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Money Market Mutual Funds and their Impact on Bank Deposits in South Africa

By

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Abstract

Traditional banking theory has always viewed banks as financial intermediaries. Technological developments and regulatory changes have given rise to different types of non-bank financial intermediaries. Researchers have made claims about banks losing importance due to the emergence of non-bank financial intermediaries. As a non-bank financial intermediary, money market mutual funds have experienced phenomenal growth in Europe and the United States over the years. This growth has also been evident in South Africa in the past ten years.

Several researchers have investigated the alleged disintermediation of banks' traditional deposit taking in favour of investment management activities like managed funds. These researchers have found different levels of existence of such disintermediation in the different countries wherein the research was conducted. None of the research known to the author has provided empirical evidence of or refuted the allegation that the traditional deposit taking role of banks is declining and that money market mutual funds are substitutes for banks' deposits. Moreover, such research has not been conducted in South Africa.

Using banks' deposits data and the net assets of money market mutual funds reported at the South African Reserve Bank, this thesis uses regression techniques to provide evidence for the substitutability of banks' deposits by

money market mutual funds. This substitution exists more in long-term deposit and short-term deposit products. The regression models derived in this thesis are found to be stable enough to be used for forecasting total bank deposits.

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted previously for any degree or examination by any other university.

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Vuyolwethu Maxabiso Wessels Mpako Date

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1. Introduction

1.1. Introduction to the research problem

Research on the declining role of banks as financial intermediaries has appeared in recent literature. The disintermediation of banks has been argued to be due to (Hackethal, 2000): deregulation, globalization, advances in information technology, and more efficiently organized capital markets and specialized financial institutions that take advantage of these markets. According to Allen and Santomero (1997), the importance of different types of intermediaries over the past three decades has seen a significant change, with the shares of assets held by banks falling and new types of financial intermediaries like GE Capital emerging.

GE expanded the range and volume of its financial services in the 1980s when it formed General Electric Financial Services (GEFS) to acquire Employers Reinsurance Corporation from Texaco for $1.1 billion (Pierce, 1994). GEFS was then given 100 percent interest in GE Credit Corporation; subsequently, GE acquired the securities firm Kidder Peabody. GEFS now operates in all major segments of the industry: securities, insurance, lending, leasing and other activities closely related to banking. GE Capital is the core company in this diversified financial conglomerate. It operates primarily as a finance company engaged in a full range of leasing, loan and asset management services: it also engages in insurance activities. These various business lines are conducted through 53 consolidated subsidiaries and joint ventures. The company's growing

portfolio of business and commercial real estate loans reflects wider industry trends and illustrates the extent to which GE Capital and other aggressively expanding finance companies have become major competitors of banks.

In Ethiopia, the early nineties saw the development of a funeral fund combined with an accumulating savings and credit association called the *Iddirs* (Wright, 1999). The *Iddirs* (which were probably originally burial societies) are formed by groups of people who commit themselves to contributing a fixed amount into a pooled fund every month. This fund is then used to meet emergency needs (particularly medical and funeral expenses) and/or lent out to members. There are several types of *iddir: c*ommunity *iddirs* (usually the largest and the oldest) occupational *iddirs*, friends and family *iddirs*. When asked why they joined an *iddir* the most common response for all income groups was financial and material assistance, and consolation in time of stress.

Technological advancements have also been a key contributor to the disintermediation of banks. As early as 1983, a USAID-supported Swazi Business Growth Trust (SBGT) pioneered a “smart” card transaction system in micro-enterprise and small enterprise (MSE) applications (Nelson, 1999). This allowed the trust to establish a registered bank more cost effectively than would otherwise be the case. It now provides working capital, agribusiness, construction and franchise lending. While it addresses the needs of small business rather than the needs of the poor, the technology can be easily transferred to programmes geared towards helping the poor. It can easily be

adapted to handle deposits in addition to the cash management for participants. Disbursements and collections are handled even in the absence of online computers, full time electricity or telephone connections. The card contains all the necessary information to conclude transactions at points of sale.

The growth type of organization, also referred to as non-banking financial intermediaries, has also been greatly facilitated by developments in payment systems and the low barriers to entry to the consumer market and these products. As far as cashless payments are concerned, non-banks have been very active along the whole payments processing chain, either as back office processors or front end service providers that interface directly with clients. Non-banks have been very successful in profitable niche markets, such as customers not served by banks, account aggregation, electronic bill presentment and payment (EBPP) and online peer-to-peer payments (P2P). A good example of P2P is PayPal, which initially focused on online auction sites. Others include Google Checkout, for online shopping, and the online payment service, Click and Buy.

In terms of the deposit taking role of banks, money market mutual funds (MMMFs) compete with banks in attracting funds directly from the public (Pierce, 1994). But, unlike banks, MMMFs do not lend directly to households and businesses. Instead, they invest in short-term, tradable instruments - predominantly bank CDs, commercial paper, and government obligations (Pierce, 1994). MMMFs avoid significant costs faced by commercial banks:

MMMFs do not pay deposit insurance premiums; nor do they pay for developing specific information about their assets or maintaining offices and automated teller machines (ATMs) that provide services to less-affluent and less-sophisticated depositors and borrowers. The absence of these costs to MMMFs also provides a price advantage that can be passed on to their customers. In the United States, there were approximately 22 million accounts at 628 taxable MMMFs (whose assets totalled $462 billion) (Pierce, 1994) at the end of 1993.

Modern computer, communications and accounting technology enable MMMFs to purchase and sell assets, and to keep track of their customers' deposits and withdrawals at low cost. This, together with strong competition among MMMFs, has produced low fees, allowing MMMFs to offer investors attractive returns while holding highly diversified portfolios of low-risk, short-term assets—typically with maturities of 90 days or less. MMMFs have a stated objective of maintaining a stable net asset value and they provide shareholders with virtually perfect liquidity because shares can be redeemed by cheque or wire transfer (Pierce, 1994).

1.2. Motivations for research

Schmidt, Hackethal and Tyrell (1999) presented empirical analysis of the alleged transformation of the financial system in France, Germany and the UK based on data developed on the basis of the 1993 system of national accounts (SNA) (United Nations Statistics Division, 1996) using intermediation and

securitization ratios based on the flow-of-funds concept. They found that there is neither a general trend towards disintermediation, nor towards a transformation from bank-based to capital market-based financial systems, nor a loss of importance of banks. The case of France was an exception in that there was a marked transformation in the role of banks and a general decline in the role of the banks.

In South Africa, in the past seven years, the market value of net assets of money-market and fixed-interest funds have increased from R30 billion and R10 billion (as of end December 1999) to R133 billion and R78 billion (as of end September 2006), respectively (South African Reserve Bank, 2006b, p. 44). With the launch of MMMFs in South Africa in 1997, it was speculated that MMMFs would hit the banks' deposit bases and force them to offer substantially higher interest rates to fend off the competition from these funds (Business Times, 1997).

The phenomenal growth in the managed funds sector in South Africa, the claims of bank disintermediation and the inconclusive research on the substitutability of MMMFs and bank deposits have motivated the research on the effects of the cash flows in MMMFs on the South African banks. Moreover, none of the research known to the author has looked at the transforming role of the banks in South Africa, whether the disintermediation of the banks can indeed be attributed to an increase in the activity of the managed funds and what South African banks have done or need to do.

1.3. Research aims

The intended aim of this research is to determine whether the significance of banks as financial intermediaries is declining and to test for the substitutability of bank deposits by MMMFs.

This research will investigate whether there is a tendency towards a decline in the role of South African banks as mobilizers of savings using SNA (United Nations Statistics Division, 1996) based on standards data published by the South African Reserve Bank over the period 1997 to 2007.This research further investigates *inter alia* if there is substitution of any of the bank deposit products by MMMFs during the same period.

2. Literature review

2.1. Introduction

This chapter provides a brief review of the literature on banks as financial intermediaries, their development as deposit taking institutions, their role and the broad role of financial intermediary development in the growth of a country's economy. Literature on the disintermediation of banks is presented in this chapter. One source of disintermediation in the banking sector has been the development of the mutual funds industry. This chapter then also introduces mutual funds, specifically money market mutual funds, as a special class of financial intermediary, their reasons for existence and their growth over time. Given that money market mutual funds and bank deposits seem to provide the same functionality (Barth, Nolle and Rice, 1997), a review of the literature on the substitutability of money market mutual funds and bank deposits is also presented in this chapter.

This chapter is organised as follows: Section 2.2 deals with the theory on banks and their role as financial intermediaries. Section 2.3 reviews the literature on the role of financial intermediaries in economic growth and whether there are ties between the development of financial intermediaries and a country's economic growth. Section 2.4 provides a review of the literature on the more recent views regarding the role of banks as financial intermediaries, with a critique on taking an institutional view versus a functional view on the role of banks. Section 2.5 introduces money market mutual funds and their development as a different class of financial intermediary. Section 2.6 reviews

the literature on the substitutability of money market mutual funds and bank deposits. Section 2.7 concludes with motivations for this research and the relevance of the subject to South Africa.

2.2. Financial intermediation theory

Traditionally, the role of banks has been to borrow loanable funds from lenders with surpluses, issuing indirect securities in exchange. Banks also transmitted the borrowed funds to the borrowers, receiving direct securities in exchange. Second, banks exchanged direct securities with spending units that wished to adjust their relative holdings of securities in direct and indirect form. In this role, banks were acting as intermediaries (Gurley & Shaw, 1955). The theory of banks acting as financial intermediaries and the general theory on financial intermediation has been based on the presence of transaction costs and asymmetric market information (Gurley & Shaw, 1955).

Following on the work by Gurley and Shaw (1955), Diamond and Dybvig (1983), Diamond (1984), etc., Van Damme (1994) provides a review of the literature on banking. Van Damme (1994) summarises the three main functions of banks as follows:

- *Transformation* – Banks transform the illiquid primary securities issued by firms into secondary liquid assets desired by consumers. This is the same function that was identified by Gurley and Shaw (1955);

- *Delegated screening and monitoring* – Banks screen potential borrowers and monitor actual borrowers on behalf of the depositors. This is the same function that was described by Diamond (1984); and
- *Payments* – Banks facilitate payments between consumers by providing a payments system.

The theory on each of these aspects of banks is detailed in the following subsections.

2.3. The liquidity transformation role of banks

According to Gurley and Shaw (1955), financial intermediaries alleviate the imperfections arising from maturity mismatch. They do this by issuing low-yield liquid liabilities that are preferred by lenders and invest a proportion of the funds received into higher-yielding earning assets of the type that borrowers prefer to issue.

The paper by Diamond and Dybvig (1983) provides explicit analysis of the demand for liquidity and the transformation role that banks provide. Diamond and Dybvig (1983) look at how banks issuing demand deposits can improve on a competitive market by providing risk-sharing among consumers who need to consume at different random times and how these demand deposits can lead to bank runs. Diamond and Dybvig (1983) also look at the measures used to prevent bank runs, namely, suspension of convertibility and demand deposit insurance which works in a similar manner to a Central Bank serving as the lender of last resort. They thus see the role of banks as providing insurance

against random shocks to consumers' preferences to the timing of consumption. One drawback of deposit insurance that Diamond and Dybvig (1983) point out is that if deposit insurance is provided, then banks have an incentive to take on interest-rate risk, i.e. they might accept too risky investments, or they might mismatch maturities of assets and liabilities, or they might neglect their task of monitoring the performance of their borrowers.

2.4. The delegated screening and monitoring role of banks

Diamond (1984) develops a theory of financial intermediation based on the minimum costs of production of information. A bank as an intermediary is delegated the task of monitoring of loan contracts that have been written with firms who borrow from the banks. A bank will have a cost advantage in collecting this information compared to the alternative wherein there is either duplication of effort if each lender monitors directly, or a free-rider problem, wherein no lender monitors. According to Diamond (1984), financial intermediation theories are generally based on a cost advantage for the intermediary. Key to the net advantage of the intermediation is diversification within the intermediary. This is the explanation for lenders delegating the monitoring activity to financial intermediaries, rather than to lenders performing this role themselves. The information production task delegated to the intermediary gives rise to incentive problems for the intermediary, which Diamond (1984) terms the delegation costs. Incentive problems arise from unreliable information, as first established in Campbell and Kracaw (1980), implying that monitors need to be given incentives to do their job properly.

Financial intermediaries are thus seen as providing solutions to this incentive problem. Diamond (1984) argues that financial intermediation is beneficial when the monitoring cost savings exceed the delegations of providing incentives.

Lewis (1992) argues that earlier analyses of banking either took the existence of banks as given, typically specifying a bank in terms of assets or liabilities without reference to any production process, or saw their operations as exploiting certain economies of scale in borrowing and lending. By contrast, Lewis (1992) contends that the new literature has as its starting point that the presence of banks must be explained: their existence is traced to what can be termed various “information economies". According to Lewis (1992), market institutions exist to facilitate the financing process with respect to various information costs. These information costs are:

- Search costs - potential transactors must search out, obtain information about, select, meet and negotiate with potential other parties to a contract;
- Verification costs - these arise from evaluating borrowing proposals when lenders are unable to assess the future prospects of a borrower accurately, particularly when some borrowers may have an incentive to paint an overly optimistic picture of the future. Adverse selection can occur when an asymmetry in information costs exists due to lenders' inability to observe the attributes of borrowers and the contingencies under which they operate;
- Monitoring costs – these are incurred when overseeing the actions of the borrower for consistency with the terms of the contract, and ensuring that any failure to meet the delivery promised is for genuine reasons. Moral hazard refers to the problems which may flow from the inability of lenders to ascertain and

exercise control over the behaviour of borrowers, either with respect to the choice of investment project or the effort and diligence with which the business is managed; and

- Enforcement costs - these arise should the borrower be unable to meet the commitments as promised, and a solution must be worked out between the borrower and lender or other aspects of the contract may need to be enforced.

Allen and Santomero (1997) argue that the literature on financial intermediation theory presented in this section is too heavily focused on functions of institutions that are no longer crucial in many developed financial systems, that they focus on products and services that are of decreasing importance to the intermediaries, and are unable to account for activities that have become the central focus of many institutions. They suggest that the literature places too strong an emphasis on the role of intermediaries as reducing frictions of transaction costs and asymmetric information. The next section thus introduces new views of the theory of financial intermediation.

2.5. The new theory of financial intermediation

Allen and Santomero (1997) review the state of intermediation theory and attempt to reconcile it with the observed behaviour of institutions in modern capital markets. Allen and Santomero (1997) suggest that theories of intermediation need to reflect and account for the fact that financial systems in many countries have changed substantially over the past 30 years. Over this period many traditional financial markets have expanded and new markets have

come into existence. Transaction costs have fallen and information has become cheaper and more available. However, these changes have not coincided with a reduction in intermediation. Allen and Santomero (1997) argue that the reverse has happened as intermediaries have become more important in traditional markets and account for a very large majority of the trading in new markets, such as those for various types of derivatives.

Allen and Santomero (1997) argue that participation costs are crucial to understanding the current activities of intermediaries and in particular their focus on risk management. Allen and Santomero's (1997) paper has focused on intermediation theory. The fact that markets have become more dominated by intermediaries also has important implications for asset pricing theory. Current asset pricing theories usually assume investors choose optimal portfolios directly. The fact that there is such extensive intermediation suggests that this approach may miss important features of actual markets.

Scholtens and Van Wensveen (2000) also provide a critique of the recent financial intermediation theory that is based on the traditional Arrow-Debreu model of resource allocation. Although the Arrow-Debreu model of resource allocation and the General Equilibrium theory are beyond the scope of this thesis, it is deemed important to briefly explain what these are and their relevance to this thesis because the existence of financial intermediaries is based on resource allocation that arises as a result of market imperfections (Scholtens and Van Wensveen, 2000). The Arrow-Debreu model is named after American economist Kenneth Arrow and French-born economist Gerard

Debreu, who examined the dynamics of the economic system and were able to prove the existence of a multi-market equilibrium in which no excess demand or supply exist (Arrow and Debreu, 1954). In the Arrow-Debreu model of resource allocation, firms and households interact through markets and financial intermediaries play no role. When markets are perfect and complete, the allocation of resources is Pareto efficient and there is no scope for intermediaries to improve welfare. Pareto efficiency, or Pareto optimality, is a term named after Vilfredo Pareto, an Italian economist who used the concept in his studies of economic efficiency and income distribution. Given a set of alternative allocations and a set of individuals, a movement from one allocation to another that can make at least one individual better off, without making any other individual worse off, is called a Pareto improvement or Pareto optimisation. An allocation of resources is Pareto efficient or Pareto optimal when no further Pareto improvements can be made.

