping
Action Aid
Action Aid Gold
Alliance and Leicester
Amazon
American Express Red
American Express Blue
American Express Platinum
American Express Travel
Amivo
Amnesty International
Amnesty Int Advantage
Amnesty International Fixed Rate
AOL
Arsenal FC
Asda
Aston Villa FC
BoS One Card
Barclaycard Charity
Barclaycard Flexi Rate
Barclaycard Graduate
Barclaycard Initial
Barclaycard Platinum
Barclaycard Premiership
Barclaycard Simplicity
Barclaycard Student
Barnardos
Barnsley BS
Barnsley BS Platinum
Birmingham FC
BMA Services
BMI
BMW
Bolton Wanderers FC
Bradford FC
Breakthrough Breast Cancer
Britannia BS
Britannia BS Platinum
British Airways
British Airways Prem
British Airways Premium Plus
Brit Heart Foundation
British Marine Fed
British Motorcycle Fed
Burnley FC
CAFOD
CAFOD Advantage
CAFOD Fixed Rate
Cahoot
Cancer Research (Eng)
Cancer Research (Scot)
Capital One No Hassle Platinum
Capital One Platinum
Capital One Classic
Cardiff City FC
Carlisle United FC
Celtic FC
Charlton FC
Chelsea FC
Cheshire Building Society
Cheshire Building Society Platinum
Childline
Children's Aid Direct
Children's Society
Christian Aid
Christian Aid Advantage
Christian Aid Fixed Rate
Chrysler
Chrysler Platinum
CIMA
Classic FM
Classical Arts
Co-op Advantage Gold
Co-op Advantage Platinum
Co-op Advantage Standard
Co-op Base Rate for Life Gold
Co-op Clear Credit Card
Co-op Flat Rate (5yrs) Gold
Co-op Flat Rate (5yrs) Platinum
Co-op Platinum Base Rate Tracker
Co-op Travel Card
Colchester United FC
Coran
Cricket
Crystal Palace FC
Darlington FC
Delta Air Lines
Egg
England Rugby
Everton FC
Field and Trek
First Direct
First Direct Classic
First Direct Gold
Fulham FC
Garfield
GE Money Everyday
GE Money Transformation
Goldfish
Golf
Great British Rugby League
Greenpeace
Greenpeace Advantage
Greenpeace Fixed Rate
Grimsby Town FC
GSE Racing
Halfords
Halifax Balance Transfer
Halifax Balance Transfer Platinum
Halifax Flat Rate
Halifax One Card
Hearts FC
Help the Aged
Help the Hospice
Homebase
Honda Racing
HSBC
HSBC Premier
HSBC Student
Huddersfield Town FC
Ideal Home Show
IF Balance Transfer
IF Flat Rate
Ipoint
Ipswich Town FC
Jeep
Jeep Platinum
Jordan Grand Prix
Labour Advantage
Labour Advantage Platinum
Labour Fixed Rate Platinum
Leeds Building Society
Leeds United FC
Leicester City FC
Leyton Orient FC
Liberal Democrat Advantage
Liberal Democrat Advantage Platinum
Liberal Democrat Fixed Rate Platinum
Liverpool FC
Lloyds TSB Advance
Lloyds TSB Platinum
Lloyds TSB Rewards
Lloyds TSB Student
Loughborough Building Society
Loughborough Building Society Platinum
Lufthansa
Manchester City FC
Manchester United FC
Mansfield Building Society
Mansfield Building Society Platinum
Marbles
Marks and Spencer More
Marriots
MBNA Classic
MasterCard
MBNA France Card
MBNA Platinum Plus
MBNA Points
MasterCard
MBNA Rewards
Medical Foundation
Medical Foundation Advantage Platinum
Medical Foundation Fixed Rate Platinum
Melton Mowbray Building Society
Melton Mowbray Building Society Platinum
Mencap
Mercedes
Mercedes Platinum
Middlesborough FC
Mini
Mint Classic
Mint Gold
Mint Platinum
Morgan Stanley Buy and Fly
Morgan Stanley Gold
Morgan Stanley Platinum
Moto GP
Motocycle Action Group Motorcard
National Aids Trust
National Geographical Society
Nationwide Comic Relief
Nationwide Classic
Nationwide Gold
NatWest Classic
NatWest Gold
NatWest Platinum
NatWest Student
Nectar
Newcastle Building Society
Newcastle Building Society Platinum
Newcastle United FC
NFU
Norwich and Peterborough
Norwich City FC
NSPCC
Oxfam
Oxfam Advantage Platinum
Oxfam Fixed Rate Platinum
Oxford United FC
PADI
PASS
Paypal Card
PDSA
Peterborough United FC
Port Vale FC
Portsmouth FC
Post Office Classic
Post Office Gold
Post Office Platinum
Priority Club
QPR FC
Ramblers' Association
Ramblers' Association Advantage
Ramblers' Association Fixed Rate
Rangers FC
RBS Classic
RBS Gold
RBS Platinum
RBS Royalties Classic
RBS Royalties Gold
RBS Royalties Platinum
RBS Student
RBS WilliamsF1 Team
Reading FC
RHS
Robinsons Country Leisure
Rotherham United FC
Royal Doutlon
Royal Liverpool Philharmonic
RSPB
RSPB Advantage
RSPB Fixed Rate
RSPB Gold
Ryanair.com

Appendix A3: The Summary Box[5657]

<table>
<tr><td colspan="4">SUMMARY BOX
The information contained in this table summarises the key product features and is not intended to replace any terms and conditions</td></tr>
<tr><td>APR</td><td colspan="3">Typical 10.9% APR variable</td></tr>
<tr><td>Other Interest Rates</td><td>Introductory Rate</td><td>Monthly Rate</td><td>Annual Rate</td></tr>
<tr><td>Purchases</td><td>0% until 1/10/06</td><td>0.87%</td><td>10.90%</td></tr>
<tr><td>Cash Advances</td><td>N/A</td><td>0.95%</td><td>12.00%</td></tr>
<tr><td>Balance Transfers</td><td>0% until 1/10/06</td><td>0.87%</td><td>10.90%</td></tr>
<tr><td>Interest Free Period</td><td colspan="3">Maximum 56 days for purchases if you pay your balance in full and on time.

There is no interest free period on cash advances. Interest free period on balance transfers only applies to the introductory period.</td></tr>
<tr><td>Interest Charging Information</td><td colspan="3">The periods over which interest are charged are as follows:

<table>
<tr><td></td><td>From</td><td>Until</td></tr>
<tr><td>Purchases</td><td>Transaction Date</td><td>Statement date</td></tr>
<tr><td>Cash withdrawals</td><td>Transaction Date</td><td>Statement date</td></tr>
<tr><td>Balance transfers</td><td>Date debited to your account</td><td>Repaid in full</td></tr>
<tr><td>Credit card cheques</td><td>Date debited to your account</td><td>Repaid in full</td></tr>
</table>

If you pay the balance in full, the interest charge for the period from the previous statement to the date of full repayment will be debited the following month.</td></tr>
<tr><td>Allocation of Payments</td><td colspan="3">We will apply payments we receive to your account in the following order:
1. Cash withdrawal fee
2. Outstanding interest
3. Transferred balances
4. Purchases
5. Cash
See section xx of customer terms and conditions for full details.</td></tr>
<tr><td>Minimum Repayment</td><td colspan="3">Greater of 2.25% of outstanding balance or £5 each month</td></tr>
<tr><td>Amount of Credit</td><td colspan="3">Minimum credit limit of £500, maximum credit limit subject to status (or amount if the maximum is known)</td></tr>
<tr><td>Fees</td><td colspan="3">No Annual Fee</td></tr>
<tr><td>Charges</td><td colspan="3">Balance transfers – 2% (minimum £2, maximum £50)
Cash withdrawals – 2% (minimum £2)
Overseas transactions – 2.75% (including purchase of foreign currency and travellers' cheques).</td></tr>
<tr><td>Default Charges</td><td colspan="3">Late payment fee – £20.00
Over credit limit - £20.00
Returned cheque or direct debit – £20.00</td></tr>
</table>

