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**University of Cape Town
Department of Accounting
Masters degree in Finance**

ANALYSIS OF CREDIT EXPANSION IN SOUTH

AFRICA (Masters Research)

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ABSTRACT

Developments in South Africa over the past few years clearly testify to the strong relationships between economic growth and credit expansion. The paper analyses the factors driving credit growth in South Africa. It shows the strong income effect on the credit level in South Africa while the changes in interest rates do negatively affect home loans but have less effect on other components of bank credit to the private sector. This paper concludes that the interest rates policy must be combined with other tools of monetary and financial policy to guarantee a structurally lower level of credit to the private sector.

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Chapter 01: INTRODUCTION

The financial system interacts with real economic activity through its various functions by which it facilitates economic exchange. “The financial system plays an important role in mobilizing funds and transforming them into assets that can better meet the needs of investors. By facilitating portfolio diversification, financial intermediaries allow savers to maximize returns to their assets and to reduce risk. Financial intermediaries transfer resources across time and space, thus allowing investors and consumers to borrow against future income and meet current needs” (Nnadozie, 2003).

In essence, the growth in the economy depends on technical innovation and the accumulation of production factors. Traditionally, financial system has been linked primarily with the input factors in the production process, regarding capital and its accumulation as an important factor and a condition for suitable economic growth. “Finance also contributes to the realization of technical progress to the extent that technical advances need to be embedded in the capital stock to influence production. In particular, in periods of rapid technical progress (innovation), an efficient financial system is required to facilitate embedding technical advances in capital formation and promote economic growth” (Thiel,2001).

This study aims to contribute to the body of literature addressing the phenomenon of rapid growth in bank credit to the private sector, using South Africa as a case study. In addition, this study will review the trends in bank lending to the private sector in the Eastern and Central European Countries (CEE) and emerging markets in Latin America.

Specific questions addressed are: What are the possible factors underlying the rapid growth of credit in South Africa? What are the implications of the rapid credit growth for the macroeconomic and financial stability of South Africa? This is particularly important in the context of the growing concerns about the implications for macroeconomic and financial stability, in particular, where rapid credit growth has coincided with a weakening current account and vulnerabilities in the financial systems.

These results can then be compared with various economic and financial theories and some conclusions about possible policy responses will be proposed in connection with the role that the financial sector should play in South Africa.

1.2. Literature Review

In order to understand the nature of rapid credit growth in South Africa, it is important to recognize the factors involved in this process. Hilbers et al. (2005) argue that there are “three main drivers of rapid credit growth”. These include periods of economic boom; phenomenal growth of credit in comparison with output; and the change in the behaviour of “financial market participants,” such that over-optimism towards future earnings prevails (Hilbers et al., 2005).

Hilbers et al. (2005) acknowledge that in reality it is not easy to separate these three factors mentioned above when analysing the drivers of credit growth and to determine its optimum level. The economic prosperity leading to more access to bank credit may impact the macroeconomic stability by causing an imbalance between the aggregate demand and the potential output; resulting in inflation pressure. The increase in import demand may negatively affect the external current account (Hilbers et al., 2005).

The impacts of rapid credit growth on the macro and microeconomic activities are interconnected. The instability of macroeconomic activities negatively affects the financial sector and corporations due to inflation, which makes the capacity of borrowers to meet their obligations deteriorate. The opposite situation with microeconomic instability affecting the stability of macroeconomic activities remains true.

In addition, Hilbers et al. (2005), pointed out that the studies conducted on the lending episodes over forty years have shown the strong link between the domestic investment boom, local interest rates, the current account, the international reserves, the exchange rates and the potential output.

According to Hilbers et al. (2005), the high volume and “speed of credit expansion” impact on the banks’ capacity and “resources” to efficiently control risks. “Substandard loan-granting procedures and unrealistic projections of future repayment capacity of borrowers may distort the growth and allocation of credit. Such exuberance would allow large exposures to develop, which could magnify real sector costs in the event of a shock” (Hilbers et al., 2005). In terms of banks’ capacity and management to evaluate the quality of credit, the high volume of loans is an important factor. Therefore, well-skilled bankers and additional staff are necessary to avoid granting loans to unqualified applicants (Hilbers et al., 2005).

The literature on credit expansion has been extensively reviewed. Gourinchas et al. (2001), have identified other factors to explain the lending boom in Latin America. Their findings have shown that “the lending boom is often followed or accompanied by banking or currency crises, or both” (Gourinchas et al., 2001). In addition, they acknowledged that the poor regulation of financial markets also plays a role in rapid credit growth (Gourinchas et al., 2001).

Cottarelli et al. (2003) found that the increase in bank credit to the private sector and the differences across Central, Eastern, and Balkan (CEB) countries “reflect primarily overall financial deepening, the speed of privatisation, crowding-in forces, and overall progress toward market institutions” (Cottarelli et al., 2003).