According Scholtens and Van Wensveen (2000) in the recent financial intermediation theory, financial intermediaries have a function only because financial markets are not perfect, i.e. financial intermediaries exist by the grace of market imperfections. As long as there are market imperfections, there are intermediaries; as soon as markets are perfect, intermediaries are redundant: they lose their function as soon as savers and investors have the perfect information to find each other directly, immediately and without any impediments, so without costs. Thus, in a world with a tendency towards greater market transparency and efficiency, financial intermediaries are an endangered species.

According to Scholtens and Van Wensveen (2000), a tendency towards a relative reduction of certain activities of some financial intermediaries is arising, most clearly in the United States. Scholtens and Van Wensveen (2000) provide empirical data that indicates that the relative size of depository institutions (commercial banks, savings institutions, credit unions) in the financial system diminishes. In contrast, the relative size of pension funds (private and government funds) as well as that of mutual funds (including money market funds) increases considerably.

Scholtens and Van Wensveen (2000) contend that banks, including universal and investment banks, are under pressure, from competition amongst themselves, and also increasingly from other intermediaries such as life insurance firms, investment funds, leasing firms and other finance firms, such as specialised daughters of big industrial or trade firms, merger and acquisition specialists and advice departments of auditor or lawyer firms. Moreover, large firms are entering the money market directly instead of dealing with a bank. The growth of securitised assets reflects the upcoming role of stock exchanges at the expense of traditional banking. Scholtens and Van Wensveen (2000) contend that it is a misconception to interpret the relative declining role of banks as a general process of disintermediation. They conclude that financial intermediaries are not fading away. Neither is the banking industry. Only an institutional perspective might conclude to disintermediation of the banking industry. The functional view, however, reveals that financial intermediaries are of increasing importance to the modern economy. They contend that financial intermediaries perform gradually more sophisticated functions in the modern

and more complex economy. Despite the ongoing perfection, indicating a declining price of information, asymmetric information and transaction costs seem to be still important elements in intermediation processes.

Scholtens and Van Wensveen (2000) assert that the theory of financial intermediation should move beyond the paradigm of the static case of the perfect market that is hampered by incidental imperfections, and assume a more dynamic concept in which new markets are developed for new products, where financial institutions do not act as agents who intermediate between savers and investors and thus alleviate market imperfections like asymmetric information and participation costs, but are independent market parties that create financial products and whose value added to their clients is the transformation of financial risk, term, scale, location, and liquidity.

Scholtens and Van Wensveen (2000) further contend that the financial intermediary provides consumer and business households with a variety of services that fulfil their different needs; the financial intermediary is involved in a complex process of financial transformation. In the course of qualitative asset transformation, with respect to maturity, liquidity, risk, scale and location, the financial intermediary adds value for ultimate savers and investors. This active role contrasts sharply with the passive intermediating of savings to investments within the economy, a thought that prevails in the traditional theory of financial intermediation. Scholtens and Van Wensveen (2000) further contend that value-addition appears to be a major drive of the modern financial intermediary. Therefore, value-addition should be the focus of intermediation theory. This may

be accomplished through participation cost reduction as Allen and Santomero (1997) suggest, and/or through an expansion of the set of services in the financial sector. This means that though asymmetric information is relevant in understanding certain policies of the financial intermediary, customer orientation is his general device. Reducing costs and informational asymmetries may be part of this process, but it occurs as a by-effect. Scholtens and Van Wensveen (2000) suggest that the analysis of policies of optimization of risks and rewards by financial intermediaries helps to better understand the essence of its business than does paying attention to the potential effects of asymmetric information, i.e. adverse selection, moral hazard and credit rationing. As an illustration, Scholtens and Van Wensveen (2000) further suggest that the modern financial intermediation theory would see the rise of the mutual fund industry not as disintermediation, but as the involvement of a new type of financial intermediary in providing financial transformation services.

2.6. Financial intermediaries and economic growth

Several researchers have focused on the linkages between financial intermediaries and economic growth and there have been divergent views on how exactly the financial structure of a nation affects economic growth (Levine, 1997).

Goldsmith (1969) gives stylized facts on financial structure i.e. the mixture of financial instruments, markets and intermediaries, and economic development He finds that in the course of economic development, a country's financial

system grows more rapidly than national wealth. Hence the financial interrelations ratio (the quotient of the aggregate market value of all financial instruments in existence in a country at a given date to the value of its tangible net national wealth) tends to increase. It appears that the main determinant of the relative size of a country's financial system is the separation of the functions of saving and investing among different (groups of) economic units. Goldsmith (1969) finds that, in most countries, the share of financial institutions in the issuance and the ownership of financial assets has considerably increased in the process of economic development. The "institutionalization" of saving and the ownership of financial assets has affected the main types of financial instruments differently. He finds that as economic development has progressed, the share of the banking system in the assets of all financial institutions has declined, though its share in the country's total financial assets has continued to increase for a while. On the question of financial development i.e. the overall quantity and quality of financial instruments, markets and intermediaries, and economic growth, Goldsmith (1969) documents a positive correlation between financial development and the level of economic activity in 35 countries, using data prior to 1964. However, he is unwilling to draw causal interpretations from the data and unwilling to asset that financial development exerts a causal influence on economic growth.

Researchers after Goldsmith (1969) have shown recognition for the positive impact of financial intermediation on the economy. Levine (1997) finds that financial intermediation can affect economic growth by acting on the saving rate, on the fraction of saving channelled to investment or on the social marginal

productivity of investment. In general, financial development will be positive for economic growth.

Levine, Loayza and Beck (2000) first examine the nature of the effect of financial intermediary development on economic growth. They use two econometric approaches. The first, generalized method-of-moments (GMM) dynamic panel estimators are specifically designed to deal with key problems plaguing past studies of the finance-growth nexus: simultaneity bias and omitted variable bias, including that derived from unobserved country-specific effects. As a consistency check, Levine *et al.* (2000) also use a pure cross-sectional, instrumental variable. The panel and cross-sectional results tell the same story: that the exogenous component of financial intermediary development is positively associated with economic growth; specifically, the large, positive link between financial intermediary development and economic growth is not due to potential biases induced by omitted variables, simultaneity or reverse causation.

Levine *et al.* (2000) further investigate whether cross-country differences in the legal rights of creditors, the efficiency of contract enforcement, and accounting system standards help explain cross-country differences in the level of financial intermediary development. Levine *et al.* (2000) find the following: countries with laws that give a high priority to secured creditors getting the full present value of their claims against firms; legal systems that rigorously enforce contracts, including government contracts; and accounting standards that produce high-quality, comprehensive and comparable corporate financial statements tend to have better developed financial intermediaries. The findings of Levine *et al.*

(2000) are consistent with the view that legal and accounting reforms that strengthen creditor rights, contract enforcement and accounting practices can boost financial intermediary development and thereby accelerate economic growth. The findings of Levine *et al.* (2000) suggest not only that financial development causes economic growth, but also that improvements in contract enforcement are a major determinant of financial development.

In a sequel to Levine *et al.* (2000), Beck, Levine and Loayza (2000) attempt to clarify the relation between financial intermediation and economic performance. The authors do this by empirically assessing the impact of financial intermediaries on private savings rates, capital accumulation, productivity growth and overall economic growth. Beck *et al.* (2000) further empirically explore one factor that underlies cross-country differences in total factor productivity growth, viz. the difference in the level of financial intermediary development. The analysis performed by Beck *et al.* (2000) is based on data from 63 countries averaged over the period 1960 to 1995.

Beck *et al.* (2000) find an economically large and statistically significant relation between financial intermediary development and real per capita growth in gross domestic product (GDP) as well as total factor productivity growth. Beck *et al.* (2000) find that the positive relation between financial development and economic growth and productivity growth are not due to simultaneity bias or country-specific effects. This result is robust to the use of different estimation procedures, conditioning information sets, and indicators of financial development. The results, however, indicate an ambiguous relation between

financial intermediary development and both physical capital growth and private savings rates. While there tends to be a positive link between financial intermediary development and both physical capital accumulation and private savings rates, the results of Beck *et al.* (2000) are sensitive to alterations in estimation techniques and measures of financial intermediary development. Their results support the view that better functioning financial intermediaries improve resource allocation and accelerate total factor productivity growth with positive repercussions for long-run economic growth.

Amaral and Quintin (2005) develop a model in which the importance of financial intermediation for economic development can be measured. They generate financial differences by varying the degree to which contracts can be enforced. By generating financial differences via enforcement frictions, Amaral and Quintin (2005) adopt and formalize the view that the quality of institutions is a key determinant of financial development. They find that both the allocation and the capital intensity channels emphasized by the literature on financial development are quantitatively important. Their experiments complement the existing literature on the links between financial development and economic development by bridging the gap between theoretical models and empirical findings. Amaral and Quintin (2005) show that the channels emphasized by the theoretical literature are quantitatively meaningful.

2.7. Background on MMMFs

According to Domian (1992), the history of MMMFs can be traced back to 1972, but most of the MMMF industry's growth occurred in the 1980s. MMMFs are a specialized type of money market intermediary that purchases large pools of money market instruments and sells shares in these instruments to investors. In this way, the MMMFs enable individuals to earn yields available on money market instruments.

The explosive growth experienced by MMMFs in the United States from the 1970s onwards is examined by Cook and Duffield (1979a). MMMFs grew from $2.2 billion in assets at the end of 1974 to $7.4 billion in assets at the end of 1980, to $200 billion by the middle of 1982 (Rosen and Katz, 1983). According to Cook and Duffield (1979a), there are two explanations for this growth in MMMFs. The first reason is that MMMFs are primarily a means of providing access to money market yields. Government regulation and minimum purchase requirements in the money markets were obstacles that meant that individual investors could not realize market yields on short-term investments. The second reason is that MMMFs fill a gap in financial systems in that they can provide asset liquidity since MMMFs offer investors the advantages that result from the pooling of large amounts of short-term funds. By pooling these large amounts of short-term funds, MMMFs have the advantages of economies of scale, liquidity creation and divisibility, and diversification (Cook and Duffield, 1979a). To substantiate these advantages, Cook and Duffield (1979b) go on to do an analysis of the expenses of MMMFs, providing evidence that the average costs

of MMMFs decline as assets increase, when looking at both the operating costs and non-operating costs.

In Koppenhaver and Sapp (2005), MMMFs are described as providing at least two financial intermediation roles of:

- *Brokerage* – in this role, MMMFs serve as agents for other decision makers and sell information and services for a fee; and
- *Asset transformation* – in this role, MMMFs change the nature of direct financial claims so that the claims on the intermediary have preferred characteristics and greater demand than the direct claims.

In the asset transformation role, MMMFs transform small balances from retail investors into liquid funds with very limited price risk. They do this through holding a diversified portfolio of high quality short-term instruments and by managing the maturity and credit risk of the portfolio.

In an attempt to understand how MMMFs perform their brokerage and asset transformation functions whilst pursuing superior performance in trading short-term credit instruments, DeGennaro and Domian (1996) develop a costly transactions efficient markets model that explains maturity decisions. The reaction of fund managers to interest rate changes supports the view that fund managers have a target level for interest-rate risk. After fund managers have selected their interest-rate risk, they forego active management as they move gradually towards to this rate. DeGennaro and Domian (1996) also find that changes in fund assets also affect the fund's maturity in a manner consistent

with the transaction costs. Because MMMF managers have limited ability to forecast interest-rates, investors choosing between such funds should base their decisions on transaction fees (management fees and expense ratios) and convenience features.

Maggs (1991) investigates the relationship between market interest rate movements and the number of MMMFs from 1971 to 1984. According to Maggs (1991), the growth in the number of MMMFs, which proceeded rapidly through 1974 (when the market interest rates in the United States peaked until they slowed in mid-1975) was greatly facilitated by improvements in wire transfer technology. In providing possible explanations for the way in which market interest rate changes affect the equilibrium quantity of MMMFs, Maggs (1991) offers two theories. The first theory is that an increase in the market interest rate above some threshold level triggers entry behaviour by non-banking financial intermediaries as long as the opportunity cost of not entering exceeds the fixed cost of entering. Subsequent reductions in the market interest rate below the peak rate result in the continued offering of MMMFs. This means that there is an asymmetric response to changes in the market interest rate about the threshold rate. The second theory is that brokers base their quantity decision on the current market interest rate and a high number of previous interest rates.

The empirical evidence from Maggs' (1991) research gives limited support to his threshold-rate theory that entry into the MMMF market and depository disintermediation takes place because there is a minimum market interest rate above which the introduction of new deposit substitutes by non-banks is

justified. There is, however, evidence of the pace at which MMMFs is being mirrored by corresponding changes in the peak market interest rate.

On the subject of MMMFs and market interest rates, Jasen and Herman (1989) make the statement that “the average maturity on MMMFs is a good indicator of which way professional money managers think rates are headed”. Domian (1992) does empirical tests to examine the relation between fund maturity and market interest rates. Domian (1992) shows that there is a causal relation between fund maturity and market interest rates, although the findings reveal a relationship that runs in the opposite direction. Market interest rates Granger-cause average fund maturity; maturity does not cause interest rates, i.e. market interest rates can be useful in forecasting average fund maturity as market interest rates provide statistically significant information about the future values of average fund maturity. Fund managers lengthen maturities after interest rates decline and shorten maturities after rates rise. The decisions on maturity, however, cannot be used to improve market interest rate forecasts. These findings are consistent with the efficient market hypothesis that was introduced by Fama (1970) that states that asset prices in financial markets should reflect all available information; as such, prices should always be consistent with fundamentals.

Rosen and Katz (1983) look at the role of money funds in households’ asset allocation decisions. Their view is that MMMFs have proliferated due to the slow pace in deregulating the financial markets. As a result, MMMFs have led to an unbalanced financial system with investments being concentrated in the short

end of the market. Full deregulation of the financial markets would lead to the end of the MMMF in *ad hoc* deregulation.

Hubbard (1983) discusses the effect of the substitution of MMMF deposits for transaction balances at depository institutions on monetary control and tests the hypothesis that MMMF deposits are a substitute for money in traditional money demand models. The paper by Hubbard (1983) finds that there is no evidence that checkable MMMFs significantly affect the demand for money as a substitute for demand deposits, and that the MMMFs should not be considered to be part of money supply and subject to the regulations imposed on other transaction accounts.

2.8. The substitutability of bank deposits by MMMFs

Hubbard (1983) was one of the first researchers to look at the substitutability of bank deposits by MMMFs, although his research was more focused on the possible implications of this to regulations and money supply. As noted earlier, his findings were that there was no evidence that MMMFs significantly affected the demand for money.

According to Barth *et al.* (1997), with the development in financial markets and financial innovation, the share of assets managed by mutual funds has seen dramatic increases. This has prompted the question of whether banks and mutual funds are complimentary or substitute monetary institutions/vehicles.

Pilloff (1999) attempts to answer the question of MMMFs becoming substitutes for accounts at insured institutions. In doing this, Pilloff (1999) examines characteristics of accounts, concentrating on non-maturing deposits, at insured depositories. Pilloff (1999) finds that MMMFs provide investors with a close substitute for deposits at insured financial institutes.

Schmidt *et al.* (1999) did an empirical study to support or refute the belief that the major European economies (Germany, France and the United Kingdom) are undergoing a process of transformation that is leading to the decline of the role of banks. The national statistics that they use are derived and explained by Corbet and Jenkinson (1996) as per the agreed standard construction of flow of funds figures based on the system of national accounts noting the differences in the definitions of sectors and transactions. Schmidt *et al.* (1999) find that there is neither a general trend towards disintermediation, nor towards a transformation from bank-based to capital market-based financial systems, nor a loss of importance of banks. France is the only country that shows strong signs of transformation as well as signs of a decline in the role of banks. However, the common pattern that they find is that the intermediation chains are lengthening in all three countries, with NBFIs (non-banking financial intermediaries) taking over a more important role as mobilizers of capital from the non-financial sectors, with a trend towards securitization of bank liabilities. They assert that this change is increasing the funding costs of banks and may put banks under pressure.

Allen and Parwada (2004) extend Pilloff's (1999) work to investigate the alleged disintermediation using data on Australian bank-affiliated funds and find that managed funds do not displace bank liabilities.