[56] This summary box is for illustrative purposes only

[57] Adapted from Choosing and Using a Credit Card, which is available <http://www.choosingandusing.com>

Appendix A4: Complete List of Credit Card Attributes

Issuer
Provider
Classification
Type of card
Fixed/Variable rate of interest
Number of years the interest rate fixed
Credit card network (status)
Introductory offer
Length of introductory offer on purchases
Length of introductory offer on balance transfers
Introductory APR on purchases
Introductory APR on balance purchases
Interest rates (%) - APR on balance transfers
- APR on cash transactions
Default Charges - Overlimit
- Late payment
- Returned payment
Fees - Balance transfer
- Credit card cheques
- Cash
- Foreign currency transactions
Minimum payment (%)
Minimum payment (£)
Fee pa
Minimum credit limit
Maximum credit limit
Purchase protection
Refund protection
Fraud protection
Minimum age
Minimum income
Loyalty scheme -Yes/No
- Cashback
- Points
- Discounts
- Airmiles
- Vouchers
- Other
Card Benefits - Travel insurance
- Travel benefits
- Holiday discounts
- Wine club
- Legal and medical assistance while aboard
Charity donation - Yes/No
- Amount when account opened (£)
- Amount per £100 spent (£)
- Extra donations (£)
Non-charity donation

Appendix B

Additional Information Related to Chapter Five

Appendix B1: Spread Diagrams for Provider Types
Appendix B2: Falling Base Rate (January 2001 – November 2003)
Appendix B3: Rising Base Rate (July 1996 – July 1998)
Appendix B4: Additional Results Relating to Section 5.X
Appendix B5: Results of Johansen Tests for Co-integration