In order to control the breaks in the ratio series of bank credit to the private sector, Cottarelli et al. incorporated in the model a number of dummy variables. The break dates in the series were provided by the country pages of international financial statistics from IMF (International Monetary Fund). With R-square of 0.66, the estimation from the model reported satisfactory results in comparison with previous attempts to estimate bank credit to the private sector (Cottarelli et al., 2003). The estimated coefficients of bank credit to private sector ratios for CEB countries “were also quite robust to alternative specifications” (Cottarelli et al., 2003).

In assessing and analysing rapid credit growth in Central and Eastern Europe countries (CEE), the dataset by Hilbers et al. (2005) consists of two groups of countries. The focus group is composed of 18 countries that are in transition from centralized planning to a market economy and are primarily located in Central and Eastern Europe. The focus group provides a panel of annual data from 1990 to 2004. The benchmark group was made up of countries within the Organization for

Economic Cooperation and Development (OECD) with economic growth above the average and having a fast credit growth during the period. Most variables, which are measures of GDP and CPI, were sampled from International Financial Statistics (IFS) and the World Economic Outlook Database.

Bank credit to the private sector was measured using both the claims that commercial banks have on the private sector and the GDP (in current prices of each country's national currency). Credit extended by leasing companies and other nonbank financial institutions was not included due to a lack of data in various countries, and also to permit cross-country comparisons. Since credit is a stock variable and GDP is a flow variable, the ratio is determined by bank credit to the private sector at the end of time t divided by the simple average of GDP over time t and $t+1$.

The public debt ratio is the stock of public debt to GDP. It has an expected negative sign while the log of GDP per capita expects to have a positive sign as it should lead to a higher degree of financial deepening in high income countries, because the latter are characterized by a higher capital labour ratio and bank credit is a key source of external financing. The sign of this coefficient should, however, not be interpreted as involving causality.

On the strength of the above considerations, one could ask how to assess whether the level of credit is growing too quickly. Are there speed limits? Duenwald et al. (2005) working on credit booms in transition economies such as Bulgaria, Romania and Ukraine, pointed out that deciding whether a “credit expansion is excessive or not is difficult both in general and for the three countries” (Duenwald et al. 2005). This was explained by the fact that in the process of convergence, it is expected that there will be a higher level consumption and an increase in investment, some extent of re-intermediation and large deficit on the external current account (Duenwald et al., 2005). In this paper, we agree with other researchers that the literature available on credit expansion providing the guideline to the question “how fast is too fast” is limited. In theory, the optimal level of credit could be obtained using the economic fundamentals of a country and the institutional structures. Then the actual credit level can be compared. However, it can be argued that the results obtained might not provide the equilibrium level of credit but only a “target” (Duenwald et al., 2005).

The research conducted on Bulgaria showed that the gap between the estimated optimal level and the actual ratio has been lessening rapidly. Before reaching the credit boom stage, the credit to GDP ratio increased from 14.5 percent in 2001 to 35.5 percent in 2004, or by 7 percent on average per year. In Romania and Ukraine, on the contrary, the credit ratio to GDP has increased at the slow pace of 2.5 percent and 4.5 percent on average, respectively, during the same period (Duenwald et al., 2005).

Drawing conclusions from the experiences of Latin America and CEE countries has shown that lending booms are often found to be associated with a domestic investment boom and a change in domestic interest rates. In this study we attempt to detect the lending boom episodes and analyze empirically the factors underlying the rapid growth of credit in South Africa.

The rest of this research report is structured as follows. Chapter 2 gives the theoretical background to the South African financial system and credit policy in South Africa. In Chapter 3 we describe the methodology and the data we use. Chapter 4 analyses indicators around the lending boom and characterization of episodes in South Africa. We then in Chapters 5 and 6 present the empirical evidence and the factors explaining credit growth in South Africa. Chapter 7 revisits the credit expansion in South Africa and the trends in other countries. Finally, we present our concluding remarks.

**Chapter 02: THEORETICAL BACKGROUND TO FINANCIAL
INTERMEDIATION AND CREDIT MARKET
PARTICIPANTS IN SOUTH AFRICA**

This chapter provides an overview of the South African financial system and policy. There are large numbers of descriptions of financial systems, their instruments, their institutions, their services, their practices and their markets. The financial system can be defined as a set of organisations and processes which facilitate the lending and borrowing of funds between savers and borrowers. The financial system makes easy the allocation of the limited resources between the economic units with excess funds and those with a deficit of funds.

2.1 Financial Intermediaries in South Africa

Financial intermediaries are institutions that act as the “middleman between investors and firms raising funds, referred to as financial institutions” (Van Zyl et al., 2006). The primary role of the financial institutions is to receive funds from the private and/or public agent in excess (lenders) and lend to the private and/or public agent in deficit (borrowers). This corrects the conflict that might exist between savers’ and borrowers’ preferences in terms of amount, term to maturity, quality and liquidity. Financial institutions issue “financial liabilities” that are suitable for investment by the qualified lenders and use the funds to purchase claims that reflect the requirements of the borrowers which are primary securities (Van Zyl et al., 2006).