2.9. Motivations for this research

The literature review provided in this chapter has shown that there are conflicting views regarding the role of banks as financial intermediaries, and the continued existence of banks. The research on the disintermediation of banks conducted in various countries has not been able to conclusively show if there is a general trend towards the disintermediation of banks.

The research, which some authors argue is based on the functional view of banks, has not conclusively shown if the role of banks in a developing economy is decreasing, nor if there is a general transformation of financial systems from bank-based to capital market-based financial systems, nor a loss of importance of banks.

The growth in the MMMFs in the past three decades has triggered research on the substitutability of MMMFs and bank deposits because, functionally, some of the roles that they perform are similar. The studies performed in various parts of the world do not provide conclusive evidence for the substitutability of MMMFs and bank deposits.

The inconclusive mixed results on the research on the general existence of disintermediation of banks, on the declining role of banks as mobilizers of savings, the phenomenal growth in MMMFs coupled with inconclusive research on the substitutability of MMMFs and bank deposits is the motivation for the study undertaken in this paper on MMMFs and their impact on bank deposits in South Africa. Moreover, none of the research known to the author has looked at the transforming role of banks in South Africa, whether there is disintermediation of banks in South Africa, whether this can be attributed to the increase in the activity of managed funds, and what South African banks have done or need to do in order to mitigate the risks associated with disintermediation arising from managed funds.

3. Research questions and hypotheses

The measure of financial disintermediation used in this paper was based on the concept of the economy as a set of sectors that interchange financial assets as in Schmidt *et al.* (1999). Accumulated over time these financial flows translate into financial assets of one sector and an offsetting liability item of another sector. With the aggregation of financial flows over sectors, flows between entities that belong to the same sector are consolidated, so that, say, a bank's loan to another bank or a liability of one non-financial company *vis-à-vis* another non-financial company are cancelled out. Because this concept focuses on sectors and not on single economic units, only inter-sectoral, but no intra-sectoral, claims and liabilities, such as a loan from one bank to another bank, are considered in the analysis.

In this thesis, the total deposits of banks were compared to the total assets held by banks. The definition of banks used in this thesis, as per the South African Reserve Bank (SARB), included all banks, mutual banks and local branches of foreign banks registered under the Banks Act, Act No. 94 of 1990. According to the Banks Act, Act No. 94 of 1990, all banks should report on their activities and their balance sheets to the SARB on a monthly basis. This is the data on Money and Banking. Bank's deposits consisted of the following product splits (South African Reserve Bank, 2006a):

- Cash management, cheque and transmission (KBP1070M);
- Other demand deposits (KBP1071M);

- Short-term savings (KBP1072M);
- Other short-term savings (KBP1073M);
- Other medium-term savings (KBP1075M); and
- Long-term deposits (KBP1076M).

Table 3-1 shows the split of bank deposits as reported by the SARB for the year ends of 2002 to 2006.

Table 3-1: Bank's deposits product splits

Deposits (R millions)								
End of	Cash managed, cheque and transmission (KBP1070M)	Other demand (KBP1071M)	Short-term savings (KBP1072M)	Other short-term (KBP1073M)	Medium-term savings (KBP1074M)	Other medium-term (KBP1075M)	Long-term (KBP1076M)	Total (KBP1077M)
2002	190,158	190,087	37,179	116,167	22	166,097	112,580	812,290
2003	225,876	196,151	45,095	146,518	15	190,881	106,749	911,284
2004	251,241	214,561	51,066	151,078	92	232,161	132,935	1,033,134
2005	301,469	249,847	57,344	182,612	313	267,637	173,406	1,232,628
2006	353,852	319,774	72,403	261,464	24	281,149	250,786	1,539,452

Source: Adapted from South African Reserve Bank (2006a)

Research question #1

Is deposit taking declining in importance relative to other banking activities (bank deposits relative to bank's assets)?

In line with the research by Allen and Parwada (2004), wherein they showed that the market share enjoyed by bank deposits has fallen from its peak of 62% in 1990 to 45% in 2001, while mutual funds increased their share from 8% in the mid-nineties to 14% in 2001, a similar trend was expected in South Africa. This was due to the increase in the net assets of money market and fixed-interest funds in South Africa from R30 billion and R10 billion (as of end December 1999) to R133 billion and R78 billion (as of end September 2006) respectively (South African Reserve Bank, 2006b, p. 44).

Research question #2

Is the role of banks as deposit taking institutions declining relative to total economic activity?

Allen and Parwada (2004) showed that the domineering position held by bank deposits was challenged by the phenomenal growth in investments held in superannuation owing largely to the introduction of a compulsory pension scheme with the promulgation of the Superannuation Guarantee (Administration) Act in 1992. Allen and Parwada (2004) showed the market share in terms of economic importance by expressing the funds under management in the four investment classes as a percentage of the gross

domestic product (GDP). The four asset classes considered in Allen and Parwada (2004) were bank deposits, cash management trusts (CMTs), superannuation funds and unit trusts. Cash management trusts were a form of managed investment in which the primary investments held were in a wider range of money market securities than bank savings accounts.

Similar results were expected in South Africa, as there had been a marked increase in the net assets of money market and fixed-interest funds in South Africa (South African Reserve Bank, 2006b, p. 44).

Research hypotheses

In this study it was proposed that a non-structural model for debt-lease substitution be used to test for the substitution of bank deposits by MMMFs, as popularised by Ang and Peterson (1984) and later used by Allen and Parwada (2004). In this model, the substitution coefficient was the proportion of deposits that banks lost to MMMFs. A significant and notable difference between the approach taken in this thesis and that of Allen and Parwada (2004) was that Allen and Parwada (2004) had data on which banks had managed fund operations and which ones did not have bank-affiliated managed funds. Because the bank deposits data comprises further product splits, a hypothesis test was first performed on the total bank deposits data and the net assets of MMMFs, whereafter several other hypothesis tests were performed on the individual product splits and the net assets of MMMFs.

Research hypotheses #1

The null hypothesis states that substitution coefficient measuring the proportion of deposits that banks lose to MMMFs is equal to 1. The alternate hypothesis states that the proportion of deposits that banks lose to MMMFs is not equal to 1.

Null hypothesis (H_0): Bank deposits and MMMFs are substitutes, Rand-for-Rand. The substitution coefficient is equal to 1;

Alternate hypothesis (H_1): The proportion of deposits that banks lose to MMMFs is not equal to 1;

Significance level (α): The significance level is 0.05 (five per cent).

Research hypotheses #2

The null hypothesis states that substitution coefficient measuring the proportion of cash management, cheque and transmission deposits that banks lose to MMMFs is equal to 1. The alternate hypothesis states that the proportion of cash management, cheque and transmission deposits that banks lose to MMMFs is not equal to 1.

Null hypothesis (H_0): Cash management, cheque and transmission deposits and MMMFs are substitutes, Rand-for-Rand. The substitution coefficient is equal to 1;

Alternate hypothesis (H_1): The proportion of cash management, cheque and transmission deposits that banks lose to MMMFs is not equal to 1;

Significance level (α): The significance level is 0.05 (five per cent).

Research hypotheses #3

The null hypothesis states that substitution coefficient measuring the proportion of other demand deposits that banks lose to MMMFs is equal to 1. The alternate hypothesis states that the proportion of other demand deposits that banks lose to MMMFs is not equal to 1.

Null hypothesis (H_0): Other demand deposits and MMMFs are substitutes, Rand-for-Rand. The substitution coefficient is equal to 1;

Alternate hypothesis (H_1): The proportion of other demand deposits that banks lose to MMMFs is not equal to 1;

Significance level (α): The significance level is 0.05 (five per cent).

Research hypotheses #4

The null hypothesis states that substitution coefficient measuring the proportion of other short-term deposits that banks lose to MMMFs is equal to 1. The alternate hypothesis states that the proportion of other short-term deposits that banks lose to MMMFs is not equal to 1.

Null hypothesis (H_0):	Other short-term deposits and MMMFs are substitutes, Rand-for-Rand. The substitution coefficient is equal to 1;
Alternate hypothesis (H_1):	The proportion of other short-term deposits that banks lose to MMMFs is not equal to 1;
Significance level (α):	The significance level is 0.05 (five per cent).

Research hypotheses #5

The null hypothesis states that substitution coefficient measuring the proportion of other medium-term deposits that banks lose to MMMFs is equal to 1. The alternate hypothesis states that the proportion of other medium-term deposits that banks lose to MMMFs is not equal to 1.

Null hypothesis (H_0): Other medium-term deposits and MMMFs are substitutes, Rand-for-Rand. The substitution coefficient is equal to 1;

Alternate hypothesis (H_1): The proportion of other medium-term deposits that banks lose to MMMFs is not equal to 1;

Significance level (α): The significance level is 0.05 (five per cent).

Research hypotheses #6

The null hypothesis states that substitution coefficient measuring the proportion of long-term deposits that banks lose to MMMFs is equal to 1. The alternate hypothesis states that the proportion of long-term deposits that banks lose to MMMFs is not equal to 1.

Null hypothesis (H_0): Long-term deposits and MMMFs are substitutes, Rand-for-Rand. The substitution coefficient is equal to 1;

Alternate hypothesis (H_1): The proportion of long-term deposits that banks lose to MMMFs is not equal to 1;

Significance level (α): The significance level is 0.05 (five per cent).

4. Research methodology

4.1. Unit of analysis

Consistent with the research by Schmidt *et al.* (1999) and Allen and Parwarda (2004), the unit of analysis was bank's deposits and the market value of the net assets of MMMFs.

4.2. Population of relevance

The South African Reserve Bank has consolidated data on the balance-sheets of banking institutions from December 1986, and has been publishing such data on a monthly basis since then. Data on the market value of the net assets of unit trusts, specifically MMMFs, has been available on a quarterly basis since January 1997. This data is based on the 1993 SNA (United Nations Statistics Division, 1996).

The data from quarter one of 1997 to quarter one of 2007 was the population of relevance.

4.3. Sampling method and size

Given that the entire population is readily available, a census type of sampling technique was used. This eliminated random sampling errors and sample bias.

4.4. Data collection and analysis

Secondary data were (data is plural, datum is singular) used on a quarterly basis by the South African Reserve Bank based on the 1993 SNA standard (United Nations Statistics Division, 1996).

To answer the research hypothesis, a simple linear regression analysis was conducted between these two variables, bank deposits and MMMFs, to measure association between bank deposits and MMMF assets. This analysis was used as the measure of association required was on ratio scale data.

The possible substitution of bank deposits by MMMFs (MMMFs) was measured as the determination of the effect of one variable on another dependent variable. This was done through linear equations linking the two variables, viz. MMMFs and bank deposits. The simple linear regression model was used to determine how bank deposits vary in relation to MMMFs. The model was also used to verify the linear model and ensure that it makes sense. The linear regression method belongs to a larger family of models called Generalised Linear Models (GLM), a useful generalisation of ordinary least squares (OLS) regression analysis. The regression model was of the form:

$$BD = \beta_0 + \beta_1 * MF + \varepsilon \qquad \text{(Equation 4-1)}$$

Where BD = bank deposits;

MF = MMMFs;

β_0 = bank deposit-intercept;

β_1 = substitution coefficient; and

ε = error term (also referred to as the disturbances or residuals in this thesis).

The OLS regression used in this thesis makes several assumptions, of which the most important are the following:

- The residuals are normally distributed with a zero mean value;
- No autocorrelation between the residuals;
- Homoscedasticity or equal variance of ε;
- There is no specification bias or error in the model used in the empirical analysis; and
- There is no perfect multicolinearity or that there are no perfect linear relationships among the explanatory variables.

4.5. Research limitations

Errors and limitations that were anticipated in this research are detailed below:

- In the hypothesis tests, Type 1 and Type 2 errors could be experienced;
- Because the study dealt with time-series data, it could be expected that the problem of autocorrelation of the residuals existed. Autocorrelation violates the OLS assumption that says that the error terms are uncorrelated. The consequences of using OLS in the presence of autocorrelation in hypothesis

testing are that there is a likelihood that we declare a coefficient to be statistically insignificant even though in fact it may be. The usual *t* and *F* tests of significance are no longer valid, and if applied, are likely to provide seriously misleading conclusions about the statistical significance of the estimated regression coefficients (Gujarati, 1995, p. 410). The graphical test of plotting the residuals at time *t* against its value at time *t*-1 and the empirical Durbin-Watson *d* test were used to detect autocorrelation of the residuals. From visible inspection of the residual plots, the nature of the autocorrelation, in terms of whether it is positive or negative or even exists can be determined. The Durbin-Watson d statistic is based on the estimated residuals as calculated in the regression analysis. The Durbin-Watson d test is based on the use of derived lower and upper boundaries of the d statistic such that if d lies outside these critical values, a decision can be made regarding the presence of positive or negative serial correlation. Critical values for the Durbin-Watson statistic adopted from Savin and White (1977) for differing significance levels are shown in Appendix 1. The aid of Appendix 2 was used to determine whether the serial correlation exists or not and the extent of the autocorrelation problem;

- As the method used to explore the research questions was based on regression techniques, the analysis on the variance of the error could suffer from heteroscedasticity. The impact of using the usual tests in the presence of heteroscedasticity is that the conclusions drawn or inferences made may be misleading. The Breusch-Pagan-Godfrey (BPG) test (Gujarati, 1995, p. 377) was used to test for heteroscedasticity with the test statistic following the chi-square distribution (Appendix 3); and

- As the study used a causal design for the research hypothesis and extraneous variables had not been controlled for, it followed that causality could not be proven.

Despite these limitations, the findings are expected to produce meaningful results because the first two factors can be fixed whilst the third factor cannot be fixed. However, given that this is a first study in this arena, this is acceptable and so provides a platform for future research offering a finer level of analysis.

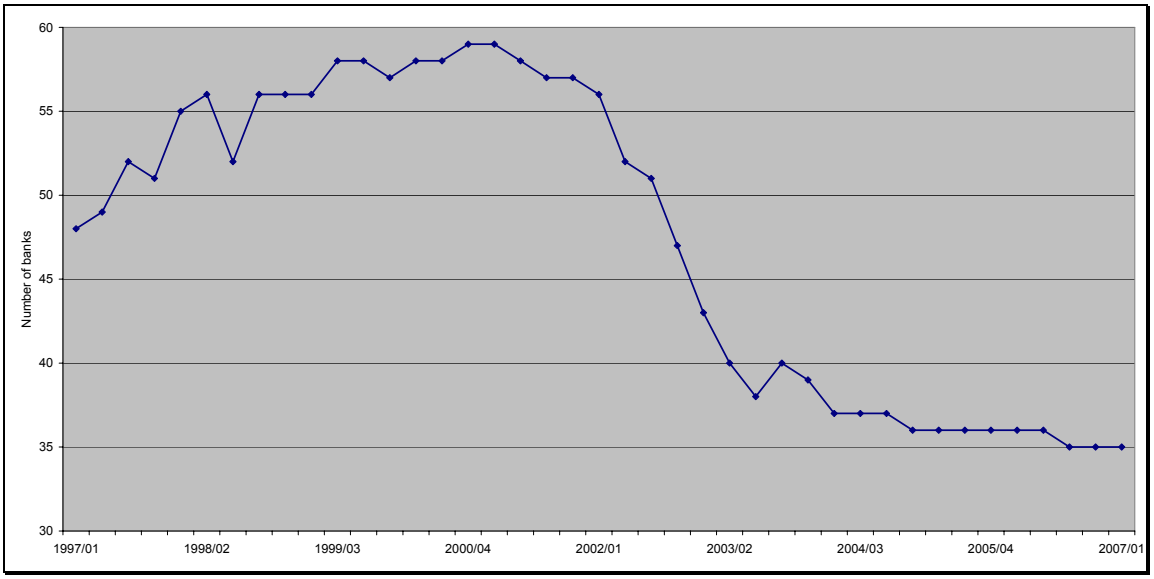
5. Results

5.1. Description of the sample

5.1.1. Banking data

The data on the banks are consolidated, as reported by the SARB, and includes all banks, mutual banks and local branches of foreign banks registered under the Banks Act, Act No. 94 of 1990. Figure 5-1 below shows the total number of banks for the period January 1997 to March 2007. This is the period under review. One point worth nothing from Figure 5-1 is that the number of banks decreased from 56 in the first quarter of 2002 to 38 in the third quarter of 2003, mainly because of consolidation among the South African banks due to a loss of confidence in second tier banks.