Appendix B1: Spread Diagrams for Provider Types

Figure B1.1: Banks

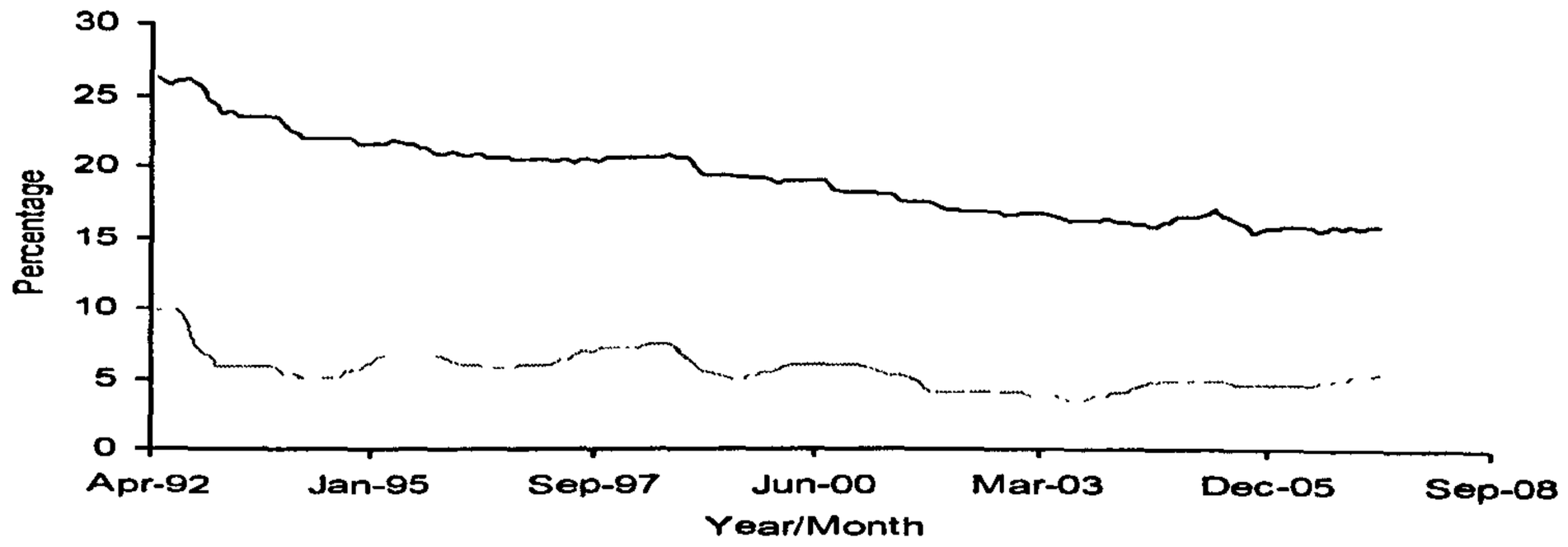


Figure B2.2: Building Societies

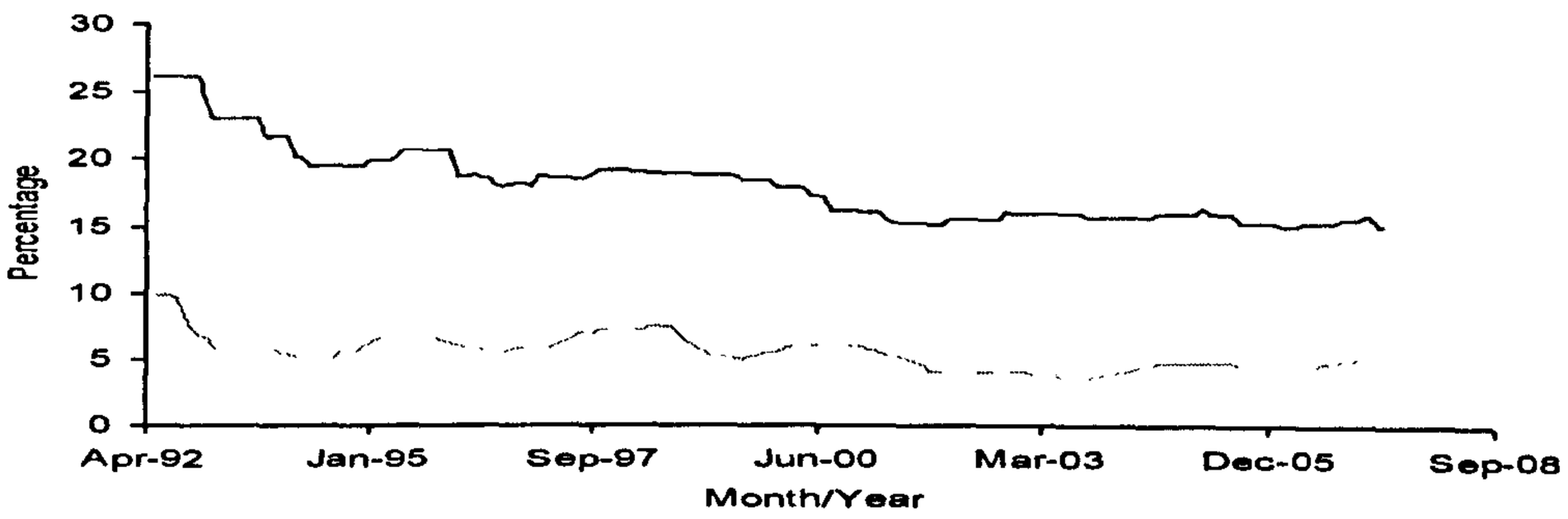


Figure B1.3: Converted Mutuals

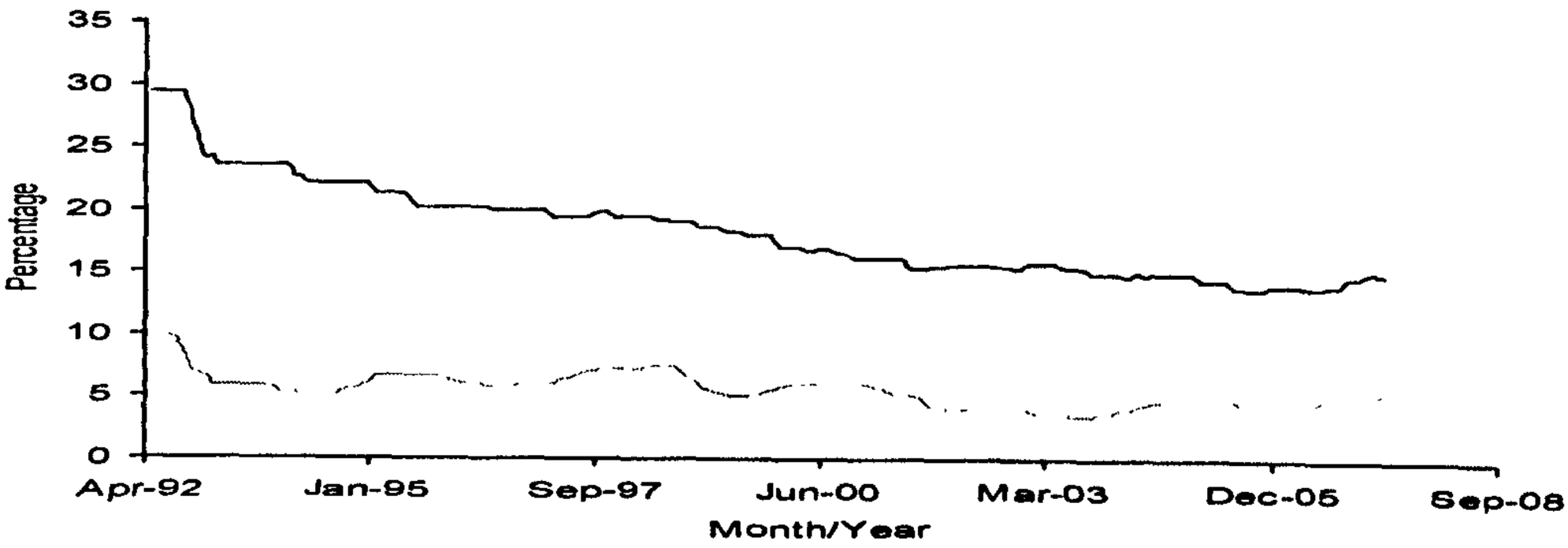
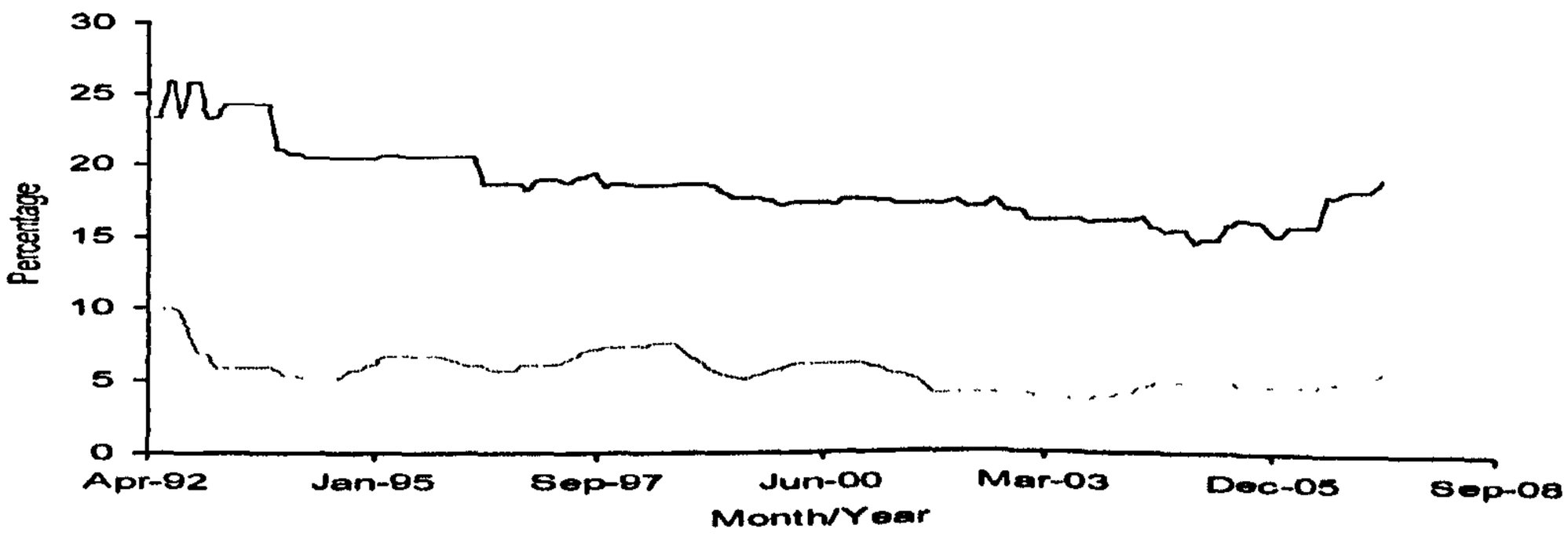


Figure B1.4: Personal Loan Specialists



Appendix B.2: Results of Johansen's tests for Co-integration

Table B2.1: Barclaycard

Maximum Rank	Trace Statistic	5% Critical Value
r=0	32.40	15.41
r≤1	**1.16**	3.76
r≤2	-	

Maximum Rank	Max Statistic	5% Critical Value
r=0	31.24	15.41
r≤1	**1.16**	3.76
r≤2	-	

Maximum Rank	SBIC	HQIC	AIC
r=0	3.77	2.11	1.01
r≤1	**3.51**	**1.79**	0.65
r≤2	3.55	1.81	0.66

Table B2.2: MBNA

Maximum Rank	Trace Statistic	5% Critical Value
r=0	22.29	15.41
r≤1	**3.41**	3.76
r≤2	-	

Maximum Rank	Max Statistic	5% Critical Value
r=0	18.89	14.07
r≤1	**3.41**	3.76
r≤2	-	

Maximum Rank	SBIC	HQIC	AIC
r=0	4.45	2.75	1.62
r≤1	**4.36**	**2.60**	1.44
r≤2	4.38	2.59	1.42

Table B2.3: HBOS

Maximum Rank	Trace Statistic	5% Critical Value
r=0	24.53	15.41
r≤1	**3.60**	3.72
r≤2	-	

Maximum Rank	Max Statistic	5% Critical Value
r=0	20.93	14.07
r≤1	**3.60**	3.76
r≤2	-	

Maximum Rank	SBIC	HQIC	AIC
r=0	2.08	0.86	0.04
r≤1	**1.98**	**0.70**	-0.16
r≤2	1.99	0.69	-0.18

Table B2.4: HSBC

Maximum Rank	Trace Statistic	5% Critical Value
r=0	44.55	15.41
r≤1	**2.63**	3.76
r≤2	-	

Maximum Rank	Max Statistic	5% Critical Value
r=0	41.92	14.07
r≤1	**2.63**	3.76
r≤2	-	

Maximum Rank	SBIC	HQIC	AIC
r=0	4.56	2.71	1.49
r≤1	**4.13**	**2.22**	0.96
r≤2	4.15	2.22	0.95

Table B2.5: RBS

Maximum Rank	Trace Statistic	5% Critical Value
r=0	26.11	15.41
r≤1	**0.74**	3.76
r≤2	-	

Maximum Rank	Max Statistic	5% Critical Value
r=0	25,36	14.07
r≤1	**0.74**	3.76
r≤2		

Maximum Rank	SBIC	HQIC	AIC
r=0	**1.51**	-0.35	-1.56
r≤1	**1.32**	-0.59	-1.85
r≤2	1.37	-0.56	-1.83

Table B2.6: Nationwide

Maximum Rank	Trace Statistic	5% Critical Value
r=0	17.38	15.41
r≤1	**0.32**	3.76
r≤2	-	

Maximum Rank	Max Statistic	5% Critical Value
r=0	17.05	14.07
r≤1	**0.32**	3.76
r≤2	-	

Maximum Rank	SBIC	HQIC	AIC
r=0	0.92	-0.22	-0.98
r≤1	**0.87**	**-0.33**	-1.12
r≤2	0.92	-0.29	-1.10

Table B2.7: Co-operative Bank
No Co-integration found

TableB2.8: Egg
No Co-integration found

Table B2.9: Lloyds TSB

Maximum Rank	Trace Statistic	5% Critical Value
r=0	10.28	15.41
r≤1	**3.51**	3.76
r≤2	-	

Maximum Rank	Max Statistic	5% Critical Value
r=0	15.77	14.07
r≤1	**3.51**	3.76
r≤2	-	