2.2 Quasi-Financial Intermediaries

In addition to the above classification, the institutions such as Investment trusts, Private equity funds, Hedge funds, Finance companies, Securisation vehicles, Saving and credit cooperatives, Micro lenders, Friendly societies, Village financial service cooperatives and Buying associations, are called Quasi-financial intermediaries (Van Zyl et al., 2006). Their borrowing and lending differ from the financial intermediaries.

2.3 Financial Markets

There are a number of other financial entities that play a role in the financial system. They are entities that provide important facilitation in the functioning of the financial system. The economic role of financial markets is to serve directly as intermediaries between the surplus units and the deficit units. In other words, financial markets constitute the mechanism that links surplus and deficit units, providing the means for surplus units to finance deficit units either directly or indirectly through financial intermediaries, stock and bond markets (Van Zyl et al. 2006). The stock market is a term used to explain the mechanism that allows a company to trade company shares or other securities. The transactions on the Bonds are done in the market called the bond market. The term or the maturity of securities traded provides the line demarcating between Bond and Money market (Van Zyl et al. 2006).

In South Africa there are two licensed exchanges, namely the JSE securities exchange and the Bond Exchange of South Africa (BESA). The JSE has three divisions: the Equities division, financial derivatives division (SAFEX) and Agricultural products division. The members of BESA and SAFEX may be banks or other financial intermediaries. In case of the JSE, the members are separately capitalized companies.

2.4 Financial Development: Trends and Patterns

2.4.1 Stock Exchange

According to Fourie et al. (1999), the first stock exchange in South Africa was formed in Cape Town in 1838. After which activities continued by public auction. The discovery of gold in the Eastern Transvaal in 1884 led to the formation of two securities markets. The two exchanges were operational from 1884 to 1890 (Fourie et al., 1999). The stock exchange was created in Kimberley after the discovery of diamonds and the committee was put in place to regulate the transactions. Fourie et al. (1999) stated that Kimberley continued to play a key role in financial activities until the discovery of gold in the Witwatersrand. Due to the poor communications system at the time, the Johannesburg Securities Exchange had to then be established. In 1886 the Witwatersrand Club and Exchange Company Limited was established and in 1887 the Johannesburg Stock Exchange took over. Besides the exchanges mentioned, those at Klerksdorp, Pietermaritzburg, Cape Town and Durban existed for short periods (Fourie et al., 1999). The development of the

South African economy affected positively the level of activity and the number of listings.

The evolution in South African stock markets shows the number of securities listed on the JSE decreased from 914 in 2000 to 873 in 2004, while the share capital raised in the primary share market by companies listed on the JSE increased from 12 billion in 1992 to 87 billion in 2006. This describes how South African companies extensively sourced funding in the share market. On the other hand, the total value of shares traded on the secondary market increased from 700 million in 1970 to 2 trillion in 2006. The All-share index (price) has also grown from 10,315 in 2002 to 21,202 in 2006².

The annualized return on South African shares was 57 percent in the fourth quarter of 2006, giving a return for the year 2006 of nearly 41. The general consensus is that the valuation of the JSE All Share is as measured by the price-earning ratio (PE), which was between 12 and 16, from 2002 to 2006. The earning growth has increased from 14 percent in 2002 to 30 percent in 2006. The JSE performances were stimulated by the recovery of the rand against the major currencies (the dollar), as well as the strong growth of the South African economy and the indications that inflation could be contained. The projection of future GDP growth in South Africa

² The information for this section was obtained from South African Reserve Bank (SARB) (www.reservebank.co.za)

with a 4.7 percent average in 2007 indicated that the companies profit growth should remain strong³.

2.4.2 Bond Exchange

The bond exchange in South Africa was initially established in 1989. In 1996, the licence for a new financial exchange was granted by the South African regulatory authorities to a regulated bond exchange, called the Bond Exchange of South Africa (BESA). This relatively new exchange operates under an annual licence granted by the Financial Services Board (Van Zyl et al., 2006).

The market size of BESA has passed from Rand 331 billion in 1998 to Rand 830 billion in 2006. The nominal debt listed increased from 398 billion in 1999 to 637 billion in 2005. The debt listed from the Central government represents 85 percent of the total debt listed with 15 percent from state-owned enterprises in 1999. The debt listed structure has changed in 2005, with 67 percent of debt listed from Central government, 22 percent and 10 percent respectively from Corporate and state-owned enterprises. It is important to notice that a corporate debt security is defined as a debt security issued by a corporate entity with no implicit government guarantee. All debt securities issued by government-owned entities and all debt securities issued by

³ South African Reserve Bank (SARB)

government elected statutory bodies, that are not government guaranteed, do not fall under this category⁴.