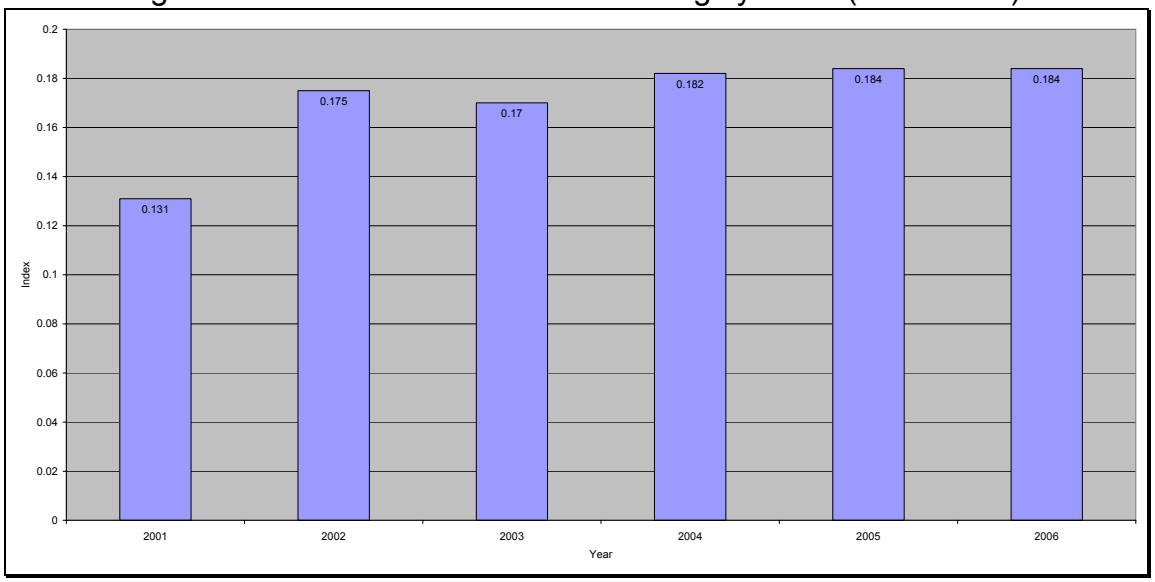
Figure 5-1: Number of banks, mutual banks and foreign banks registered in South Africa



Source: Adapted from South African Reserve Bank (2006a)

The effect of the consolidation in the banks during this period is evident from the market concentration. A commonly accepted measure of market concentration in a banking system is the Herfindahl-Hirschman Index (HHI). The HHI is calculated by squaring the market share of each bank in the system and subsequently summing the squares. The higher the index, the less competition exists in the market and *vice versa*. Concentration in the South African banking system is portrayed in Figure 5-2. An HHI of 0.184 was recorded in December 2006 and can be attributed to continued dominance by the four largest banks which constituted 84.12% of banking-sector assets compared to 83.81% in December 2005 (South African Reserve Bank, 2006a).

Figure 5-2: HHI for South African banking systems (2001-2006)



Source: Adapted from South African Reserve Bank (2006b)

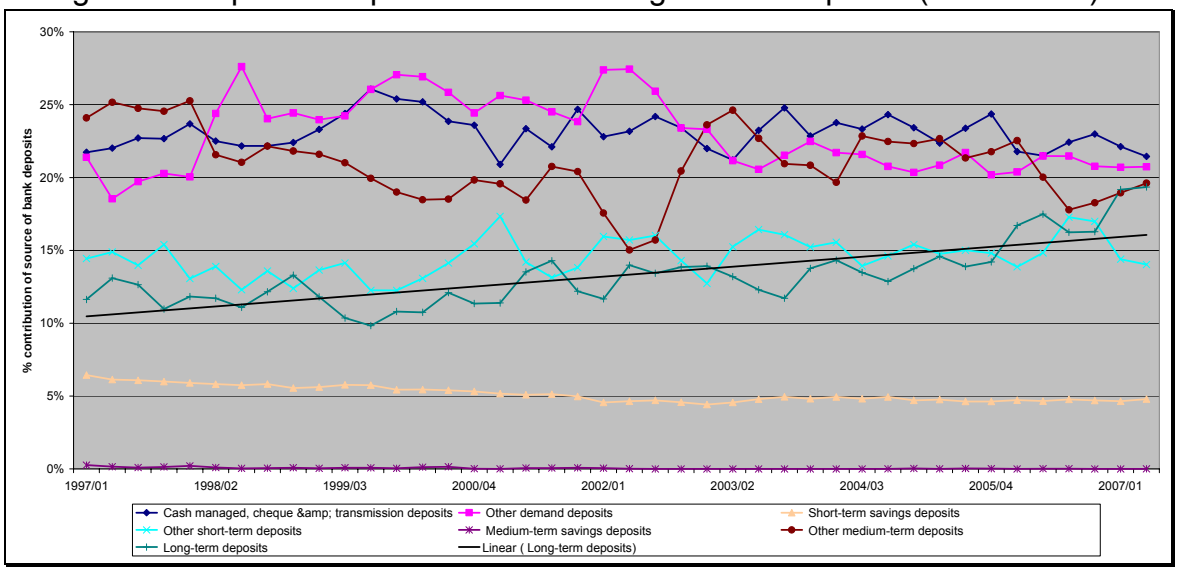
The value of bank deposits, as reported in SARB's Bank Supervision (South African Reserve Bank, 2006a), consist of the following product splits:

- Cash management, cheque and transmission (KBP1070M) – these are current accounts and cash management;

- Other demand deposits (KBP1071M) – these are call deposit products and credit card debtors;
- Short-term savings (KBP1072M) – these are savings products and society schemes;
- Other short-term savings (KBP1073M) – these are deposit products with less than 31 days of maturity term;
- Other medium-term savings (KBP1075M) – these are deposit products with less than 181 days of maturity term, (i.e. 31 > 181 days to maturity); and
- Long-term deposits (KBP1076M) – these are deposit products with greater than 181 days of maturity term.

Figure 5-3 below shows the percentage splits of the products contributing to total bank deposits for the period under review.

Figure 5-3: Split of the products contributing to bank deposits (1997–2007)



Source: Adapted from South African Reserve Bank (2007)

Table 5-1 below shows the descriptive statistics for bank deposit data, including the different product splits.

Table 5-1: Descriptive statistics for the product splits of bank deposit data

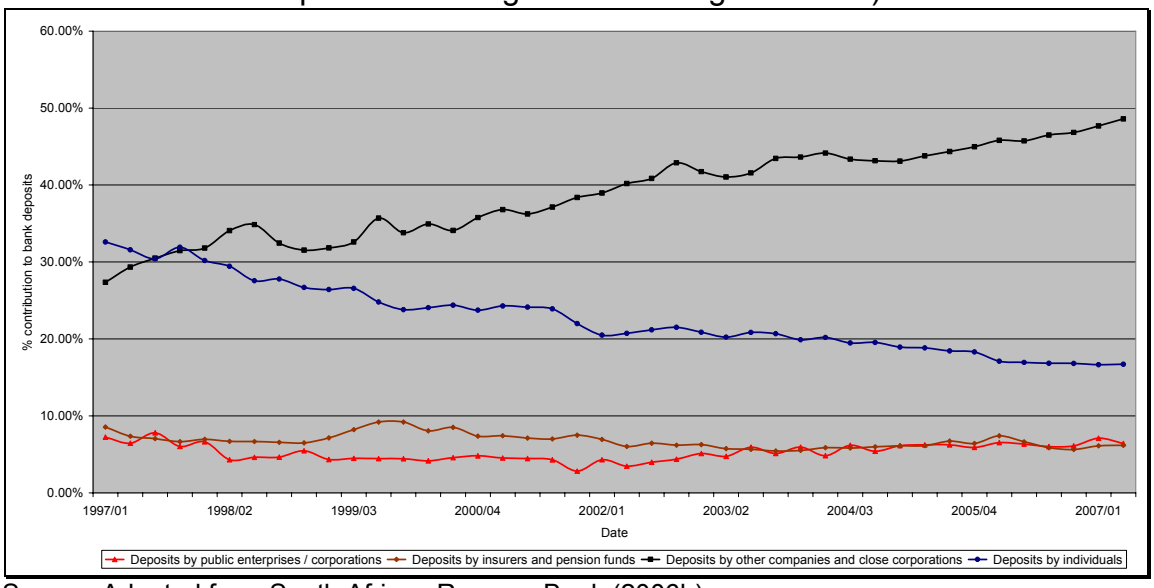
Statistic	Cash managed, cheque and transmission	Other demand deposits	Short-term savings deposits	Other short-term deposits	Medium-term savings deposits	Other medium-term deposits	Long-term deposits	Total all deposits
No. of observations	126	126	126	126	126	126	126	126
Minimum (R millions)	75,455.93	70,651.02	23,529.62	46,760.64	1.01	85,199.64	42,121.68	362,767.81
Maximum (R millions)	364,968.44	352,883.50	81,577.05	270,848.19	2,000.96	333,822.13	329,358.91	1,701,525.63
Mean (R millions)	186,013.42	182,193.89	40,865.70	119,254.65	320.65	173,320.90	114,809.41	816,778.63
Standard deviation (*n*)	77,460.63	69,007.82	14,681.67	57,142.77	332.42	70,581.74	69,773.43	350,794.02
Skewness (Pearson)	0.63	0.53	1.01	0.82	1.67	0.59	1.34	0.78
Kurtosis (Pearson)	-0.61	-0.20	0.06	-0.24	4.25	-1.03	1.14	-0.32

Source: Own calculations from South African Reserve Bank (2007)

Figure 5-4 shows the composition of the sources of the bank deposits as reported by the SARB. The sources are:

- Bank group deposits (KBP1140M);
- Inter-bank group deposits (KBP1141M);
- Government deposits (KBP1143M);
- Deposits at local government and regional services councils (KBP1144M);
- Deposits by public enterprises and corporations (KBP1145M);
- Deposits by insurers and pension funds (KBP1146M);
- Deposits by other companies and close corporations (KBP1147M);
- Deposits by individuals (KBP1148M);
- Deposits by other residents (KBP1149M); and
- Deposits by non-residents (KBP1152M).

Figure 5-4: Percentage contribution of the various entities to bank deposits (data excludes bank group deposits, inter-bank groups, Government deposits and deposits at local government organizations)



Source: Adapted from South African Reserve Bank (2006b)

5.1.2. MMMFs data

Unlike banks, mutual funds are not required by law to submit their balance sheets to SARB. However, SARB conducts quarterly surveys on the activities and balance sheets of managed fund companies. According to the SARB Money Market research department, as of quarter two of 2007, there were 772 mutual funds in South Africa, with 27 of them being MMMFs (MMMFs). Twenty-six of these MMMFs had responded to the SARB's quarterly survey on assets of mutual funds.

Table 5-2 below shows the descriptive statistics for the market value of net assets for MMMFs for the period quarter one 1997 to quarter one 2007.

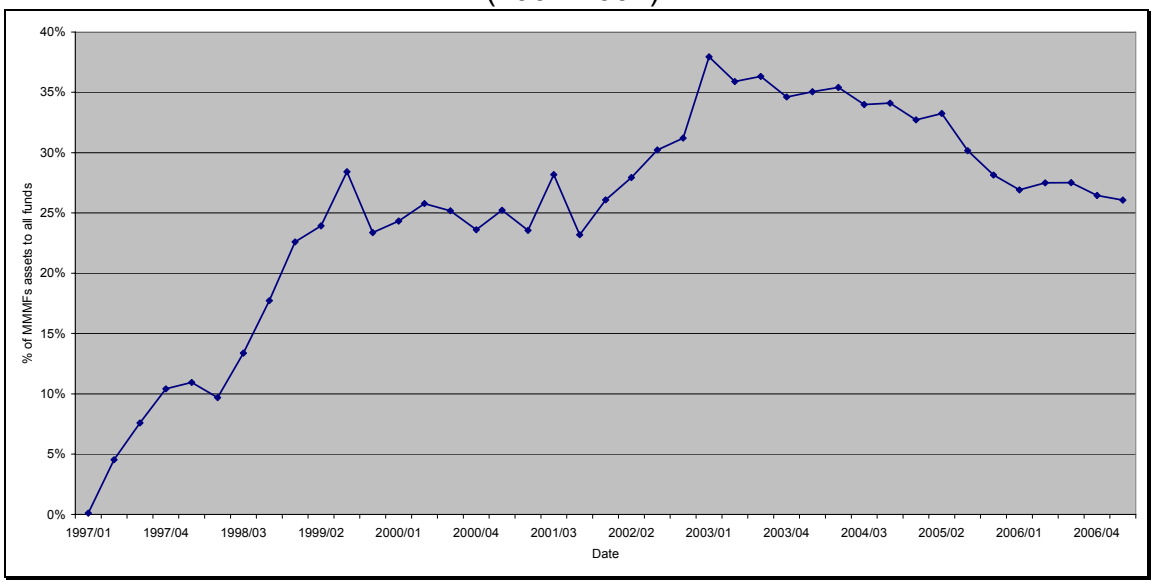
Table 5-2: Descriptive statistics–Market value of net assets of MMMFs (1997-2007)

Statistic	Money market funds – market value of net assets
No. of observations	41
Minimum (R millions)	48.05
Maximum (R millions)	15,0081.61
Mean (R millions)	58,217.03
Standard deviation (*n*)	43,879.25
Skewness (Pearson)	0.49
Kurtosis (Pearson)	-1.05

Source: Own calculations from South African Reserve Bank (2007)

Figure 5-5 below shows the net assets of MMMFs (KBP2423K) as a percentage of the net assets of all funds (KBP2415K).

Figure 5-5: Net assets of MMMFs as a percentage of the net assets of all funds (1997-2007)



Source: Adapted from South African Reserve Bank (2006b)

5.1.3. Other macroeconomic factors

In attempting to fix the autocorrelation problems experienced in the model presented in equation 3.1, several other macroeconomic factors that can help to explain variations in bank deposits were included in the model. These include the total credit to households, money supply, disposable income of households and prime overdraft rate.

Table 5-3 below shows the descriptive statistics for the additional macroeconomic factors included in the regression model.

Table 5-3: Descriptive statistics for additional macroeconomic factors

Variable	Obs.	Min.	Max.	Mean	Std. Dev.
Credit to households at all monetary institutions (R millions)	41	228,256.70	765,448.81	377,052.57	150,652.66
Monetary aggregates : M3 (R millions)	41	350,385.16	1,447,354.88	712,749.63	302,851.01
Disposable income of households (R millions)	41	110,869.00	305,327.00	184,829.15	55,288.38
Prime Overdraft Rate (Percentage)	41	10.50	25.50	15.10	3.90

Source: Own calculations from South African Reserve Bank (2007)

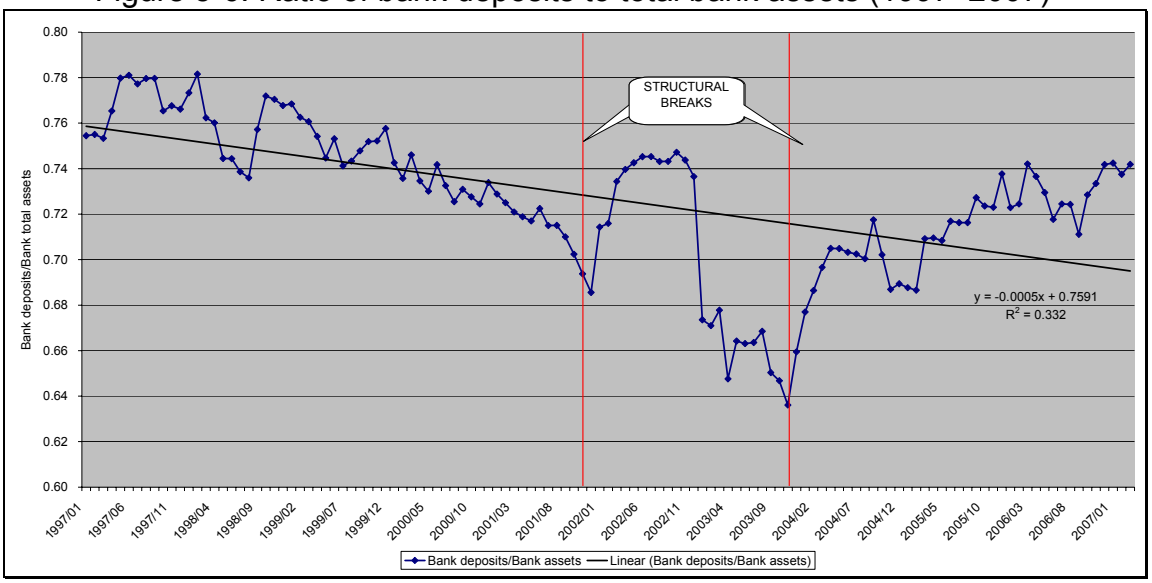
5.2. Banks as deposit taking institutes

5.2.1. Research question #1: Is deposit taking declining in importance relative to the other banking activities (bank deposits relative to bank's assets)?