Maximum Rank	SBIC	HQIC	AIC
r=0	0.00	-0.89	-1.50
r≤1	**-0.03**	**-0.98**	-1.62
r≤2	-0.02	-0.99	-1.64

Table B2.10: Capital One

Maximum Rank	*Trace Statistic*	5% Critical Value
r=0	*17.23*	*15.41*
r≤1	**2.00**	*3.76*
r≤2	-	

Maximum Rank	Max Statistic	5% Critical Value
r=0	15.23	14.07
r≤1	**2.00**	3.76
r≤2		

Maximum Rank	SBIC	HQIC	AIC
r=0	3.30	2.40	1.80
r≤1	**3.28**	**2.32**	1.69
r≤2	3.31	1.69	1.69

Appendix B3: Short-Run Coefficients

Table B3.1: Average Credit Card

Variable	Coefficient	Standard Error
L1D.creditcard	0.05	0.09
L2D.creditcard	-0.01	0.09
L3D.creditcard	0.07	0.09
L4D.creditcard	0.13	0.09
L5D.creditcard	0.11	0.10
L6D.creditcard	0.12	0.10
L7D.creditcard	0.11	0.10
L8D.creditcard	0.05	0.10
L9D.creditcard	0.07	0.10
L10D.creditcard	-0.04	0.09
L11D.creditcard	-0.04	0.08
L1D.baserate	0.45	0.18
L2D.baserate	-0.03	0.21
L3D.baserate	-0.03	0.21
L4D.baserate	-0.06	0.21
L5D.baserate	-0.02	0.21
L6D.baserate	0.01	0.21
L7D.baserate	-0.21	0.21
L8D.baserate	-0.31	0.22
L9D.baserate	-0.04	0.22
L10D.baserate	0.09	0.21
L11D.baserate	0.03	0.20
Trend	$2.5e^{-4}$	$4.2e^{-4}$
Constant	-0.04	0.04

Table B3.2: Standard Model

Variable	Coefficient	Standard Error
L1D.creditcard	0.11	0.22
L2D.creditcard	-0.02	0.22
L3D.creditcard	0.08	0.22
L4D.creditcard	-0.20	0.23
L5D.creditcard	-0.16	0.23
L6D.creditcard	-0.27	0.25
L7D.creditcard	-0.30	0.28
L8D.creditcard	-0.08	0.30
L9D.creditcard	-0.22	0.28
L10D.creditcard	0.28	0.28
L11D.creditcard	0.08	0.28
L12D.creditcard	0.25	0.26
L13D.creditcard	0.27	0.25
L14D.creditcard	0.08	0.22
L15D.creditcard	0.12	0.23
L16D.creditcard	-0.12	0.21
L17D.creditcard	0.24	0.22
L18D.creditcard	0.12	0.23
L19D.creditcard	0.28	0.20
L20D.creditcard	0.19	0.19
L1D.baserate	-0.47	0.42
L2D.baserate	-0.44	0.44
L3D.baserate	-0.54	0.46
L4D.baserate	-0.02	0.45
L5D.baserate	-0.53	0.45
L6D.baserate	0.06	0.43
L7D.baserate	0.52	0.44
L8D.baserate	0.52	0.45
L9D.baserate	-0.15	0.48
L10D.baserate	-0.52	0.46
L11D.baserate	0.73	0.46
L12D.baserate	-0.35	0.48
L13D.baserate	0.20	0.50
L14D.baserate	-1.22	0.51
L15D.baserate	-0.42	0.56
L16D.baserate	-0.67	0.48
L17D.baserate	0.36	0.49
L18D.baserate	-0.88	0.46
L19D.baserate	0.16	0.48
L20D.baserate	-0.20	0.41
Trend	0.00	0.01
Constant	-0.06	0.15

Table B3.3: Gold Model

Variable	Coefficient	Standard Error
L1D.creditcard	0.20	0.26
L2D.creditcard	0.23	0.26
L3D.creditcard	0.12	-0.26
L4D.creditcard	0.32	0.26
L5D.creditcard	0.32	0.26
L6D.creditcard	0.27	0.26
L7D.creditcard	0.53	0.25
L8D.creditcard	0.16	0.24
L9D.creditcard	0.18	0.23
L10D.creditcard	0.41	0.22
L11D.creditcard	0.071	0.20
L12D.creditcard	0.301	0.19
L13D.creditcard	0.27	0.19
L14D.creditcard	0.03	-0.19
L15D.creditcard	0.19	0.17
L16D.creditcard	0.09	0.17
L17D.creditcard	0.30	-0.16
L1D.baserate	-0.20	0.36
L2D.baserate	-0.53	0.40
L3D.baserate	-0.17	0.37
L4D.baserate	-0.15	0.37
L5D.baserate	-0.52	0.40
L6D.baserate	-0.40	0.37
L7D.baserate	0.35	0.38
L8D.baserate	-0.09	0.37
L9D.baserate	0.06	0.37
L10D.baserate	-0.25	0.41
L11D.baserate	0.67	0.40
L12D.baserate	-0.22	0.39
L13D.baserate	-0.14	0.40
L14D.baserate	-0.51	0.40
L15D.baserate	-0.40	0.40
L16D.baserate	-0.06	0.39
L17D.baserate	-0.94	0.38
Trend	0.00	0.00
Constant	-0.07	0.09

Table B3.4: Platinum Model

Variable	Coefficient	Standard Error
L1D.creditcard	0.70	0.28
L2D.creditcard	0.53	0.24
L3D.creditcard	0.24	0.20
L4D.creditcard	0.28	0.19
L5D.creditcard	0.40	0.20
L6D.creditcard	0.30	0.19
L7D.creditcard	-0.14	0.20
L8D.creditcard	-0.02	0.21
L9D.creditcard	0.12	0.20
L10D.creditcard	-0.01	0.20
L11D.creditcard	-0.02	0.19
L12D.creditcard	0.02	0.21
L13D.creditcard	-0.31	0.21
L14D.creditcard	-0.39	0.25
L15D.creditcard	-0.21	0.25
L16D.creditcard	0.06	0.21
L17D.creditcard	-0.34	0.22
L18D.creditcard	-0.49	0.21
L19D.creditcard	-0.33	0.24
L20D.creditcard	-0.27	0.27
L21D.creditcard	0.01	0.23
L22D.creditcard	0.25	0.19
L23D.creditcard	0.54	0.21
L1D.baserate	-0.99	0.56
L2D.baserate	-1.75	0.51
L3D.baserate	-0.78	0.45
L4D.baserate	-1.12	0.39
L5D.baserate	-0.79	0.41
L6D.baserate	-1.57	0.44
L7D.baserate	-0.79	0.39
L8D.baserate	-0.93	0.39
L9D.baserate	-0.79	0.35
L10D.baserate	-0.06	0.32
L11D.baserate	-0.16	0.28
L12D.baserate	-0.05	0.27
L13D.baserate	-0.73	0.27
L14D.baserate	-0.31	0.29
L15D.baserate	0.28	0.28
L16D.baserate	-0.65	0.29
L17D.baserate	-0.26	0.29
L18D.baserate	-0.23	0.29
L19D.baserate	-0.45	0.28
L20D.baserate	-0.18	0.29
L21D.baserate	-0.60	0.33
L22D.baserate	0.57	0.29
L23D.baserate	-0.39	0.26
Trend	0.00	0.00
Constant	0.19	0.15