The BESA market turnover dropped from R11.7 trillion in 2002 to R8.1 trillion in 2005. Macro-economic stability coupled with a low level of inflation and the decline in the repo rates as a result of the Reserve Bank's monetary policy, among others events, coincided with the low level of activities in the Bond Exchange of South Africa (BESA). The nominal turnover on the South African Bond Exchange increased from R8.1 trillion in 2005 to R11.4 trillion in 2006. The most traded instruments remain the Government bonds which represented 93 percent of the total nominal turnover. The turnover on a monthly basis in 2006 reached a higher level, namely R1.2 trillion in October 2006. The improvement in the turnover can be explained by the volatility in the bond market due to various external factors such as increases in the Reserve Bank's repo rate, the general confidence of foreign investors in terms of "the risk-reward payoff of investing in emerging markets" and the depreciating rand⁵.

The return on R153 decreased from 11.86 percent in 2002 to 7.31 percent in 2005. South African bonds provided the annualised return of 24 percent at the last quarter

⁴ The information for this section was obtained from the Bonds Exchange of South Africa. (www.bondexchange.co.za)

⁵ Idem

of 2006. The return in South African bonds market beat the inflation of 5.5 percent in 2006. The stronger rand and improvement in bond prices attracted more foreign investors with the next exposure of around R13 billion to the South African bond in the last quarter of 2006. This increased the total net bond purchases by foreign investors from 8 billion in 2005 to 30 billion in 2006⁶.

2.4.3 Money Market

The South African money market developed after the creation of the National Finance Corporation (NFC), which was formed in 1949 as the outcomes of a joint venture between private financial institutions and the South African Reserve Bank. NFC became very successful after 1949; this motivated the private sector in South Africa to take part in the development of private markets. First Merchant Bank was established in 1955 as result of the development of private market services (Van Zyl et al., 2006). This was followed by the establishment of the discount house in 1957 and its activities involved taking over the discounting business of the existing merchant bank. In 1985, three others discount houses were established (Van Zyl et al., 2006).

⁶ Bond exchange of South Africa (www.bondexchange.co.za)

The South African money market delivered an annualised cash return of 7.8 percent compared with the return of 11 percent in 2002. The higher interest rates since the middle of 2006 contributed to lift the return of cash in South African markets⁷.

2.5 Financial Policy in South Africa

The South African financial system is well established and is centred on the South African Reserve Bank. This is the only bank with authority for issuing the national currency in South Africa (Van Zyl et al., 2006). Among other roles, the Reserve Bank of South Africa defines and conducts the monetary policy and manages international reserves. There are many registered banking institutions in South Africa, including commercial and merchant banks, savings and investment banks, and discount banks. The South African financial system is made up of large numbers of private pension and provident funds as well as insurance companies and active capital markets, which play important roles in the financial sector (Van Zyl et al., 2006)..

2.5.1 Credit Policies: Direct or Indirect Control

To conduct the financial policy, the Central Bank can use three major tools which are open market operations, interest rates and the reserve requirement. In South Africa

⁷ South African Reserve Bank (www.reservebank.co.za)

the financial policy is led by the South African Reserve Bank (SARB) which manages all the functions of a central bank (Van Zyl et al., 2006). The SARB is the institution with authority recognised by the constitution of the country to protect the value of the local currency. In the same way as central banks in developed countries; the SARB conducts the monetary policy using the interest rates and controls the liquidity provided to the private sector (Van Zyl et al., 2006). In South Africa the administrative control and quantity control of credit is no longer applicable. This is due to the commitment of South African banks to adhere to the International Standards.

Analysing the financial policy in South Africa, Aron et al. (2000) have shown that the government started the process of financial liberalization following the Kock commission reports in 1978 and 1985, which were in favour of a market-oriented policy. The controls of credit and interest were banished from 1980 and the liquidity ratios of banks were considerably decreased between 1983 and 1985. However, due to the international debt crisis of South Africa a temporary reversal occurred later in 1985, with a decrease in the net capital inflows (Aron et al., 2000). "Demutualization and takeovers in 1989-1990 consolidated the stronger competition in the credit market" (Aron et al., 2000). Pensions were considerably used to provide additional protection for housing loans in 1990. In 1995, the use of special mortgage accounts was put in place to allow households to borrow and be able to pay back with flexibility from the special mortgage accounts up to the limit acceptable, considering

the value of their housing collateral (Aron et al., 2000). The change in the financial conditions for more black South Africans with their being able to obtain formal employment mainly in the public sector after elections in 1994, gave them more access to credit that they might not have received in the past (Aron et al.,2000).

The financial liberalisation in South Africa since the 1980s has changed considerably the ratios between income and household debt. The private sector has suffered from low rates of savings since then. The low level of saving is considered as a sign of structural weakness in any economy.

2.5.2 Financial Regulation Regimes

As pointed out by Falkena et al.(2001), the high competition globally is one of the reasons that explain the structural changes of financial systems and why the regulatory arrangements have also become complex. The national regulation in many countries tempts the authorities to adapt to the international standards set by bodies such as the International Accounting Standards Committee, the Basel Committee on Banking Supervision, the International Organization of Securities Commissions or the International Association of Insurance Supervisors (Falkena et al., 2001).