Figure 5-6 below shows the ratio of bank deposits (KBP1077M) to total bank assets (KBP1132M) for the period under review. A decline in the ratio of bank deposits in relation to total assets from the beginning of 1997 to August 2001 is noted. A sharper decline in December 2001 is then noted followed by a steep increase in the first quarter of 2002. These distinct periods with breaks are called structural breaks. The structural breaks were caused by the South African currency crisis of September to December 2001 and the subsequent improvement from late 2003 (Knedlik, 2006).

From Figure 5-6, it can be said that banks' deposit taking is declining in importance relative to the banks' assets. This is illustrated by the declining slope of the linear trend line. From the equation for the linear trend-line presented in Figure 5-6, the R^2 value, which is a measure of the goodness of fit, of 33.20% means that 33.20% of the variation in bank deposits in relation to the total assets of banks can be explained by a linear line.

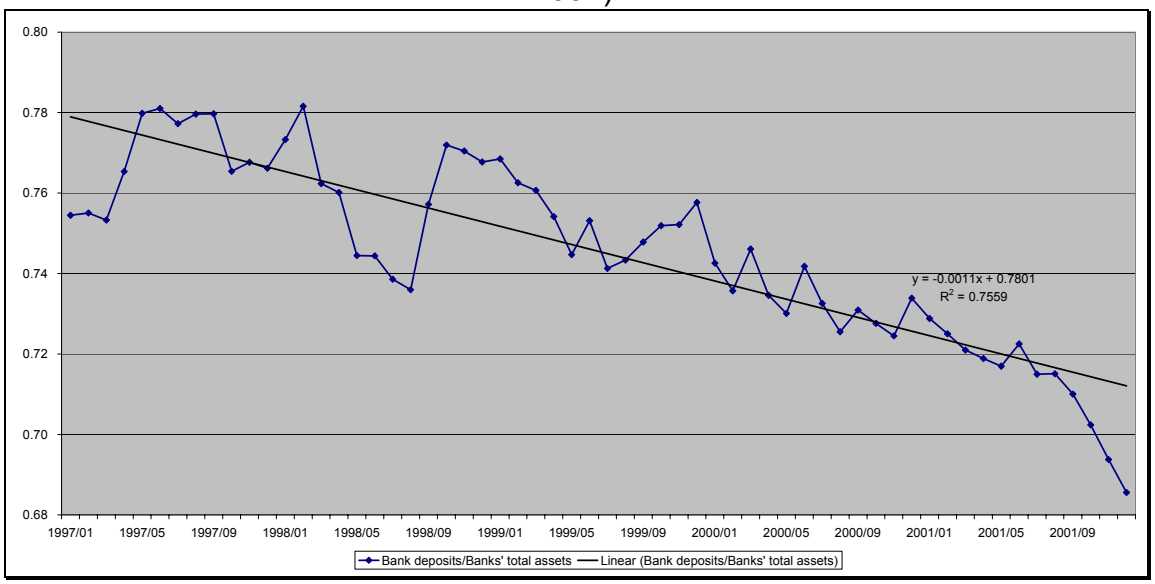
Figure 5-6: Ratio of bank deposits to total bank assets (1997–2007)



Source: Adapted from South African Reserve Bank (2007)

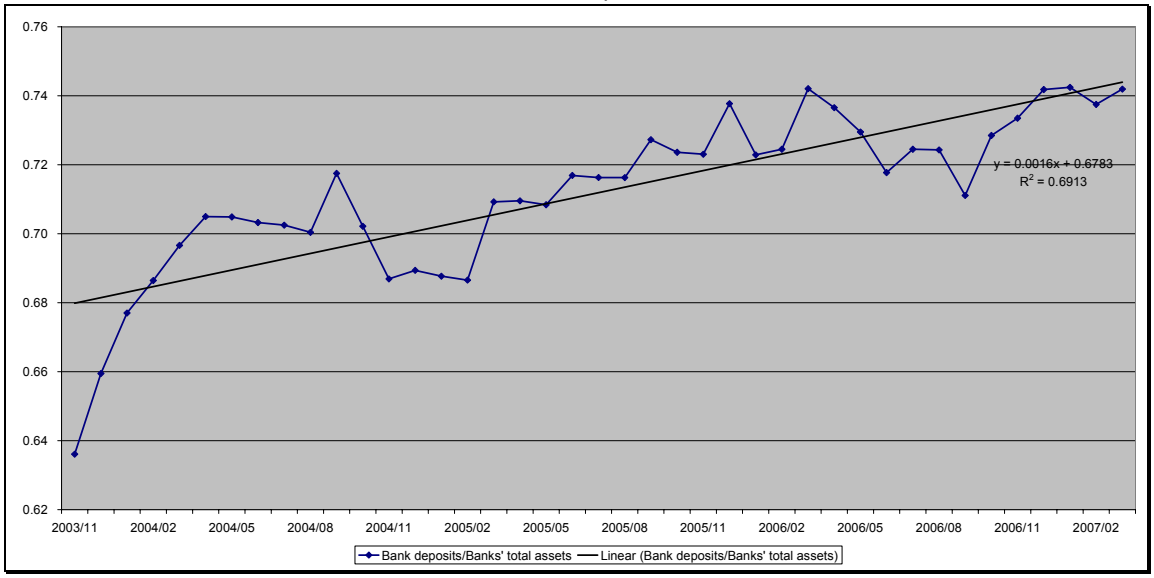
Taking into account the structural breaks noted from Figure 5-6, the ratios were then compared for the periods January 1997 to December 2001 and November 2003 to March 2007. Figure 5-7 and Figure 5-8 show the trends of bank deposits to total bank assets for these periods, respectively.

Figure 5-7: Ratio of bank deposits to total bank assets (January 1997-December 2001)



Source: Adapted from South African Reserve Bank (2007)

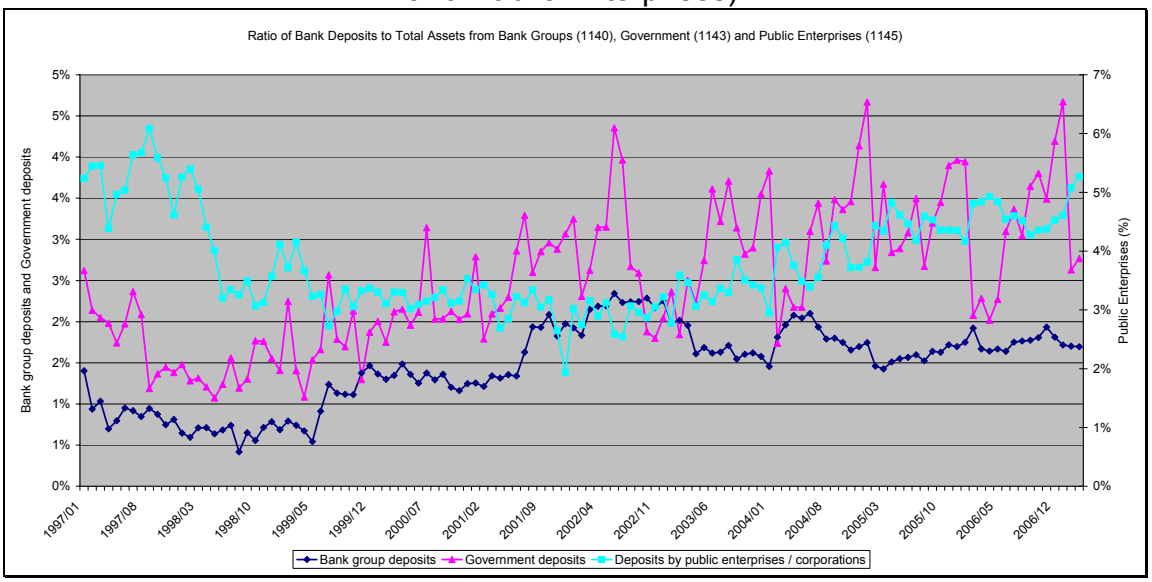
Figure 5-8: Ratio of bank deposits to total bank assets (November 2003-March 2007)



Source: Adapted from South African Reserve Bank (2007)

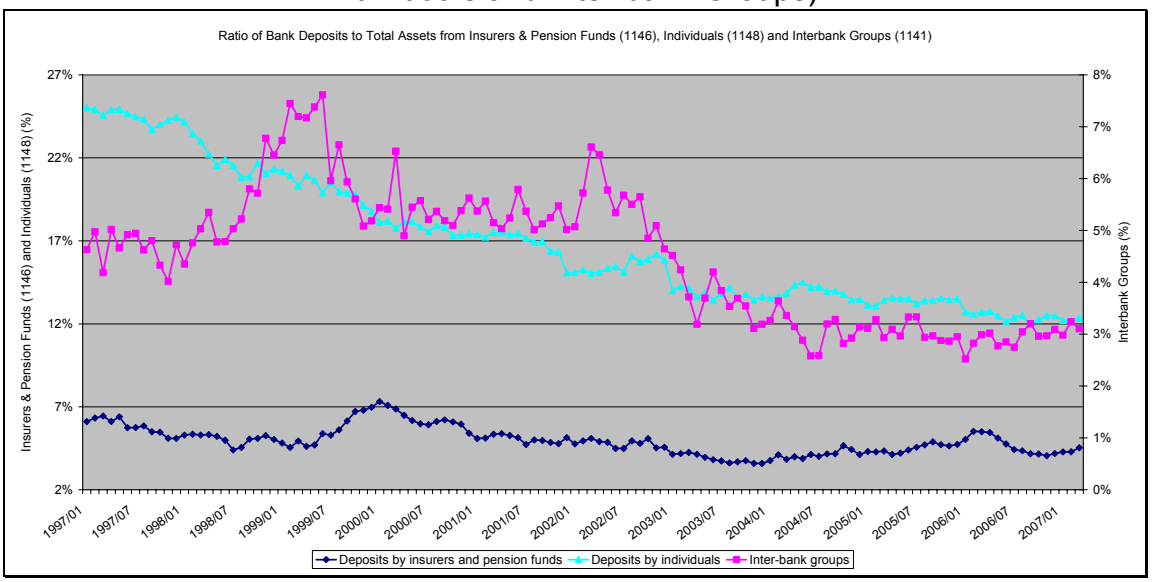
A break down of the sources of bank deposits as a ratio to the total assets of all banks is shown in the figures below.

Figure 5-9: Ratio of bank deposits to total assets (Bank groups, Government and Public Enterprises)



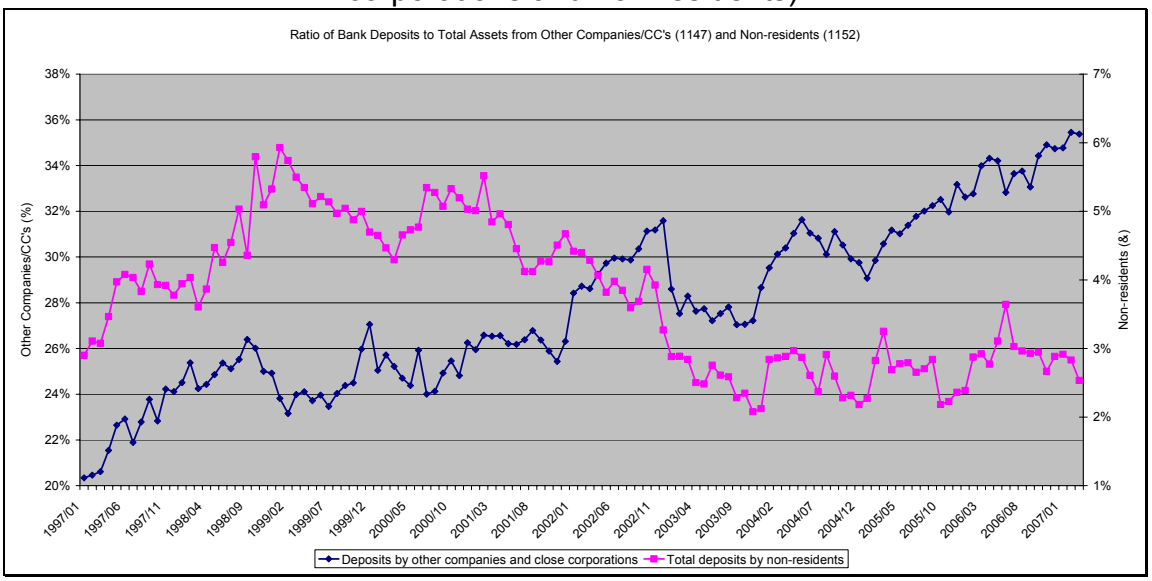
Source: Adapted from South African Reserve Bank (2007)

Figure 5-10: Ratio of bank deposits to total assets (Insurers and Pension Funds, Individuals and Inter-bank Groups)



Source: Adapted from South African Reserve Bank (2007)

Figure 5-11: Ratio of bank deposits to total assets (Other companies and close corporations and non-residents)



Source: Adapted from South African Reserve Bank (2007)

The average contributions of the various entities to bank deposits over the period under review are shown in Table 5-4.

Table 5-4: Average contributions of the various entities to bank deposits (1997-2007)

Banking entity	Contribution
Deposits by other companies and close corporations	38.68%
Deposits by individuals	23.02%
Deposits by other residents	7.58%
Deposits by insurers and pension funds	6.80%
Inter-bank groups	6.14%
Deposits by public enterprises / corporations	5.28%
Total deposits by non-residents	5.08%
Government deposits	3.48%
Bank group deposits	2.04%
Deposits at local governments & regional services councils	1.88%

Source: Own calculations from South African Reserve Bank (2007)

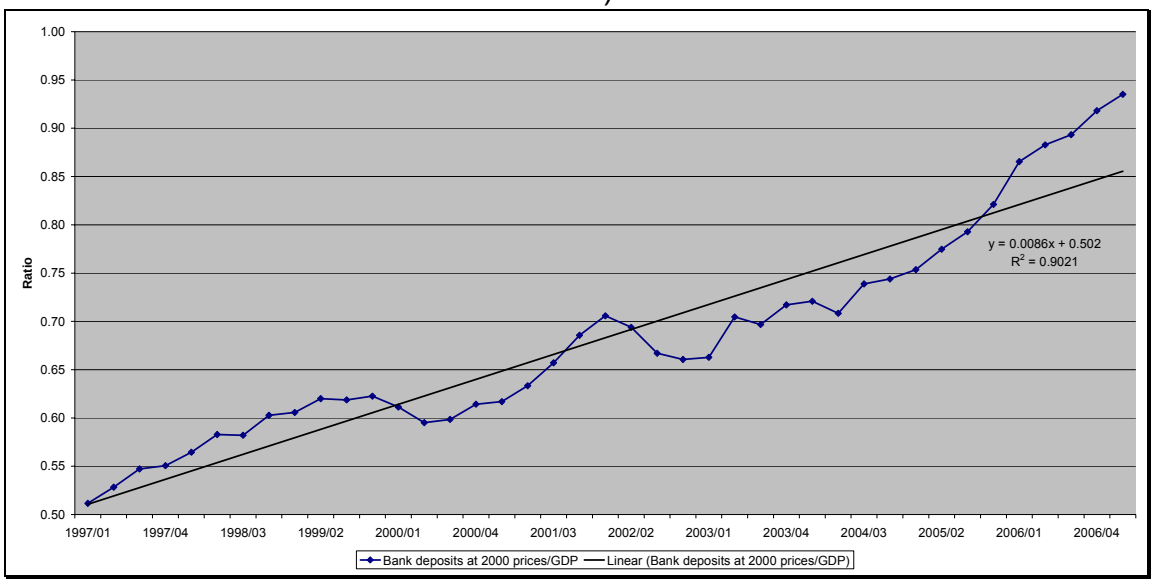
5.3. Banks deposits in relation to total economic activity

5.3.1. Research question #2: Is the role of banks as deposit taking institutions declining relative to total economic activity)?