Table B3.5: Barclaycard

Variable	Coefficient	Standard Error
L1D.Barclaycard	0.07	0.25
L2D.Barclaycard	0.13	0.24
L3D.Barclaycard	-0.07	0.25
L4D.Barclaycard	0.01	0.27
L5D.Barclaycard	0.10	0.29
L6D.Barclaycard	-0.08	0.29
L7D.Barclaycard	0.01	0.28
L8D.Barclaycard	-0.16	0.29
L9D.Barclaycard	-0.26	0.30
L10D.Barclaycard	0.29	0.29
L11D.Barclaycard	-0.18	0.29
L12D.Barclaycard	-0.07	0.28
L13D.Barclaycard	0.16	0.26
L14D.Barclaycard	-0.05	0.25
L15D.Barclaycard	0.02	0.25
L16D.Barclaycard	-0.04	0.24
L17D.Barclaycard	-0.11	0.22
L18D.Barclaycard	0.07	0.21
L19D.Barclaycard	0.18	0.20
L20D.Barclaycard	-0.12	0.19
L21D.Barclaycard	0.13	0.18
L1D.baserate	-0.08	1.59
L2D.baserate	-0.83	1.58
L3D.baserate	-1.75	1.55
L4D.baserate	0.30	1.61
L5D.baserate	-0.21	1.68
L6D.baserate	0.13	1.68
L7D.baserate	-0.06	1.66
L8D.baserate	1.23	1.65
L9D.baserate	-0.14	1.55
L10D.baserate	-0.86	1.53
L11D.baserate	0.87	1.57
L12D.baserate	2.56	1.56
L13D.baserate	-0.40	1.80
L14D.baserate	-1.39	1.78
L15D.baserate	-2.28	1.81
L16D.baserate	1.22	1.86
L17D.baserate	-0.45	1.80
L18D.baserate	1.54	1.69
L19D.baserate	-0.58	1.59
L20D.baserate	2.69	1.62
L21D.baserate	-2.08	1.43
Constant	-0.03	0.15

Table B3.6: HBOS

Variable	Coefficient	Standard Error
L1D.HBOS	0.04	0.15
L2D.HBOS	0.03	0.15
L3D.HBOS	-0.01	0.14
L4D.HBOS	-0.07	0.14
L5D.HBOS	-0.11	0.14
L6D.HBOS	-0.18	0.14
L7D.HBOS	-0.03	0.14
L8D.HBOS	-0.20	0.14
L9D.HBOS	0.01	0.15
L10D.HBOS	-0.05	0.18
L11D.HBOS	0.01	0.18
L12D.HBOS	0.22	0.18
L13D.HBOS	-0.10	0.19
L14D.HBOS	0.22	0.18
L15D.HBOS	0.20	0.19
L16D.HBOS	-0.20	0.19
L1D.baserate	-1.25	0.87
L2D.baserate	-0.50	0.85
L3D.baserate	-0.14	0.86
L4D.baserate	-1.03	0.85
L5D.baserate	-0.17	0.91
L6D.baserate	-0.53	0.88
L7D.baserate	-0.42	0.91
L8D.baserate	1.03	0.92
L9D.baserate	-0.23	0.87
L10D.baserate	0.02	0.87
L11D.baserate	-0.54	0.84
L12D.baserate	1.26	0.84
L13D.baserate	-0.03	0.86
L14D.baserate	-0.49	0.85
L15D.baserate	-0.61	0.85
L16D.baserate	0.67	0.71
Constant	0.00	0.08

Table B3.7: HSBC

Variable	Coefficient	Standard Error
L1D.HBSC	-0.45	0.44
L2D.HBSC	-0.61	0.46
L3D.HBSC	-0.69	0.46
L4D.HBSC	-0.54	0.48
L5D.HBSC	-0.61	0.44
L6D.HBSC	-0.56	0.43
L7D.HBSC	-1.23	0.47
L8D.HBSC	-0.60	0.48
L9D.HBSC	-0.82	0.49
L10D.HBSC	-0.55	0.46
L11D.HBSC	-0.62	0.46
L12D.HBSC	-0.53	0.42
L13D.HBSC	-0.48	0.41
L14D.HBSC	-1.27	0.40
L15D.HBSC	-0.44	0.42
L16D.HBSC	-0.76	0.45
L17D.HBSC	-0.49	0.35
L18D.HBSC	-0.29	0.35
L19D.HBSC	-0.40	0.32
L20D.HBSC	-0.39	0.29
L21D.HBSC	-0.74	0.32
L22D.HBSC	-0.32	0.31
L23D.HBSC	-0.43	0.32
L1D.baserate	1.49	1.92
L2D.baserate	-1.31	2.00
L3D.baserate	0.63	1.90
L4D.baserate	-1.31	2.00
L5D.baserate	3.10	2.00
L6D.baserate	-0.43	2.06
L7D.baserate	-1.24	2.09
L8D.baserate	-0.86	2.07
L9D.baserate	0.78	2.09
L10D.baserate	-0.40	2.04
L11D.baserate	-1.37	2.03
L12D.baserate	-0.94	1.95
L13D.baserate	0.59	2.02
L14D.baserate	1.19	2.02
L15D.baserate	0.47	2.04
L16D.baserate	-3.02	2.01
L17D.baserate	1.53	2.08
L18D.baserate	2.02	1.91
L19D.baserate	-3.28	2.00
L20D.baserate	-0.12	2.06
L21D.baserate	-3.18	2.10
L22D.baserate	1.88	2.06
L23D.baserate	-1.12	1.96
Constant	-0.02	0.30

Table B3.8: RBS

Variable	Coefficient	Standard Error
L1D.RBS	0.06	0.76
L2D.RBS	0.30	0.75
L3D.RBS	0.41	0.76
L4D.RBS	0.13	0.70
L5D.RBS	-0.08	0.68
L6D.RBS	-0.10	0.69
L7D.RBS	-0.06	0.67
L8D.RBS	0.33	0.64
L9D.RBS	0.07	0.62
L10D.RBS	0.07	0.63
L11D.RBS	-0.04	0.60
L12D.RBS	0.09	0.54
L13D.RBS	0.15	0.50
L14D.RBS	0.19	0.51
L15D.RBS	0.14	0.48
L16D.RBS	-0.04	0.40
L17D.RBS	-0.07	0.31
L18D.RBS	0.03	0.29
L19D.RBS	0.09	0.30
L20D.RBS	-0.19	0.26
L21D.RBS	0.09	0.15
L22D.RBS	0.08	0.15
L23D.RBS	-0.07	0.15
L1D.baserate	-0.86	0.92
L2D.baserate	0.25	0.90
L3D.baserate	0.62	0.72
L4D.baserate	-0.27	0.70
L5D.baserate	-0.36	0.82
L6D.baserate	-1.50	0.80
L7D.baserate	0.67	0.77
L8D.baserate	0.26	0.81
L9D.baserate	0.18	0.84
L10D.baserate	0.14	0.90
L11D.baserate	-0.26	0.73
L12D.baserate	0.12	0.68
L13D.baserate	-0.49	0.92
L14D.baserate	0.27	0.92
L15D.baserate	0.34	0.77
L16D.baserate	-0.58	0.76
L17D.baserate	-0.16	0.83
L18D.baserate	-0.40	0.78
L19D.baserate	-0.15	0.65
L20D.baserate	0.15	0.63
L21D.baserate	0.27	0.59
L22D.baserate	0.64	0.61
L23D.baserate	-0.33	0.52
Constant	-0.02	0.03

Table B3.9: Nationwide

Variable	Coefficient	Standard Error
L1D.Nationwide	-0.17	0.20
L2D.Nationwide	-0.14	0.20
L3D.Nationwide	-0.45	0.20
L4D.Nationwide	0.02	0.20
L5D.Nationwide	0.04	0.19
L6D.Nationwide	-0.05	0.19
L7D.Nationwide	0.05	0.19
L8D.Nationwide	-0.04	0.16
L9D.Nationwide	-0.12	0.15
L10D.Nationwide	0.00	0.16
L11D.Nationwide	-0.26	0.16
L12D.Nationwide	-0.03	0.16
L13D.Nationwide	0.01	0.15
L14D.Nationwide	0.04	0.14
L15D.Nationwide	0.07	0.14
L1D.baserate	0.54	0.51
L2D.baserate	-1.05	0.56
L3D.baserate	0.61	0.57
L4D.baserate	-0.35	0.53
L5D.baserate	-0.02	0.53
L6D.baserate	0.33	0.52
L7D.baserate	-0.57	0.56
L8D.baserate	1.15	0.56
L9D.baserate	0.23	0.57
L10D.baserate	0.45	0.53
L11D.baserate	-0.39	0.53
L12D.baserate	-0.70	0.52
L13D.baserate	1.14	0.54
L14D.baserate	-1.35	0.57
L15D.baserate	0.30	0.51
Constant	0.05	0.04