South Africa reluctantly took the first step to free the economy from tight regulation during the 1980s. “During that period, regulators hardly looked beyond the national frontiers; capital requirements were based on simple gearing ratios of capital to total

assets” (Falkena et al., 2001). The political situation of isolation in South Africa constrained the authorities from following the international trends (Falkena et al., 2001).

On the other hand, the change in the regulation in the late 1980s in South Africa was explained by factors such as financial innovation, capital mobility and global financial conglomerates (Falkena et al., 2001). South Africa moved from over-regulation to deregulation with more free market forces playing an important role and South Africa rapidly followed the international trends after the political isolation in the mid-1990s (Falkena et al., 2001).

2.5.3 Credit Authority in South Africa

The National Credit Regulator (NCR) in South Africa was established as the regulator under the National Credit Act 34 of 2005 with the effective date of 1 June 2007 and is responsible for the regulation of the South African credit industry excluding (mostly) credit to business. The National Credit Regulator has among other functions to educate consumers, to research, to develop policies, to register industry participants, and to investigate complaints while ensuring the enforcement of the Act.

One of the requirements of the Act is for the Regulator to promote the development of an accessible credit market, especially for those that historically were disadvantaged, the consumers with low income and isolated or low density

communities (National Credit Act, 2005). “The NCR is also tasked with the registration of credit providers, credit bureaux and debt counsellors; and enforcement of compliance with the Act” (National Credit Act, 2005). One of the important clauses states that: “Lenders must do an affordability check before granting. If no affordability was done a court can set aside the agreement. Banks and clothing stores may not automatically increase limits on the credit and store cards without written permission of client” (National Credit Act, 2005).

2.5.4 Regulation Authority in South Africa

The regulatory structure in South Africa is currently fragmented, with different components of the financial markets regulated by different institutions. Banks are regulated by the Banking Supervision Department of the SA Reserve Bank with regard to their banking activities, while non-banking financial institutions are regulated by the Financial Service Board (FSB) which is independent from Department of Finance but under its control.

Chapter 03: RESEARCH METHODOLOGY AND DATA

3.1 Archival Analysis

The following methodology was used to investigate the phenomenon of rapid credit growth. First, the behaviour of the variables over time was explored graphically and the ADF (Augmented Dickey-Fuller) test was used to establish whether there is evidence of trends and breaks in the time series.

Secondly, cross-sectional data were used in order to provide a summary of developments in bank credit in South Africa and in both the Eastern and Central European Countries (CEE) and emerging markets in Latin America. Just as time series data create their own special problems because of stationarity issues, cross-sectional data too have their own problems, specifically the problem of heterogeneity. By including such heterogeneous issues in statistical analysis, the level of inflation and/or currency denomination was taken into account so as not to mix apples with oranges. Finally, pooled data or combined data of both time series and cross-section were used to identify episodes and cases of rapid growth in South Africa

To detect credit boom, Hilbers et al. (2005) determine the cycle: “The model establish a trend of credit to GDP over time, using the recursive (or rolling) Hodrick Prescott filter (“HP filter”). The HP filter decomposes a series into a trend (X_t) and a

stationary component $(Y_t - X_t)$, Y_t represents the actual credit ratio, by choosing X_t such that the following formula is minimized :

$$\text{Min } \left\{ \sum (Y_t - X_t)^2 + \lambda \sum ((X_{t+1} - X_t) - (X_t - X_{t-1}))^2 \right\}$$

λ is a smoothing parameter, usually set at 1000 for annual data. If $\lambda=0$, X_t will be minimized when $X_t = Y_t$

“The recursive HP filter sets a trend at each point by de-trending the first 5 years, then calculating a trend for the first 6 years, and another for the 7 years, etc. The last trend point for each exercise makes up the trend for the whole series. This method enables the policymaker to identify whether a boom has occurred up until the time a decision has to be made, hence identifying where the economy is located in the cycle at any given point in time” (Hilbers et al., 2005).

Using the model described above, Hilbers et al. (2005) have mentioned that Gourinchas (2001) calculates the relative difference and absolute difference between the actual series and the trend, where the relative difference equals $(Y_t - X_t) / X_t$. In their analysis Hilbers et al. (2005) confirmed using the relative difference approach rather than absolute difference, “to take into consideration the level of financial deepening in assessing how concerning credit growth could be (for example, a rise in private credit to GDP from 10 percent to 20 percent will have a much different expansionary effect on macroeconomic variables than a rise from 100 percent to 110 percent)” (Hilbers et al., 2005).