Total economic activity is represented by the gross domestic product (GDP). The GDP data is adjusted for seasonality and represents the real GDP, based on the 2000 prices (Statistics South Africa, 2007). Bank deposit data is nominal in that the effects of inflation have not been accounted for. The bank deposits

data was first adjusted for inflation to 2000 prices. Figure 5-12 below shows the ratio of total bank deposits to the GDP for the period under review.

Figure 5-12: Ratio of total bank deposits to total economic activity, GDP (1997-2007)



Source: Adapted from South African Reserve Bank (2007)

From the R^2 value of the equation of the fitted linear trend-line in Figure 5-12, 90.20% of the variation in the ratio of bank deposits to GDP can be explained by a straight line. There is also a clear increase in the ratio of bank deposits to GDP.

5.4. Regression of bank deposits

Table 5-5 below shows the results from the goodness-of-fit test for the regression analysis of bank deposits. In this particular case, the adjusted R^2 value is 97.18%. This means that 97.18% of the variability of bank deposits can

be explained by MMMFs. The remainder of the variability is due to some effects (other explanatory variables) that have not been included in the analysis.

From Table 5-5, the Durbin-Watson statistic has a value of 0.28, which is less than the critical value of 1.44 for a sample size of 41 with a significance level of 0.05. This implies that the errors are positively autocorrelated.

Table 5-5: Goodness-of-fit tests for regression of bank deposits

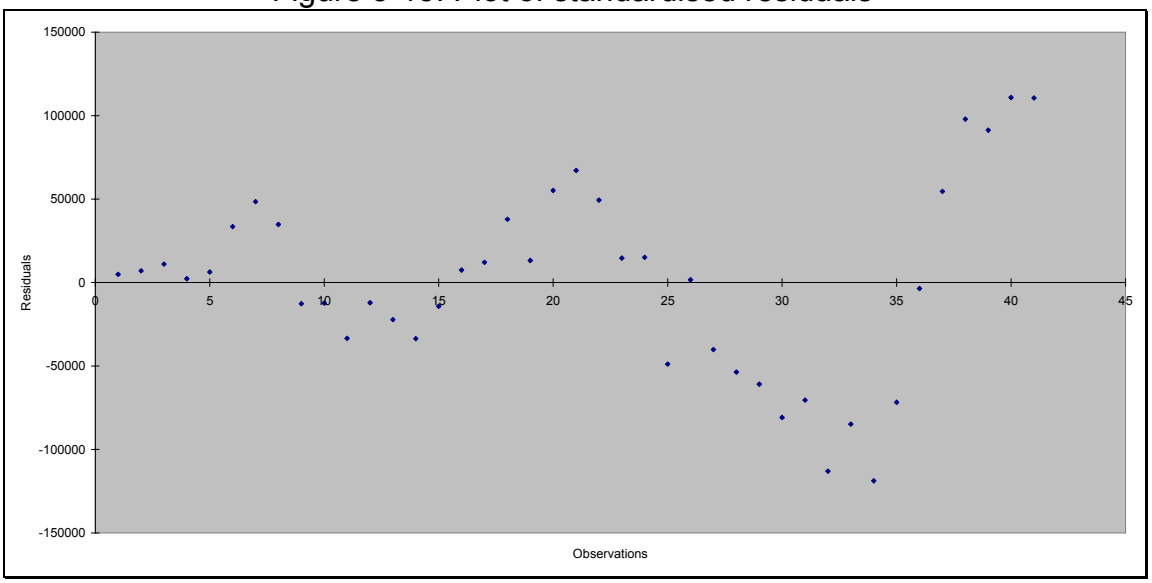
R^2	97.25%
Adjusted R^2	97.18%
Standard Error	57,124.85
Durbin-Watson statistic	0.28
Observations	41

Source: Own calculations from South African Reserve Bank (2007)

Figure 5-13 below shows a plot of standardised residuals. From this figure, it is evident that there is autocorrelation of the residuals, as there seems to be a repetitive pattern in the residuals. This implies that the standard errors and the *t* ratios from this regression cannot be trusted and the subsequent model may not be valid.

In attempting to fix the autocorrelation problems from regression model, several other macroeconomic factors that can help to explain variations in bank deposits were included in the model.

Figure 5-13: Plot of standardised residuals



Source: Own work from South African Reserve Bank (2007)

The regression equation for bank deposits then takes the form:

$$BD = \beta_0 + \beta_1 MF + \beta_2 M3 + \beta_3 CrHH + \beta_4 DIHH + \beta_5 POR + \varepsilon \qquad \text{(Equation 5-1)}$$

where BD = Total bank deposits (KBP1077M);

MF = Market value of net assets of money market funds (KBP2423K);

M3 = Monetary aggregates, M3 (KBP1374M);

CrHH = Total credit to households at all monetary institutions (KBP1505M);

DIHH = Disposable income of households (KBP6264K);

POR = Prime overdraft rate (KBP1403M); and

ε = error term

Table 5-6 below shows the results from the goodness-of-fit test for the regression in equation 5-1.

Table 5-6: Goodness-of-fit statistics for regression analysis with additional macroeconomic factors

Observations	41
R^2	99.81%
Adjusted R^2	99.79%
Standard Error	245,942,928.64
Durbin-Watson statistic	0.91

Source: Own calculations from South African Reserve Bank (2007)

From Table 5-6, the R^2 and adjusted R^2 values of 99.81% and 99.79%, respectively, indicate that the variables selected can be used to give sufficient explanation for the variability of bank deposits. However, the Durbin-Watson statistic of 0.91 is lower than the lower limit for the Durbin-Watson statistic of 1.23 for 41 observations, with five explanatory variables and a significance level of 95% (Appendix 1). This implies that the model suffers from positive autocorrelation.

Given that the Durbin-Watson statistic is known (0.914 from Table 5-6); this implies that the structure of the autocorrelation is known. The generalized difference equation was used to resolve the serial correlation problem. The sample first-order coefficient of correlation, ρ, was calculated using the Durbin-Watson statistic as follows:

$$\rho = 1 - d/2 = 1 - 0.914/2 = 0.543 \qquad \text{(Equation 5-2)}$$

where *d* is the Durbin-Watson statistic.

Using the correlation coefficient from equation 5-2, the generalized difference equation for the regression in equation 5-1 takes the form:

$$BD_t^* = \alpha^* + \beta_1^* MF_t^* + \beta_2^* M3_t^* + \beta_3^* CrHH_t^* + \beta_4^* DIHH_t^* + \beta_5^* POR_t^* + \varepsilon \quad \text{(Equation 5-3)}$$

where $BD_t^* = (BD_t - \rho BD_{t-1})$,

$\beta_0^* = \beta_0(1-\rho)$,

$MF_t^* = (MF_t - \rho MF_{t-1})$,

$M3_t^* = (M3_t - \rho M3_{t-1})$,

$CrHH_t^* = (CrHH_t - \rho CrHH_{t-1})$,

$DIHH_t^* = (DIHH_t - \rho DIHH_{t-1})$, and

$POR_t^* = (POR_t - \rho POR_{t-1})$

Equation 5-3 involves regressing *BD* on all the independent variables, not in the original form, but in the differenced form, which is obtained by subtracting a proportion (=ρ) of the value of a variable in the previous time period from its value in the current time period (Gujarati, 1995, p. 427). The differenced regression in equation 5-3 has goodness-of-fit statistics shown in Table 5-7.

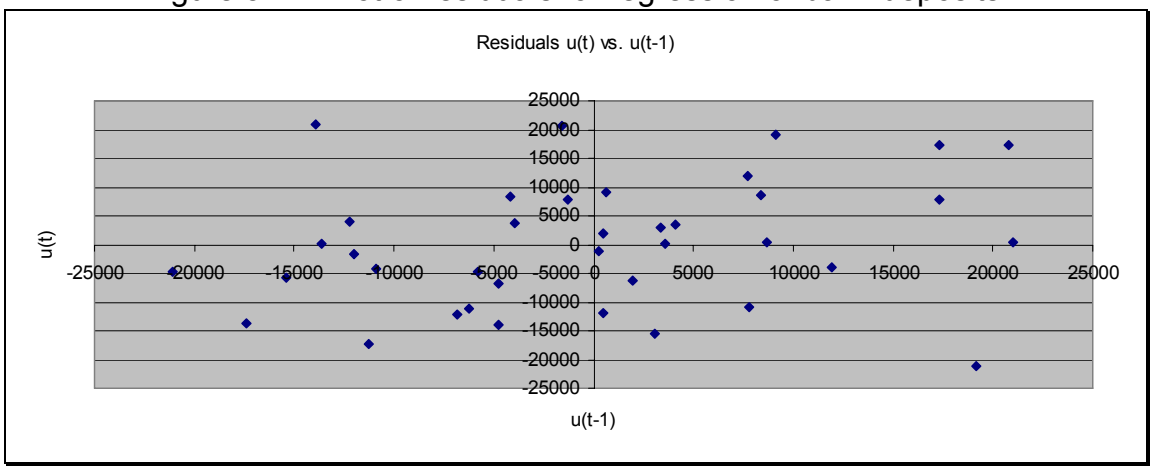
Table 5-7: Goodness-of-fit statistics for the difference regression

Observations	39
R^2	99.50%
Adjusted R^2	99.44%
Standard Error	132,109,240.46
Durbin-Watson statistic	1.50

Source: Own calculations from South African Reserve Bank (2007)

From Table 5-7, the adjusted R^2 values of 99.44% indicates that the variables selected can be used to give sufficient explanation for the variability of bank deposits. The Durbin-Watson statistic of 1.50 is between the lower limit of 1.27 and the upper limit of 1.72 for 39 observations, with five explanatory variables and a significance level of 95% (Appendix 1). This implies that no conclusions can be drawn from the Durbin-Watson statistic only regarding the autocorrelation of the model (see Appendix 2 for decision areas of the Durbin-Watson statistic). A graphical test for autocorrelation was then used. The residuals at time *t* were plotted against the residuals at time *t-1* as shown in Figure 5-14 below. No pattern can be observed from the residual plots in Figure 5-14. It can thus be concluded that there is no autocorrelation present in the model presented by equation 5-3.

Figure 5-14: Plot of residuals for regression of bank deposits



Source: Own work from South African Reserve Bank (2007)

The parameters for the regression model presented in equation 5-3 are thus shown in Table 5-8. The impact of credit to household's at all monetary institutions is not significant and as such this variable was removed from the model.

Table 5-8: Model parameters for the differenced regression on bank deposits

Source	Value	Standard error	*t*	Pr > |t|
Intercept	12,396.69	18,266.03	0.68	0.50
MF*	-0.29	0.51	-0.57	0.57
CrHH*	0.000	0.000		
M3*	1.19	0.08	15.61	0.000
DIHH*	-0.20	0.27	-0.75	0.46
POR*	-705.84	1,393.12	-0.51	0.62

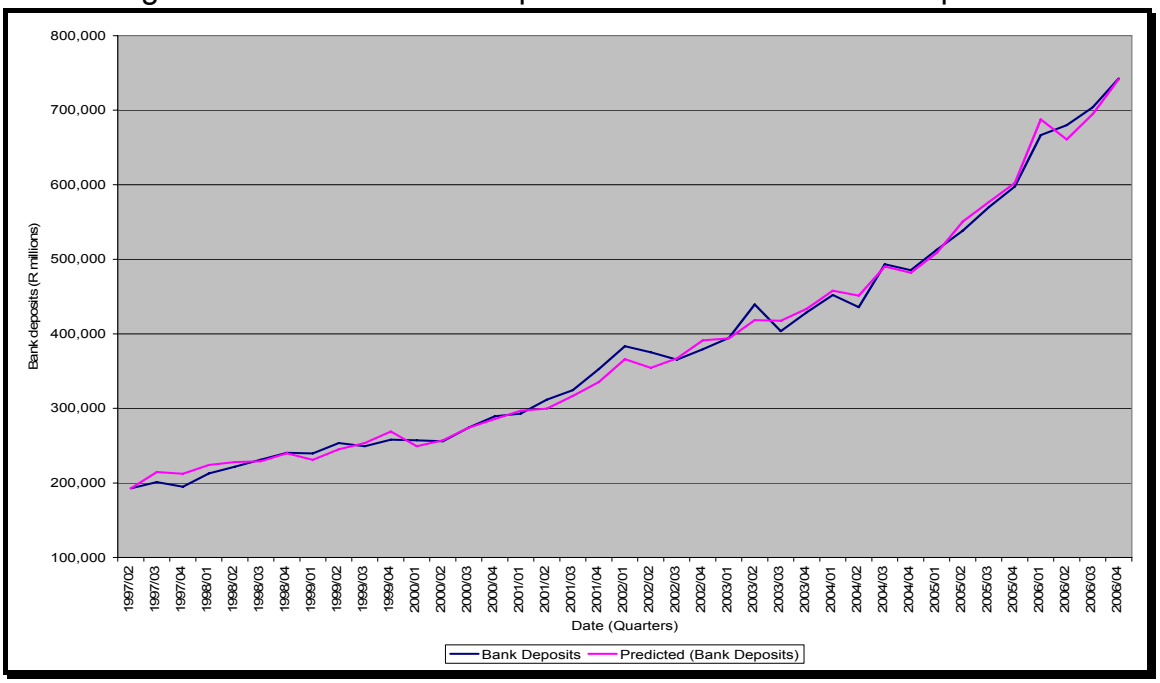
Source: Own calculations from South African Reserve Bank (2007)

The regression equation is thus:

$$BD = 12{,}367 - 0.29 * MF + 1.19 * M3 - 0.20 * DIHH - 705.84 * POR \quad \text{(Equation 5-4)}$$

Figure 5-15 shows a plot of the bank deposits and the predicted bank deposits using the regression model in equation 5-4.

Figure 5-15: Plot of Bank Deposits and Predicted Bank Deposits



Source: Own work from South African Reserve Bank (2007)

As can be seen from Figure 5-15, the regression model of bank deposits presented in equation 5-4 provides an accurate prediction of bank deposits. Table 5-9 below presents the diagnostic test results for the regression model of bank deposits.

Table 5-9: Diagnostic tests for the regression on bank deposits

Purpose of test	Test	Statistic
Normality	Jarque-Bera	0.58
Heteroscedasticity	BPG test	6.78
Model stability	Ramsey regression specification error test (RESET)	0.75

Source: Own calculations from South African Reserve Bank (2007)

From the Jarque-Bera test for normality in Table 5-9, the normality assumption for the model is validated as the *p*-value of 0.58 is greater than the five per cent significance level of 0.05 for a model with four degrees of freedom. The BPG test statistic of 6.78 is lower than the five per cent significance level with four degrees of freedom of 9.49, hence it can be concluded that there is no heteroscedasticity in the error variance. The computed *F* value for the Ramsey RESET test for the stability of the regression model of 0.75 is not significant. The hypothesis that the model is mis-specified should thus be rejected.

5.5. Regression of cash management, cheque and transmission products

Table 5-10 shows the goodness-of-fit statistics for the regression of cash managed, cheque and transmission products. With an adjusted R^2 value of 98.67%, it can be deduced that the variables chosen do provide sufficient

information about changes in cash managed, cheque and transmission products. The Durbin-Watson statistic of 1.65 indicates that no inferences can be made from this statistic regarding the autocorrelation in the model.

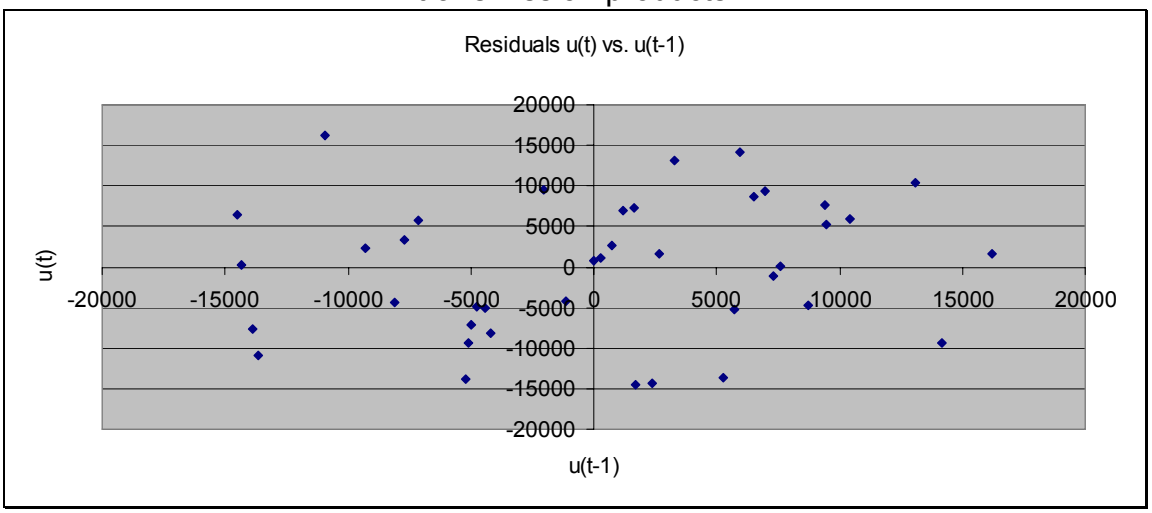
Table 5-10: Goodness-of-fit statistics for the regression of cash managed

Observations	41
R^2	98.83%
Adjusted R^2	98.67%
Standard Error	78,095,021.37
Durbin-Watson statistic	1.65

Source: Own calculations from South African Reserve Bank (2007)

A visibility test for autocorrelation was then used. The residuals at time *t* were plotted against the residuals at time *t-1* as shown in Figure 5-16 below. No pattern can be observed from the residual plots in Figure 5-16. It can thus be concluded that there is no autocorrelation present in the model.