Table B3.10: Lloyds TSB

Variable	Coefficient	Standard Error
L1D.Lloydstsb	0.24	0.13
L2D.Lloydstsb	0.20	0.14
L3D.Lloydstsb	0.09	0.14
L4D.Lloydstsb	0.11	0.13
L5D.Lloydstsb	0.25	0.13
L6D.Lloydstsb	0.11	0.13
L7D.Lloydstsb	0.12	0.13
L8D.Lloydstsb	0.18	0.12
L9D.Lloydstsb	0.01	0.13
L10D.Lloydstsb	0.24	0.13
L11D.Lloydstsb	0.22	0.13
L12D.Lloydstsb	0.16	0.13
L1D.baserate	0.32	0.32
L2D.baserate	-0.32	0.34
L3D.baserate	-0.12	0.34
L4D.baserate	0.25	0.35
L5D.baserate	-0.08	0.36
L6D.baserate	-0.21	0.36
L7D.baserate	-0.15	0.36
L8D.baserate	0.56	0.36
L9D.baserate	-0.67	0.35
L10D.baserate	0.69	0.37
L11D.baserate	-0.25	0.37
L12D.baserate	0.02	0.32
Constant	0.00	0.02

Table B3.11: Capital One

Variable	Coefficient	Standard Error
L1D.capitalone	-0.13	0.22
L2D.capitalone	-0.16	0.22
L3D.capitalone	-0.23	0.21
L4D.capitalone	-0.12	0.21
L5D.capitalone	-0.17	0.20
L6D.capitalone	-0.11	0.21
L7D.capitalone	-0.12	0.21
L8D.capitalone	-0.15	0.22
L9D.capitalone	-0.30	0.36
L10D.capitalone	-0.18	0.35
L11D.capitalone	-0.24	0.35
L12D.capitalone	-0.10	0.35
L1D.baserate	2.92	1.68
L2D.baserate	-1.55	1.83
L3D.baserate	-0.54	1.87
L4D.baserate	-0.12	1.92
L5D.baserate	0.18	1.97
L6D.baserate	0.36	1.96
L7D.baserate	-0.82	1.91
L8D.baserate	0.80	1.91
L9D.baserate	-0.66	1.84
L10D.baserate	-1.28	1.81
L11D.baserate	0.57	1.79
L12D.baserate	-0.26	1.59
Constant	0.02	0.31

Appendix C

Additional Information Related to Chapter Six

Appendix C1: Unit Root Tests
Appendix C2: Johansen's Co-Integration Tests
Appendix C3: Marginal Effects for Ordered Probit Model

Appendix C1: Dickey-Fuller and Phillips-Perron Test Results

C1.1: Base Rate

Interest Rate	Dickey-Fuller	Phillips-Perron
Base Rate	-0.585	-1.022
ΔBase Rate	-5.342	-5.344

No intercept or constant included. Δ(.) is the first difference operator. Critical values for the Dickey-Fuller and Phillps-Perron tests at the 5% significance level. The critical value is ....

C1.2: Portfolio without a Trend

Issuer	Dickey-Fuller	Phillips-Perron
Barclaycard	-1.576	-1.595
ΔBarclaycard	-8.894	-8.877
MBNA	-2.033	-2.226
ΔMBNA	-9.343	-9.350
HBOS	-1.337	-1.351
ΔHBOS	-9.247	-9.247
HSBC	-2.527	-2.644
ΔHSBC	-9.277	-9.277
RBS	-2.868	-2.858
ΔRBS	-9.602	-9.609
Nationwide	-1.720	-1.638
ΔNationwide	-10.062	-10.116
Co-operative Bank	-1.400	-1.434
ΔCo-operative Bank	-9.481	-9.491
Egg	-2.135	-2.144
ΔEgg	-9.417	-9.417
Lloyds TSB	-1.843	-1.953
ΔLloyds TSB	-9.383	-9.384
Capital One	-0.079	0.029
ΔCapital One	-9.591	-9.597

C1.3: Portfolio Results with a Trend

Issuer	Dickey-Fuller	Phillips-Perron
Barclaycard	-2.100	-2.194
ΔBarclaycard	-8.851	-8.832
MBNA	-2.193	-2.349
ΔMBNA	-9.372	-9.376
HBOS	-2.056	-2.208
ΔHBOS	-9.216	-9.215
HSBC	-2.622	-2.846
ΔHSBC	-9.269	-9.269
RBS	-2.598	-2.581
ΔRBS	-9.723	-9.739
Nationwide	-2.482	-2.354
ΔNationwide	-10.206	-10.326
Co-operative Bank	-0.013	0.098
ΔCo-operative Bank	-9.969	-9.967
Egg	-1.763	-1.758
ΔEgg	-9.561	-9.565
Lloyds TSB	-1.658	-1.772
ΔLloyds TSB	-9.407	-9.407
Capital One	-1.648	-1.635
ΔCapital One	-9.770	-9.796

C1.4: Standard

Issuer	Dickey-Fuller	Phillips-Perron
Barclaycard	-1.551	-1.576
ΔBarclaycard	-9.362	-9.362
MBNA	-2.287	-2.314
ΔMBNA	-9.391	-9.391
HBOS	-0.877	-0.856
ΔHBOS	-9.633	-9.642
HSBC	-1.684	-1.684
ΔHSBC	-9.433	-9.434
RBS	-7.327	-7.876
ΔRBS	-9.464	-9.464
Nationwide	-0.869	-0.775
ΔNationwide	-9.342	-9.363
Co-operative Bank	0.556	0.885
ΔCo-operative Bank	-9.753	-9.766
Egg	-1.293	-1.299
ΔEgg	-10.161	-10.275
Lloyds TSB	-1.676	-1.751
ΔLloyds TSB	-5.660	-5.639
Capital One	-0.870	-0.855
ΔCapital One	-9.512	-9.515

C1.5: Gold

Issuer	Dickey-Fuller	Phillips-Perron
Barclaycard	-1.908	-1.899
ΔBarclaycard	-6.795	-6.723
MBNA	-1.171	-1.141
ΔMBNA	-3.606	-3.611
HBOS	-0.597	-0.468
ΔHBOS	-7.452	-7.550
HSBC	-	-
ΔHSBC	-	-
RBS	-1.915	-1.975
ΔRBS	-9.416	-9.416
Nationwide	-1.519	-1.590
ΔNationwide	-9.383	-9.383
Co-operative Bank	0.574	0.906
ΔCo-operative Bank	-9.804	-9.817
Egg	-	-
ΔEgg	-	-
Lloyds TSB	-1.227	-1.299
ΔLloyds TSB	-9.487	-9.487
Capital One	-	-
ΔCapital One	-	-

C1.5: Platinum

Issuer	Dickey-Fuller	Phillips-Perron
Barclaycard	-2.628	-2.558
ΔBarclaycard	-9.482	-9.549
MBNA	-2.653	-2.854
ΔMBNA	-9.381	-9.381
HBOS	0.065	0.295

ΔHBOS	-6.622	-6.665
HSBC	-	-
ΔHSBC	-	-
RBS	-1.174	-1.313
ΔRBS	-8.124	-8.114
Nationwide	-	-
ΔNationwide	-	-
Co-operative Bank	-0.188	-0.118
ΔCo-operative Bank	-8.374	-8.381
Egg	-	-
ΔEgg	-	-
Lloyds TSB	-0.257	-0.179
ΔLloyds TSB	-7.360	-7.371
Capital One	-0.199	-0.189
ΔCapital One	-9.454	-9.454

Appendix C2: Johansen Co-Integration Tests

C2.1: Portfolio

Maximum Rank	Trace Statistic	5% Critical Value
r=0	465.842	277.71
r≤1	350.56	233.13
r≤2	266.02	192.89
r≤3	204.52	156.00
r≤4	153.40	124.24
r≤5	106.54	94.15
r≤6	**63.72**	68.52
r≤7	39.03	47.21
r≤8	19.23	29.68
r≤9	6.57	15.41
r≤10	0.30	3.76
r≤11	-	-