Gourinchas cited by Hilbers et al. (2005) set an arbitrary limit threshold at 5 percent relative difference and 2 percent absolute difference to be able to identify the rapid credit growth episode (Hilbers et al., 2005). “They rank in a descending order the relative and absolute difference of all observations in their dataset and set a cut off point for the credit boom at 60th highest deviation, the 80th and the 100th case; hence all observations with the relative difference exceeding 22.2 percent are considered as booms in their analysis” (Hilbers et al., 2005). As for any empirical work the quality of the resultants depends on the accessibility of the dataset. In order to identify a boom episode in a given country, the quality and availability of the data are crucial. “Should one particular country experience a profound and long-lasting credit boom, it may crowd out credit booms in other countries from the list of 60 80, or 100 cases that the method suggests” (Hilbers et al., 2005).

In order to examine more formally the evolution of lending episodes in South Africa, we apply as mentioned earlier the deviation of the credit to GDP ratio from a rolling, backward-looking, country-specific stochastic trend (estimated by a Hodrick-Prescott Filter). “The idea is that such stochastic trend represents the historically “normal” pace of credit growth for the country” (Cottarelli et al. 2003). “This methodology has the advantage that to construct a rolling backward-looking trend one needs only the information available up to the time period that needs to be evaluated” (Cottarelli et al., 2003). This allows us to examine the evolution of bank credit also for the very

recent past. Obviously, this methodology does not allow us to predict what will happen to a lending boom episode. Nevertheless, to the extent that most banking crises are preceded by lending booms, this approach provides useful information for assessing whether or not a lending boom is in progress.

Furthermore, Cottarelli et al. (2003) working on the bank credit growth to the private sector in central and eastern Europe and the Balkans estimated an econometric model based on annual data for 24 countries using a random effects GLS (Generalised least squares) estimation procedure. The dependent variable is the bank credit to the private sector as a ratio to GDP and as independent variables are public debt ratios; the log of GDP per capita measured in PPP (Purchasing power parity) prices and controls for the level of economic development; high inflation which is expected to have a detrimental effect on financial deepening and the LibIndex which is an index of financial liberalization of both the domestic financial system and of the capital account (Cottarelli et al., 2003).

As shown from the considerations above, this study also used the econometrics models to present the empirical evidence of factors leading to credit growth in South Africa.

3.2 Data

The study used data from the South African Reserve Bank (SARB). The basic source of the SARB'S data is Statistics South Africa (Stats SA), which in turn collects its data via surveys. Two of the other sources were the Johannesburg Stock Exchange (JSE) and international financial statistics from the International Monetary Fund (IMF). The principal series used in the investigation are: (i) measures of the supply of credit by banks as a share of total domestic credit or as a ratio of GDP; (ii) measures of the supply of credit to the private sector as a share of total domestic credit or as a ratio of GDP; (iii) breakdown of the supply of credit to the households and to the corporate sector as a share of total domestic credit or as a ratio of GDP; and (iv) economic variables including Real GDP and domestic investment.

To identify credit booms in our model framework, we use the sample of data from the South African Reserve Bank from 1978 to 2006. We measure private credit as total claims (Investments, bills discounted, instalment sale credit, leasing finance, mortgages and other loans and advances) on the nonbanking private sector from all monetary institutions in South Africa. Credit being a stock variable measured at the end of the year, we consider the average of GDP in year t and $t+1$ as a relevant measure of GDP in the ratio calculations.

On the other hand, in the standard (econometrics) model in South Africa, we consider that the bank credit to private sector depends on the GDP cycle, gross domestic expenditure, interest rates (nominal and real) and inflation rates. As explanatory variables the use of the real and nominal interest is referred to prime rates applied by the South African banking system while GDP is the measure indicating the supply side of the economy and gross domestic expenditure reflects the demand side of the South African economy. The regression results were based on quarterly data from South African Reserve Bank (for the period 1970-2006).

Chapter 04: LENDING BOOMS AND CHARACTERISATION OF EPISODES IN SOUTH AFRICA

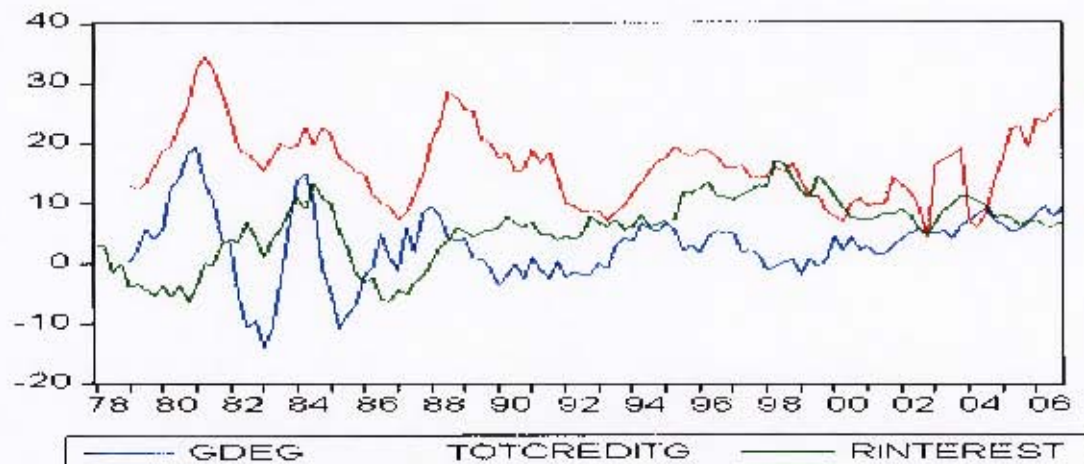
To further our investigation of lending booms in South Africa, we now present a set of indicators associated with episodes and evaluate the results of our research using the methodology described in the previous chapter.