Figure 5-16: Plot of residuals for regression of cash managed, cheque and transmission products



Source: Own work from South African Reserve Bank (2007)

The parameters for the regression model are shown in Table 5-11 below. From the *t* statistic, it can be seen that all the variables included are significant.

Table 5-11: Model parameters for the regression of cash managed

Source	Value	Standard error	*t*	Pr > |t|
Intercept	94,855.86	29,309.55	3.24	0.00
MF	0.27	0.27	1.00	0.32
CrHH	-0.14	0.09	-1.61	0.12
M3	0.34	0.09	3.93	0.00
DIHH	-0.46	0.26	-1.76	0.09
POR	-2030.73	761.74	-2.67	0.01

Source: Own calculations from South African Reserve Bank (2007)

Equation 5-5 gives the equation for the regression model of cash managed, cheque and transmission products.

$$CashMan = 94{,}856 + 0.27 * MF - 0.14 * CrHH + 0.34 * M3 - 0.46 * DIHH - 2{,}031 * POR \quad \text{(Equation 5-5)}$$

Table 5-12 shows the diagnostic tests for the regression of cash managed, cheque and transmission products.

Table 5-12: Diagnostic tests for the regression of cash managed, cheque and transmission products

Purpose of test	Test	Statistic
Normality	Jarque-Bera	0.44
Heteroscedasticity	BPG test	2.65
Model stability	Ramsey RESET	1.06

Source: Own calculations from South African Reserve Bank (2007)

From the Jarque-Bera test for normality in Table 5-12, the normality assumption for the model is validated as the *p*-value of 0.44 is greater than the five per cent significance level of 0.05 for a model with five degrees of freedom. The BPG test statistic of 2.65 is lower than the five per cent significance level with five degrees of freedom of 11.07, hence it can be concluded that there is heteroscedasticity in the error variance. The computed *F* value for the Ramsey RESET test for the stability of the regression model of 0.42 is not significant. The hypothesis that the model is mis-specified should thus be rejected.

5.6. Regression of other demand deposits

Table 5-13 shows the goodness-of-fit statistics for the regression of other demand deposit products as per SARB. With an adjusted R^2 value of 94.28%, it

can be deduced that the variables chosen do provide sufficient information about changes in cash managed, cheque and transmission products. The Durbin-Watson statistic of 0.74 indicates that the model may be having a positive autocorrelation.

Table 5-13: Goodness-of-fit statistics for the regression of other demand deposits

Observations	41
R^2	95.00%
Adjusted R^2	94.28%
Standard Error	258,610,847.26
Durbin-Watson statistic	0.74

Source: Own calculations from South African Reserve Bank (2007)

The generalised difference equation was used to resolve the serial correlation problem. The sample first-order coefficient of correlation, ρ, was calculated using the Durbin-Watson statistic as follows:

$$\rho = 1 - d/2 = 1 - 0.744/2 = 0.628 \qquad \text{(Equation 5-6)}$$

The model parameters after differencing using the coefficient of correlation in equation 5-6 are shown in Table 5-14 below.

Table 5-14: Model parameters for the regression of other demand deposits after applying the differencing technique

Source	Value	Standard error	*t*	Pr > |t|
Intercept	-3,582.50	12,961.54	-0.28	0.78
CrHH	-0.10	0.17	-0.56	0.58
M3	0.23	0.12	2.01	0.05
DIHH	0.20	0.27	0.74	0.46
POR	1,818.88	1,197.97	1.52	0.14

Source: Own calculations from South African Reserve Bank (2007)

The regression model of other demand deposits is thus given by:

$$ODD = -3{,}583 - 0.10 * CrHH + 0.23 * M3 + 0.20 * DIHH + 1{,}819 * POR \quad \text{(Equation 5-7)}$$

where *ODD* denotes the other demand deposit products.

Table 5-15 shows the diagnostic tests for the regression of cash and other demand deposit products.

Table 5-15: Diagnostic tests for the regression of other demand deposits after applying the differencing technique

Purpose of test	Test	Statistic
Normality	Jarque-Bera	0.39
Heteroscedasticity	BPG test	4.83
Model stability	Ramsey RESET	1.10

Source: Own calculations from South African Reserve Bank (2007)

From the Jarque-Bera test for normality in Table 5-15, the normality assumption for the model is validated as the *p*-value of 0.39 is greater than the five per cent significance level of 0.05 for a model with four degrees of freedom. The BPG test statistic of 4.83 is lower than the five per cent significance level with four degrees of freedom of 9.49, hence it can be concluded that there is heteroscedasticity in the error variance. The computed *F* value for the Ramsey RESET test for the stability of the regression model of 1.10 is not significant. The hypothesis that the model is mis-specified should thus be rejected.

5.7. Regression of other short-term deposits

Table 5-16 shows the goodness-of-fit statistics for the regression of other short-term deposit products as per SARB. With an adjusted R^2 value of 95.90%, it can be deduced that the variables chosen do provide sufficient information about changes in cash managed, cheque and transmission products. The Durbin-Watson statistic of 1.51 indicates that no inferences can be made from this statistic regarding the autocorrelation in the model.

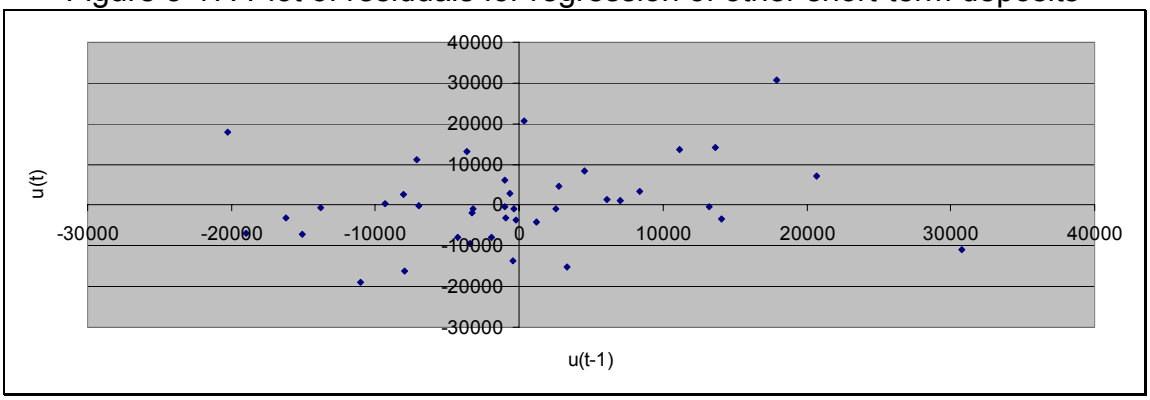
A visibility test for autocorrelation was then used. The residuals at time *t* were plotted against the residuals at time *t-1* as shown in Figure 5-17 below. No pattern can be observed from the residual plots in Figure 5-17. It can thus be concluded that there is no autocorrelation present in the model.

Table 5-16: Goodness-of-fit statistics for the regression of other short-term deposits

Observations	41
R^2	96.41%
Adjusted R^2	95.90%
Standard Error	129,748,903.22
Durbin-Watson statistic	1.51

Source: Own calculations from South African Reserve Bank (2007)

Figure 5-17: Plot of residuals for regression of other short-term deposits



Source: Own work from South African Reserve Bank (2007)

The regression model parameters for the regression of other short-term deposits are shown in Table 5-17 with the regression equation shown in equation 5-8.

Table 5-17: Model parameters for the regression of other short-term deposits

Source	Value	Standard error	*t*	Pr > |t|
Intercept	46,559.95	37,778.90	1.23	46,559.95
MF	-0.23	0.35	-0.65	-0.23
CrHH	-0.19	0.11	-1.62	-0.19
M3	0.40	0.11	3.53	0.40
DIHH	-0.59	0.33	-1.75	-0.59
POR	-1,297.97	981.860	-1.32	-1,297.97

Source: Own calculations from South African Reserve Bank (2007)

$$OSTD = -46{,}560 - 0.23 * MF - 0.19 * CrHH + 0.40 * M3 - 0.59 * DIHH - 1298POR \quad \text{(Equation 5-8)}$$

The diagnostic tests for the regression of other short-term deposits are shown in Table 5-18 below.

Table 5-18: Diagnostic tests for the regression of other short-term deposits

Purpose of test	Test	Statistic
Normality	Jarque-Bera	0.38
Heteroscedasticity	BPG test	22.66
Model stability	Ramsey RESET	0.42

Source: Own calculations from South African Reserve Bank (2007)

From the Jarque-Bera test for normality in Table 5-18, the normality assumption for the model is validated as the *p*-value of 0.38 is greater than the five per cent significance level of 0.05 for a model with five degrees of freedom. The BPG test

statistic of 22.66 is greater than the five per cent significance level with five degrees of freedom of 11.07, hence it can be concluded that there is no heteroscedasticity in the error variance. The computed *F* value for the Ramsey RESET test for the stability of the regression model of 0.42 is not significant. The hypothesis that the model is mis-specified should thus be rejected.

5.8. Regression of other medium-term deposits

Table 5-19 shows the goodness-of-fit statistics for the regression of other medium-term demand deposit products as per SARB. With an adjusted R^2 value of 94.17%, it can be deduced that the variables chosen do provide sufficient information about changes in cash managed, cheque and transmission products. The Durbin-Watson statistic of 0.99 indicates that the model may be having a positive autocorrelation.

Table 5-19: Goodness-of-fit statistics for the regression of other demand deposits

Observations	41
R^2	94.90%
Adjusted R^2	94.17%
Standard Error	273,633,918.90
Durbin-Watson statistic	0.99

Source: Own calculations from South African Reserve Bank (2007)

The generalised difference equation was used to resolve the serial correlation problem. The sample first-order coefficient of correlation, ρ, was calculated using the Durbin-Watson statistic as follows:

$$\rho = 1 - d/2 = 1 - 0.990/2 = 0.505 \qquad \text{(Equation 5-9)}$$

The model parameters after differencing using the coefficient of correlation in equation 5-9 are shown in Table 5-20 below with the regression model given in equation 5-10.

Table 5-20: Model parameters for the regression of other medium-term deposits

Source	Value	Standard error	*t*	Pr > |t|
Intercept	14,717.15	17,447.51	0.84	0.40
MF	0.58	0.51	1.13	0.27
CrHH	-0.09	0.20	-0.44	0.66
M3	0.15	0.16	0.95	0.35
DIHH	0.16	0.35	0.47	0.64

Source: Own calculations from South African Reserve Bank (2007)

$$OMTD = 14{,}717 + 0.58 * MF - 0.09 * CrHH + 0.15 * M3 + 0.16 * DIHH \qquad \text{(Equation 5-10)}$$

The diagnostic tests used for the regression of other short-term deposits are shown in Table 5-21 below.

Table 5-21: Diagnostic tests used for the regression of other medium-term deposits

Purpose of test	Test	Statistic
Normality	Jarque-Bera	0.90
Heteroscedasticity	BPG test	7.96
Model stability	Ramsey RESET	0.14

Source: Own calculations from South African Reserve Bank (2007)

From the Jarque-Bera test for normality in Table 5-21, the normality assumption for the model is validated as the *p*-value of 0.90 is greater than the five per cent significance level of 0.05 for a model with three degrees of freedom. The BPG test statistic of 7.96 is lower than the five per cent significance level with three degrees of freedom of 7.82, hence it can be concluded that there is heteroscedasticity in the error variance. The computed *F* value for the Ramsey RESET test for the stability of the regression model of 0.14 is not significant. The hypothesis that the model is mis-specified should thus be rejected.

5.9. Regression of long-term deposits

Table 5-23 shows the goodness-of-fit statistics for the regression of other medium-term demand deposit products as per SARB.

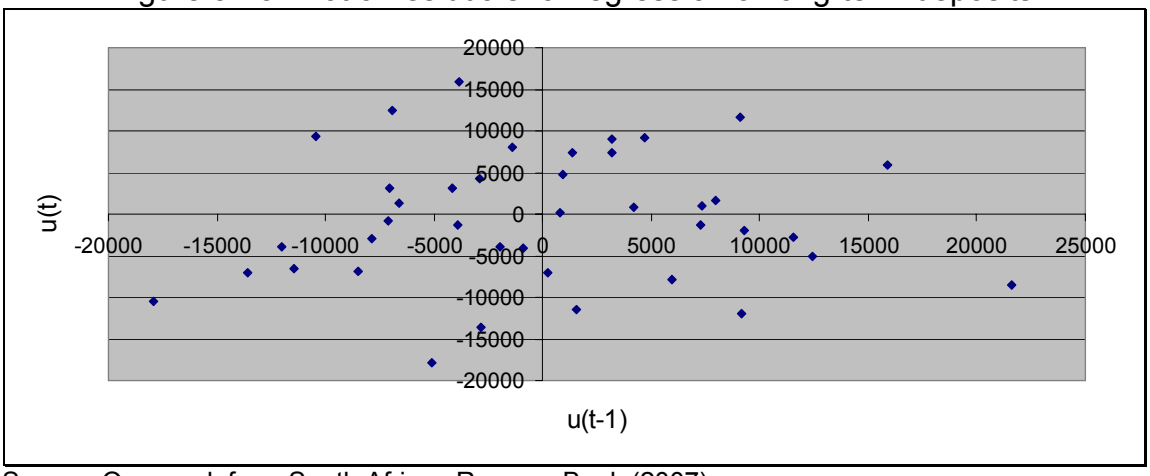
Table 5-22: Goodness-of-fit statistics for the regression of long-term deposits

Observations	41
R^2	98.33%
Adjusted R^2	98.09%
Standard Error	81,357,511.20
Durbin-Watson statistic	1.71

Source: Own calculations from South African Reserve Bank (2007)

With an adjusted R^2 value of 98.09%, it can be deduced that the variables chosen do provide sufficient information about changes in cash managed, cheque and transmission products. The Durbin-Watson statistic of 1.71 is between the lower limit of 1.273 and the upper limit of 1.786 for 41 observations, with five explanatory variables and a significance level of 95% (Appendix 1). This implies that no conclusions can be drawn from the Durbin-Watson statistic only regarding the autocorrelation of the model (see Appendix 2 for decision areas of the Durbin-Watson statistic). A graphical test for autocorrelation was then used. The residuals at time *t* were plotted against the residuals at time *t-1* as shown in Figure 5-18 below. No pattern can be observed from the residual plots in Figure 5-18. It can thus be concluded that there is no autocorrelation present in the regression model of long-term deposits.

Figure 5-18: Plot of residuals for regression of long-term deposits



Source: Own work from South African Reserve Bank (2007)

The parameters for the regression model as well as the regression equation of long-term deposits are shown in Table 5-23 and equation 5-11, respectively. It should be noted that since the *t* statistics for the disposable income to households and the prime overdraft rate terms in Table 5-23 are lower, they were considered insignificant and not included in the regression model.