Maximum Rank	Max Statistic	5% Critical Value
r=0	115.28	68.83
r≤1	84.55	62.81
r≤2	61.49	57.12
r≤3	51.12	51.42
r≤4	46.86	45.28
r≤5	42.82	39.37
r≤6	**24.69**	33.46
r≤7	19.81	27.07
r≤8	12.65	20.97
r≤9	6.27	14.07
r≤10	0.30	3.76
r≤11	-	-

Maximum Rank	SBIC	HQIC	AIC
r=0	22.81	16.53	12.29
r≤1	22.57*	15.93	11.45
r≤2	22.58	15.62	10.92
r≤3	22.74	15.50	10.61
r≤4	22.93	15.43	10.37
r≤5	23.06	15.24	10.13
r≤6	23.13	**15.22**	9.90
r≤7	23.31	15.25	9.82
r≤8	23.44	15.26	9.76
r≤9	23.55	15.29	9.73
r≤10	23.63	15.33	9,22
r≤11	23.68	15.36	9.74

C2.2: Standard/Classic

Maximum Rank	Trace Statistic	5% Critical Value
r=0	1008.43	233.13
r≤1	761.71	192.89
r≤2	567.18	156.00
r≤3	405.32	124.24
r≤4	262.54	94.15
r≤5	182.20	68.52
r≤6	115.21	47.21
r≤7	58.77	29.68
r≤8	27.14	15.41
r≤9	**10.70**	3.76
r≤10	-	

Maximum Rank	Max Statistic	5% Critical Value
r=0	246.73	62.81
r≤1	194.54	57.12
r≤2	161.86	51.42
r≤3	142.77	45.28
r≤4	80.34	39.37
r≤5	66.99	33.46
r≤6	56.44	27.07
r≤7	31.63	20.97
r≤8	16.43	14.07
r≤9	10.70	3.76
r≤10	-	

Maximum Rank	SBIC	HQIC	AIC
r=0	23.65	13.17	6.12
r≤1	21.74	10.93	3.66
r≤2	20.34	9.24	1.77
r≤3	19.22	7.86	0.22
r≤4	18.22	6.64	-1.15
r≤5	17.85	6.08	-1.84
r≤6	17.53	5.61	-2.42
r≤7	17.23	5.19	-2.91
r≤8	17.12	4.99	-3.17
r≤9	17.08	4.90	-3.29
r≤10	17.00	4.81	-3.39

C2.3: Gold

Maximum Rank	Trace Statistic	5% Critical Value
r=0	163.53	68.52
r≤1	99.80	47.21
r≤2	56.58	29.68
r≤3	16.56	15.41
r≤4	1.09	3.76
r≤5	-	

Maximum Rank	Max Statistic	5% Critical Value
r=0	63.73	33.46
r≤1	43.22	27.07
r≤2	40.01	20.97
r≤3	15.47	14.07
r≤4	1.09	3.76
r≤5	-	

Maximum Rank	SBIC	HQIC	AIC
r=0	2.03	-1.54	-3.94
r≤1	1.74	-1.99	-4.49
r≤2	1.60	-2.26	-4.85
r≤3	1.38	-2.56	-5.21
r≤4	1.35	-2.64	-5.32
r≤5	1.39	-2.62	-5.31

Appendix C3: Marginal Effects from Ordered Probit Estimation

Sample: Barclaycard

	Coefficient	Std. Error	Marginal Effects		
			Decrease	Same	Increase
Barclaycard	**-0.851**	0.198	**0.115**	**-0.074**	**-0.042**
MBNA	0.066	0.171	-0.009	0.006	0.003
HBOS	0.239	0.226	-0.032	0.021	0.012
HSBC	0.126	0.122	-0.017	0.011	0.006
RBS	**2.054**	0.559	**-0.278**	**0.178**	**0.100**
Nationwide	-0.155	0.301	0.021	-0.013	-0.008
Co-operative	**-0.840**	0.423	**0.114**	-0.073	-0.041
Egg	-0.136	0.230	0.018	-0.012	-0.007
Lloyds TSB	-0.328	0.454	0.044	-0.028	-0.016
Capital One	-0.149		0.020	-0.013	-0.007
Base Rate	**1.375**	0.114	**-0.186**	0.119	0.067
Cut-off point 1	10.291	12.282			
Cut-off point 2	13.811	12.318			
Number of observations	92	-			
Log Likelihood	-43.949	-			
Pseudo R-square	0.28	-			
Chi-Square Statistic (p-val)	34.34	(0.000)			

Notes: [1] *All figures in bold are significant at the 5 percent level*

[2] *The marginal effects are calculated at the mean values of the explanatory values*

Sample: MBNA

	Coefficient	Std. Error	Marginal Effects		
			Decrease	Same	Increase
Barclaycard	0.179	0.273	-0.001	0.000	0.001
MBNA	**-0.817**	0.307	0.005	-0.001	-0.004
HBOS	0.388	0.367	-0.003	0.001	0.002
HSBC	**-0.629**	0.225	0.004	-0.001	-0.003
RBS	-0.998	0.715	0.007	-0.002	-0.005
Nationwide	**0.730**	0.428	-0.005	0.001	0.004
Co-operative	0.481	0.633	-0.002	0.001	0.002
Egg	-0.076	0.274	0.000	-0.000	-0.000
Lloyds TSB	-0.933	0.726	0.006	0.002	-0.005
Capital One	0.110	0.134	-0.001	0.000	0.001
Base Rate	-1.253	1.245	0.008	-0.002	-0.006
Cut-off point 1	-36.941	18.761			
Cut-off point 2	-31.105	19.121			
Number of observations	92	-			
Log Likelihood	-25.682	-			
Pseudo R-square	0.38	-			
Chi-Square Statistic	31.15	(0.001)			

Notes: [1] *All values in bold are significant at the 5 percent level*

[2] *The marginal effects are calculated at the mean values of the explanatory values*

Sample: HBOS

	Coefficient	Std. Error	Marginal Effects		
			Decrease	Same	Increase
Barclaycard	0.019	0.168	-0.004	0.002	0.002
MBNA	-0.162	0.150	0.037	-0.020	-0.017
HBOS	**-0.343**	0.199	**0.079**	-0.043	-0.036
HSBC	-0.063	0.114	0.015	-0.008	-0.007
RBS	**0.790**	0.478	**-0.183**	0.100	**0.083**
Nationwide	0.088	0.268	-0.020	0.011	0.009
Co-operative	0.082	0.355	-0.019	0.010	0.009
Egg	-0.296	0.225	0.068	-0.037	-0.031
Lloyds TSB	-0.244	0.392	0.056	-0.031	-0.025
Capital One	-0.046	0.103	0.011	-0.006	-0.005
Base Rate	-0.371	0.605	0.086	-0.047	-0.039
Cut-off point 1	-3.636	11.407			
Cut-off point 2	-0.956	11.409			
Number of observations	92	-			
Log Likelihood	-59.294	-			
Pseudo R-square	0.12	-			
Chi-Square Statistic (p-val)	16.00	(0.141)			

Notes: [1]*All values in bold are significant at the 5 percent level*
[2]*The marginal effects are calculated at the mean values of the explanatory values*

Sample: HSBC

	Coefficient	Std Error	Marginal Effects		
			Decrease	Same	Increase
Barclaycard	-0.056	0.262	0.003	-0.001	-0.002
MBNA	0.115	0.195	-0.006	0.002	0.004
HBOS	0.150	0.283	-0.07	0.002	0.005
HSBC	**-0.305**	0.174	0.015	-0.005	-0.010
RBS	-0.598	0.575	0.029	-0.010	-0.019
Nationwide	**-0.712**	0.379	0.034	-0.011	-0.023
Co-operative	-0.186	0.522	0.009	-0.003	-0.006
Egg	-0.132	0.296	0.006	-0.002	-0.004
Lloyds TSB	**-1.410**	0.707	0.068	-0.023	-0.045
Capital One	0.059	0.146	-0.003	0.001	0.002
Base Rate	**1.514**	0.881	-0.073	0.024	0.048
Cut-off point 1	-43.103	17.900		-	-
Cut-off point 2	-38.796	17.540		-	-
Number of observations	92	-			
Log Likelihood	-29.176	-			
Pseudo R-square	0.24	-			
Chi-Square Statistic (p-val)	18.36	(0.073)			