4.1. Statistical Analysis of Growth in South Africa Credit

4.1.1 Credit extension by banks to private sector (total claims to private sector)

Demand for credit by South Africa's private sector soared from 8 percent in the 1970s to the average of 20 percent in the 2000s, year on year credit growth. It accelerated from 2003 and chalked up a record rate of increase of 25 percent, above forecasts in 2006. Credit extension to the private sector by banks amounted to R1.4 trillion in 2006. This led to credit growth of 429 percent between 1994 and 2006.

Figure 1: Total Credit to private Sector (year on year growth), Gross Domestic Expenditure and Real Interest (1978-2006)



Source: Author's calculations based on South African Reserve Bank data.

Compiled by using Eviews5 Software

4.1.2. Credit Extension to Households and Corporate Sector

Credit extended to South African households amounted to R727 billions in 2006 with credit growth of 352 percent from 1994 to 2006. Growth in demand for credit by South Africa's households is led by the higher level of households spending. Apart from the threat that higher spending poses to price stability in the South African economy, the major concern is the household debt as a percentage of disposable income. The household debt ratio to disposal income moved above 50 percent of disposal income in the 1990s. It reached record levels of 72 percent in 2006.

Figure2:



Source: Author's calculations based on South African Reserve Bank data.

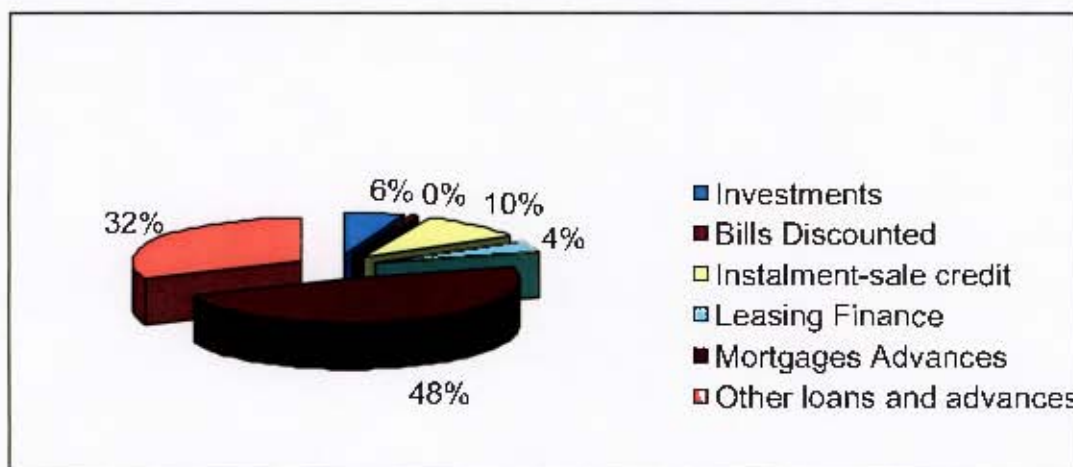
Compiled by using EViews5 Software

The figures for "debt", as measured in the official statistics, refer only to the credit extended through commercial banks and do not include the money that consumers owe to clothing stores and other retail outlets or to unregistered money lenders and loan sharks. In this sense, the official measurements of household debt actually underestimate the level of indebtedness of the average South African's ratio of debt to household.

In addition, one could say that South Africa's ratio of debt to household income of more than 70 percent is a national average. There is an opinion that the burden of debt is not evenly spread across all households; richer consumers may have a

mortgage bond, car bought on credit and high levels of credit card debt, while poorer consumers do not have access to as much debt. The debt to income ratio of the richer consumer could easily be above 100 percent while the poorer consumer may be living well within his means, with the debt to income ratio below 50 percent. The poorer consumer could be able to pay off his outstanding debt if he saved hard for a few months while it is not easy for a richer consumer carrying debt equivalent to the value of two or three year's salary of the poorer consumer.

Figure3: Total Credit Extended to private sector



Source: Author's calculations based on South African Reserve Bank data.

An analysis of the levels of accumulated private sector credit extended to households indicates that the largest contributor to the household debt has been the growth in mortgage loans as people hope to benefit from the recent housing boom in South Africa. The household debt level is the major concern as the final consumption expenditure to GDP by households in South Africa represents more than 60 percent,

leading to a ratio of saving by households to disposal income of -0.62 percent or negative savings of more or less R6 billion as at the end of 2006.