Table 5-23: Model parameters for the regression of long-term deposits

Source	Value	Standard error	*t*	Pr > |t|
Intercept	-122,632.31	29915.50	-4.10	0.00
MF	-1.15	0.28	-4.15	0.00
CrHH	0.13	0.09	1.46	0.15
M3	0.28	0.09	3.14	0.00
DIHH	0.22	0.26	0.82	0.42
POR	743.08	777.49	0.96	0.35

Source: Own calculations from South African Reserve Bank (2007)

$$LTD = -122{,}632 - 1.15 * MF + 0.13 * CrHH + 0.28 * M3 \qquad \text{(Equation 5-11)}$$

Table 5-24: Diagnostic tests for the regression of long-term deposits

Purpose of test	Test	Statistic
Normality	Jarque-Bera	0.75
Heteroscedasticity	BPG test	10.15
Model stability	Ramsey RESET	6.63

Source: Own calculations from South African Reserve Bank (2007)

From the Jarque-Bera test for normality in Table 5-24, the normality assumption for the model is validated as the *p*-value of 0.75 is greater than the five per cent significance level of 0.05 for a model with three degrees of freedom. The BPG test statistic of 10.15 is greater than the five per cent significance level with three degrees of freedom of 7.81, hence it can be concluded that there is heteroscedasticity in the error variance. The computed *F* value for the Ramsey RESET test for the stability of the regression model of 6.63 is not significant. The hypothesis that the model is mis-specified should thus be rejected.

6. Discussion of results

6.1. Banks as deposit taking institutes

From Figure 5-6, it can be noted that there are at least three different eras revealed in the data resulting from the structural breaks that were caused by the South African currency crisis of September to December 2001 and the subsequent improvement from late 2003 (Knedlik, 2006). During the currency crisis period from late 2001 to early 2003, there was a material increase in the deposits by other companies and close corporations. The foreign currency denominated non-resident deposits as a ratio of the total assets of all banks grew from 25.43% in November 2001 to 31.59% in November 2002. This could be attributed to the exchange rate arbitrage from foreign currency denominated deposits into South African banks.

Figure 5-10 shows a steady decrease in the ratio of banks deposits from individuals to the total assets of all banks. As seen from Table 5-4, the highest contributors to bank deposits are “other companies and close corporations” followed by “individuals”.

Figure 5-11 shows that the total deposit holdings of companies and close corporations as a ratio of the total assets of banks grew substantially from 20.34% in January 1997 to 35.38% in March 2007. There was also a noticeable sharp spike in their deposit holdings at the end of 2001, at the beginning of the currency crisis. Van der Walt (1998) shows that the deposits by companies and

close corporations have increased at a substantially faster rate than has the increase in economic activity, especially since 1994. The process of Black Economic Empowerment, wherein investors of the previously disadvantaged groups bought control of large companies, could have left sellers with large amounts in cash being held at banks in anticipation of new investment opportunities. Companies' and close corporations' preference for liquidity also increased during the period, especially from 1994 onwards. This development seems to confirm their preference to hold deposits for speculative purposes.

The deposits from individuals decreased from 25% at the end of January 1997 to 12.36% at the end of March 2007. This is inline with the research by Van der Walt (1998), which showed that the deposits held by individuals with banks not only grew at a slower rate than total deposits of "other domestic parties" with banks over the period December 1991 to December 1997, but also at a slower rate than gross domestic product over the same period. Van der Walt (1998) also showed that the deposit holdings of individuals, as a percentage of GDP, consequently decreased from 25% in the fourth quarter of 1991 to 21.70% in the fourth quarter of 1993 and further to only 20.50% in the fourth quarter of 1997.

6.2. Banks deposits in relation to total economic activity

The ratio of bank deposits to the GDP gives evidence of the importance of banks as deposit taking institutes relative to the size of the economy. As can be seen from the measure of variability of bank deposits and GDP giving a R^2 value

of 90.21%, it can be deduced that 90.21% of the variation in bank deposits can be explained by the GDP.

6.3. Total bank deposits and MMMFs

The regression of bank deposits and MMMFs reveals that money supply, the net assets of MMMFs, the disposable income of households and the prime overdraft rate are important determinants of bank deposits. However, compared to the money supply and the prime overdraft rate, the net assets of MMMFs and the disposable income of households play a less significant role than the money supply and prime overdraft rate in influencing bank deposits. Moreover, the net assets of MMMFs negatively influence bank deposits. Although there is a negative relationship between bank deposits and the net assets of MMMFs, there are factors other than the net assets of MMMFs that play a significant role in the growth of bank deposits. The negative relationship between bank deposits and MMMFs is expected *a priori*.

6.4. Cash management, cheque and transmission and MMMFs

The regression of the cash managed, cheque and transmission accounts reveals that the macroeconomic variables chosen, including the net assets of MMMFs, are important determinants of the cash managed, cheque and transmission products of banks. However, there is a small positive relationship

between cash management, cheque and transmission products and the net assets of MMMFs.

6.5. Other demand deposits and MMMFs

The regression of other demand deposits reveals that MMMFs are not a determinant for other demand deposits. The regression also reveals that credit to households and money supply have a significant and positive relationship with other demand deposits.

6.6. Other short-term demand deposits and MMMFs

The regression of other short-term demand deposits reveals that MMMFs have a less significant but negative influence on other short-term demand deposits. The negative influence is *a priori*. The more significant influence is from credit to households, money supply, the disposable income of households and the prime overdraft rates. The regression model reveals that with a 1% increase in the net assets of MMMFs, *ceteris paribus*, the other short-term demand deposits decrease by about 0.23%.

6.7. Other medium-term demand deposits and MMMFs

The regression of other medium-term demand deposits reveals that MMMFs, credit to households, money supply and the disposable income of households have a significant influence on other medium-term demand deposits. The positive influence of MMMFs on other medium-term demand deposits is contrary to expectations. For a 1% increase in the net assets of MMMFs, *ceteris paribus*, the other medium-term demand deposits can be expected to increase by about 0.58%.

6.8. Long-term demand deposits and MMMFs

The regression of long-term demand deposits reveals that MMMFs, credit to households and money supply have a significant influence on long-term demand deposits. The influence of the prime overdraft rate and the disposable income of households on long-term deposits are insignificant. *A priori*, there is a negative influence of MMMFs on long-term demand deposits. For a 1% increase in the net assets of MMMFs, *ceteris paribus*, the long-term demand deposits can be expected to decrease by about 1.15%.

7. Conclusions

This thesis has reviewed the literature on the role of banks as financial intermediaries and their development as deposit taking institutions. It has also reviewed the literature on the development of mutual funds, specifically MMMFs, as a class of financial intermediary. Given that MMMFs and bank deposits provide a similar functionality, a review of the literature on the substitutability of MMMFs and bank deposits has also been presented in this thesis. The conclusion of the literature review has shown that current research, which has focused on the substitutability of banks' deposits and MMMFs, has been inconclusive and that no research known to the author has focused on the impact of MMMFs on bank deposits in South Africa, in spite of the phenomenal growth in the net assets of MMMFs over the past ten years.

Chapter 3 provided the research questions and hypotheses. The questions and hypotheses looked at: whether there is a decline in the role of banks as deposit taking institutions; the decline in the importance of banks' deposits in relation to total economic activity; and the possible substitution of banks' deposits with MMMFs. Chapter 4 provided the research methodology, with Chapters 5 and 6 providing the results and the discussions of the results.

This thesis has shown that banks' deposits as a ratio of total assets of banks has been declining during the period 1997-2007. However, during this period, South Africa experienced the currency crisis and the dynamics of the sources of

banks' deposits as a ratio of total assets of banks changed significantly. There was thus a marked change in the deposit behaviour of companies and close corporations during this period. Van der Walt (1998) has also attributed this change to the process of Black Economic Empowerment in South Africa, and the fact that companies' and close corporations' preference for liquidity also increased during the period. During the period 1997-2007, deposits from individuals and inter-bank groups as a ratio of total economic activity declined. However, the causes of these declines have not been covered in this thesis, except for looking specifically at MMMFs compared to the different product splits of banks' deposits.

This thesis has shown the importance of banks' deposits in relation to total economic activity to be on the increase. The causes of this are unknown and are beyond the scope of this thesis.

The main contribution of this thesis has been the empirical analysis of the regression on bank deposits, looking specifically at the impact of the growth in the net assets of MMMFs on bank deposits. In this regard, this thesis has shown that MMMFs are strong determinants of bank deposits and that there is a negative relationship between the net assets of MMMFs and bank deposits. This is thus evidence that there is a level of substitution between bank deposits and the net assets of MMMFs. The regression analysis on bank deposits has *inter alia* given a stable and useful model that can be used for forecasting bank deposits.

This thesis has further looked at the individual products within the total bank deposits, with regressions applied to these products. The findings of this thesis have shown that not all products in banks' deposits have been impacted in the same manner by the introduction of MMMFs. Cash management, cheque and transmission products and other medium-term products have a positive relationship with MMMFs. This means that these products are complementary to MMMFs.

The demand deposit products have no relationship with MMMFs. This can be expected, as demand deposit products are deposits on products wherein the amounts are repayable on demand, including call deposit products and credit cards.

The other short-term deposits and long-term deposits have a negative relationship with MMMFs. This means that these products and MMMFs are substitutes. Short-term deposit products include notice and fixed deposits with less than 31 days in maturity. Long-term deposit products include notice and fixed deposits with less than 181 days in maturity. The conclusion from this thesis is that notice and fixed deposit products are substitutes with MMMFs.

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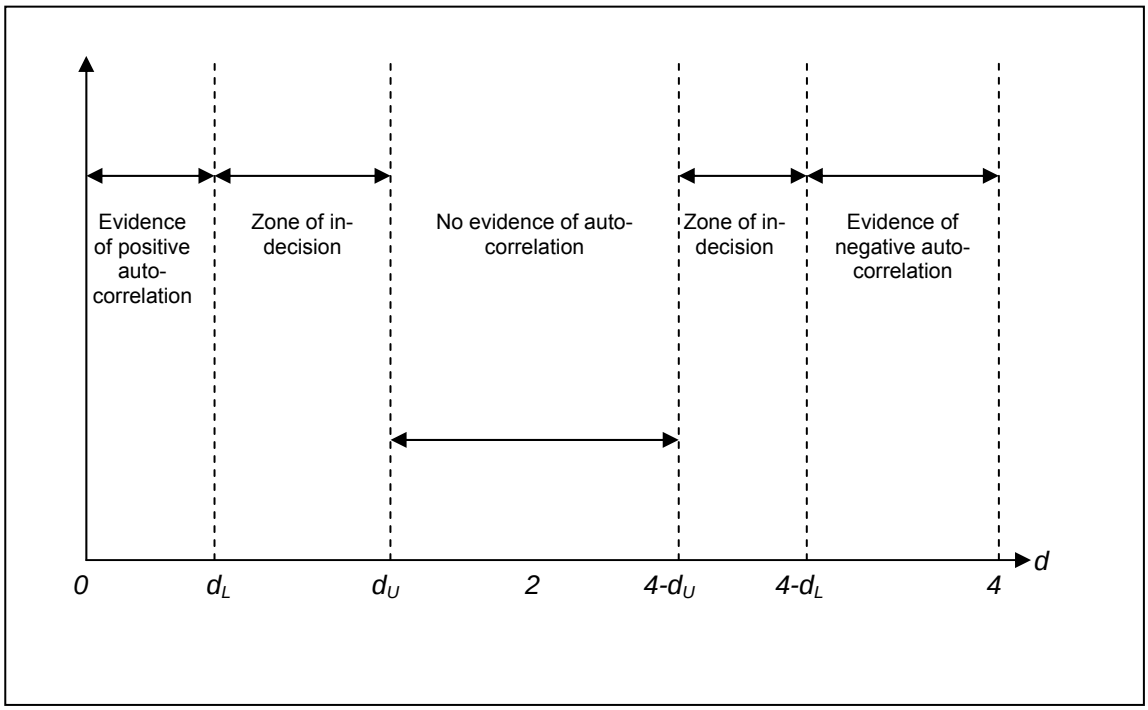
Appendices

Appendix 1–Critical values of the Durbin-Watson statistic

Sample Size	Probability in Lower Tail (Significance Level= α)	k = Number of Regressors (Excluding the Intercept)									
		1		2		3		4		5	
		d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U
15	.01	.81	1.07	.70	1.25	.59	1.46	.49	1.70	.39	1.96
	.025	.95	1.23	.83	1.40	.71	1.61	.59	1.84	.48	2.09
	.05	1.08	1.36	.95	1.54	.82	1.75	.69	1.97	.56	2.21
20	.01	.95	1.15	.86	1.27	.77	1.41	.63	1.57	.60	1.74
	.025	1.08	1.28	.99	1.41	.89	1.55	.79	1.70	.70	1.87
	.05	1.20	1.41	1.10	1.54	1.00	1.68	.90	1.83	.79	1.99
25	.01	1.05	1.21	.98	1.30	.90	1.41	.83	1.52	.75	1.65
	.025	1.13	1.34	1.10	1.43	1.02	1.54	.94	1.65	.86	1.77
	.05	1.29	1.45	1.21	1.55	1.12	1.66	1.04	1.77	.95	1.89
30	.01	1.13	1.26	1.07	1.34	1.01	1.42	.94	1.51	.88	1.61
	.025	1.25	1.38	1.18	1.46	1.12	1.54	1.05	1.63	.98	1.73
	.05	1.35	1.49	1.28	1.57	1.21	1.65	1.14	1.74	1.07	1.83
40	.01	1.25	1.34	1.20	1.40	1.15	1.46	1.10	1.52	1.05	1.58
	.025	1.35	1.45	1.30	1.51	1.25	1.57	1.20	1.63	1.15	1.69
	.05	1.44	1.54	1.39	1.60	1.34	1.66	1.29	1.72	1.23	1.79
50	.01	1.32	1.40	1.28	1.45	1.24	1.49	1.20	1.54	1.16	1.59
	.025	1.42	1.50	1.38	1.54	1.34	1.59	1.30	1.64	1.26	1.69
	.05	1.50	1.59	1.46	1.63	1.42	1.67	1.38	1.72	1.34	1.77
60	.01	1.38	1.45	1.35	1.48	1.32	1.52	1.28	1.56	1.25	1.60
	.025	1.47	1.54	1.44	1.57	1.40	1.61	1.37	1.65	1.33	1.69
	.05	1.55	1.62	1.51	1.65	1.48	1.69	1.44	1.73	1.41	1.77
80	.01	1.47	1.52	1.44	1.54	1.42	1.57	1.39	1.60	1.36	1.62
	.025	1.54	1.59	1.52	1.62	1.49	1.65	1.47	1.67	1.44	1.70
	.05	1.61	1.66	1.59	1.69	1.56	1.72	1.53	1.74	1.51	1.77
100	.01	1.52	1.56	1.50	1.58	1.48	1.60	1.45	1.63	1.44	1.65
	.025	1.59	1.63	1.57	1.65	1.55	1.67	1.53	1.70	1.51	1.72
	.05	1.65	1.69	1.63	1.72	1.61	1.74	1.59	1.76	1.57	1.78

Source: Adapted from Gujarati (1995, p. 818)

Appendix 2-Durbin-Watson statistic decision regions



Source: Adapted from Gujarati (1995, p. 422)

Appendix 3–Chi-squared distribution (one-tailed)

Degrees of freedom	5.0%	1.0%	0.1%
1	3.84146	6.63490	10.828
2	5.99147	9.21034	13.816
3	7.81473	11.3449	16.266
4	9.48773	13.2767	18.467
5	11.0705	15.0863	20.515
6	12.5916	16.8119	22.458
7	14.0671	18.4753	24.322
8	15.5073	20.0902	26.125
9	16.9190	21.6660	27.877
10	18.3070	23.2093	29.588
11	19.6751	24.7250	31.264
12	21.0261	26.2170	32.909
13	22.3621	27.6883	34.528
14	23.6848	29.1413	36.123
15	24.9958	30.5779	37.697
16	26.2962	31.9999	39.252
17	27.5871	33.4087	40.790
18	28.8693	34.8053	42.312
19	30.1435	36.1908	43.820
20	31.4104	37.5662	45.315
21	32.6705	38.9321	46.797
22	33.9244	40.2894	48.268
23	35.1725	41.6384	49.728
24	36.4151	42.9798	51.179
25	37.6525	44.3141	52.620
26	38.8852	45.6417	54.052
27	40.1133	46.9630	55.476
28	41.3372	48.2782	56.892
29	42.5569	49.5879	58.302
30	43.7729	50.8922	59.703
40	55.7585	63.6907	73.402
50	67.5048	76.1539	86.661
60	79.0819	88.3794	99.607
70	90.5312	100.425	112.317
80	101.879	112.329	124.839
90	113.145	124.116	137.208
100	124.342	135.807	149.449

Source: Adapted from Gujarati (1995, p. 816)