Notes: [1]*All values in bold are significant at the 5 percent level*
[2]*The marginal effects are calculated at the mean values of the explanatory values*

Sample: RBS

	Coefficient	Std. Error	Marginal Effects		
			Decrease	Same	Increase
Barclaycard	0.052	0.199	-0.006	0.007	0.004
MBNA	0.099	0.173	-0.012	0.003	0.008
HBOS	-0.007	0.226	0.001	-0.000	-0.001
HSBC	-0.038	0.129	0.005	-0.001	-0.003
RBS	**-1.443**	0.501	**0.174**	-0.050	**-0.124**
Nationwide	0.139	0.291	-0.017	0.005	0.012
Co-operative	1.928	0.426	-0.023	0.007	0.017
Egg	-0.021	0.254	0.003	-0.001	-0.002
Lloyds TSB	-0.231	0.454	0.028	-0.008	-0.020
Capital One	-0.081	0.119	0.010	-0.003	-0.007
Base Rate	0.953	0.653	-0.115	0.033	0.082
Cut-off point 1	-20.514	12.674		-	-
Cut-off point 2	-17.212	12.620		-	-
Number of observations	92	-			
Log Likelihood	-42.705	-			
Pseudo R-square	0.16	-			
Chi-Square Statistic (p-val)	16.60	(0.163)			

Notes: [1] *All values in bold are significant at the 5% level*

[2] *The marginal effects are calculated at the mean values of the explanatory values*

Sample: Nationwide

	Coefficient	Std. Error	Marginal Effects		
			Decrease	Same	Increase
Barclaycard	0.373	0.251	-0.010	-0.005	0.014
MBNA	0.093	0.196	-0.002	-0.001	0.004
HBOS	-0.483	0.334	0.013	0.006	-0.019
HSBC	0.100	0.148	-0.003	-0.001	0.004
RBS	0.853	0.666	-0.022	-0.011	0.033
Nationwide	**-1.076**	0.453	0.028	0.013	-0.042
Co-operative	-0.114	0.504	0.003	0.001	-0.004
Egg	-0.290	0.313	0.008	0.004	-0.011
Lloyds TSB	-0.274	0.602	0.007	0.003	-0.011
Capital One	0.200	0.141	-0.005	-0.002	0.008
Base Rate	-0.528	0.893	0.014	0.007	-0.020
Cut-off point 1	-11.063	15.990		-	-
Cut-off point 2	-6.571	15.952		-	-
Number of observations	92	-			
Log Likelihood	-25.861	-			
Pseudo R-square	0.27	-			
Chi-Square Statistic (p-val)	19.57	(0.052)			

Notes: [1] *All values in bold are significant at the 5 percent level*

[2] *The marginal effects are calculated at the mean values of the explanatory values*

Sample: Co-operative Bank

	Coefficient	Std. Error	Marginal Effects		
			Decrease	Same	Increase
Barclaycard	-0.054	0.163	0.013	-0.002	-0.011
MBNA	0.217	0.140	-0.051	0.007	0.043
HBOS	-0.108	0.195	0.025	-0.004	-0.022
HSBC	0.173	0.109	-0.410	0.006	0.035
RBS	**-1.710**	0.441	**0.400**	-0.058	**-0.342**
Nationwide	0.237	0.250	-0.055	0.008	0.047
Co-operative	-0.228	0.346	0.053	-0.008	-0.046
Egg	-0.331	0.209	0.073	-0.011	-0.062
Lloyds TSB	-0.421	0.383	0.099	-0.014	-0.084
Capital One	-0.119	0.098	0.028	-0.004	-0.024
Base Rate	**1.298**	0.610	**-0.304**	0.044	**0.260**
Cut-off point 1	-32.280	11.208		-	-
Cut-off point 2	-30.072	11.155		-	-
Number of observations	92	-			
Log Likelihood	-68.218	-			
Pseudo R-square	0.22	-			
Chi-Square Statistic (p-val)	38.61	(0.000)			

Notes: [1] *All values are significant at the 5 percent level*
[2] *The marginal effects are calculated at the mean values of the explanatory values*

Sample: Egg

	Coefficient	Std. Error	Marginal Effects		
			Decrease	Same	Increase
Barclaycard	-0.657	0.445	7.85e-25	5.03e-07	-4.30e-07
MBNA	-0.673	0.460	8.04e-25	5..16e-07	-4.40e-07
HBOS	-0.664	0.730	7.93e-25	5.09e-07	-4.34e-07
HSBC	**1.137**	0.675	**-1.36e-24**	-8.71e-07	7.44e-07
RBS	-1.134	0.953	1.36e-24	8.70e-07	-7.42e-07
Nationwide	**-4.030**	2.239	**4.82e-24**	3.09e-06	-2.62e-06
Co-operative	-1.091	1.401	1.30e-24	8.36e-07	-7.14e-07
Egg	**-4.445**	2.423	**5.31e-24**	3.41e-06	-2.91e-06
Lloyds TSB	**-5.571**	2.970	**6.66e-24**	4.27e-06	-3.65e-06
Capital One	0.068	0.214	-8.12e-24	-5.21e-08	4.45e-08
Base Rate	**4.675**	2.527	**-5.59e-24**	-3.58e-06	3.06e-06
Cut-off point 1	-242.409	126.749			
Cut-off point 2	-224.710	118.206			
Number of observations	92	-			
Log Likelihood	-15.879	-			
Pseudo R-square	0.43	-			
Chi-Square Statistic (p-val)	23.50	(0.015)			

Notes: [1] *All values are significant at the 5 percent level*
[2] *The marginal effects are calculated at the mean values of the explanatory values*

Sample: Lloyds TSB

	Coefficient	Std. Error	Marginal Effects		
			Decrease	Same	Increase
Barclaycard	0.006	0.227	-0.000	-0.000	0.000
MBNA	0.293	0.226	-0.002	-0.007	0.009
HBOS	**0.659**	0.297	-0.003	-0.016	0.019
HSBC	0.109	0.156	-0.001	-0.003	0.003
RBS	-0.082	0.684	0.000	0.002	-0.002
Nationwide	0.600	0.475	-0.003	-0.014	0.018
Co-operative	**-1.371**	0.567	0.008	0.032	-0.040
Egg	0.138	0.317	-0.001	-0.003	0.004
Lloyds TSB	**-2.881**	0.126	0.017	0.068	-0.085
Capital One	0.159	0.149	-0.001	-0.004	0.005
Base Rate	**2.778**	0.997	-0.016	-0.065	0.082
Cut-off point 1	-25.271			-	-
Cut-off point 2	-20.078			-	-
Number of observations	92				
Log Likelihood	-25.880				
Pseudo R-square	0.31				
Chi-Square Statistic (p-val)	23.71				

Notes: [1]*All coefficients in bold are significant at the 5% level*
[2]*The marginal effects are calculated at the mean values of the explanatory values*

Sample: Capital One

	Coefficient	Std. Error	Marginal Effects		
			Decrease	Same	Increase
Barclaycard	0.066	0.188	-0.007	-0.002	0.009
MBNA	**0.321**	0.163	-0.036	-0.007	**0.043**
HBOS	-0.156	0.217	0.018	0.004	-0.021
HSBC	0.023	0.117	-0.003	-0.001	0.003
RBS	0.106	0.467	-0.012	-0.002	0.014
Nationwide	-0.097	0.281	0.011	0.002	-0.013
Co-operative	-0.123	0.397	0.014	0.003	-0.017
Egg	0.367	0.233	-0.041	-0.008	0.050
Lloyds TSB	0.528	0.450	-0.059	-0.012	0.072
Capital One	-0.125	0.112	0.014	0.003	-0.017
Base Rate	-0.028	0.663	0.003	0.001	-0.004
Cut-off point 1	12.278	12.185			
Cut-off point 2	15.339	12.259			
Number of observations	92	-			
Log Likelihood	-48.013	-			
Pseudo R-square	0.10	-			
Chi-Square Statistic (p-val)	10.92	(0.450)			

Notes: [1]*All values in bold are significant at the 5 percent level*
[2]*The marginal effects are calculated at the mean values of the explanatory values*