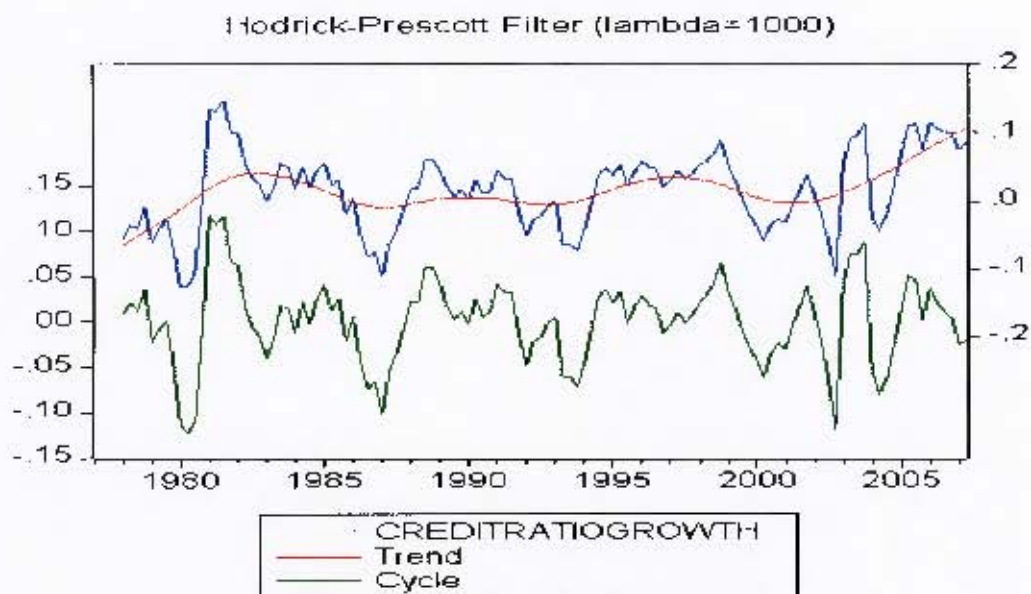
On the other hand, the credit extension to the corporate and business sector accounts for more or less 40 percent of the credit extended to the private sector with the rest to households. Credit extension for investments amounted to R85 billion as at 2006 with credit growth of 600 percent from 1994 to 2006. In determining the risk profile of credit expansion, an analysis of breakdown of credit data in term of the type of borrower, in particular the distinction above between households and the corporate sector is important. Households tend to borrow for purchases of durable consumer goods or real and financial assets. The consumer loans should be relatively small otherwise there may be substantial risks involved. It is important to closely monitor the overall balance sheet of household sector and in particular the degree of indebtedness in relation to disposal income. For corporate loans, the risk is explained more by weaknesses in the transparency, accounting and contract enforcement.

4.2. Credit Boom and Characterization of Episodes in South Africa

This research uses the definition of lending boom given by Gourinchas et al.(2001), as a deviation of the ratio between nominal private credit and nominal GDP from a rolling, backward-looking, country-specific stochastic trend. To become an episode, the deviation from the trend has to be larger than a given threshold. We consider the growth in ratio bank credit to private sector and GDP to be greater than 5 percent (given threshold), the highest GDP growth rate in South Africa, as constituting a

lending boom episode. We use The Hodrick-Prescott Filter⁸ which is a smoothing method that is widely used among macroeconomists to obtain a smooth estimate of the long term trend component of a series.

Figure 4: South African Lending Episodes: Credit/ GDP ratio (percent)



Source: Author's calculation based on South African Reserve Bank data.

Compiled by using Eviews 5 Software

Using Eviews 5 software, we estimate the trend of the credit to GDP ratio using a rolling Hodrick-Prescott Filter for South Africa (parameter set at 1000 with annual data). Graph 4 shows that South Africa has experienced four lending episodes. The first episode is from 1980 to 1985, the second from 1988 to 1992, the third from 1994 to 2000 and the fourth from 2003 to 2006. The credit to GDP ratio increased

⁸ The method was first used in a working paper circulated in the 1980s and published in 1977 by Hodrick and Prescott to analyze postwar US business cycles.

by 15 percent in 1981 (in the first episode), by 7 percent in 1988 (in the second episode), by 6 percent in 1994 and 12 percent (in 2004 in the last episode).

Since any series experiences deviations around its stochastic trend, one needs to choose a threshold beyond which a positive deviation from the trend should be classified as a lending boom. This choice is necessarily an arbitrary one. Gourinchas, et al. (2001) employ different thresholds ranging from 4.8 percent to 6.4 percent for the absolute deviation, and from 22 percent to 31.1 percent for the relative ones.

According to those boundaries, the examination of the case of South Africa as per Figure 4 and Table 1 reveals that four lending episodes (1980 to 1985, 1988 to 1992, 1994 to 2001 and 2003 to 2006) could be detected and defined as lending booms.

Table 1: Credit/GDP ratio in South Africa: Deviation from Trend, 1980-2006

Lending Episodes	Credit to GDP ratio (% Growth)(A)	HP Estimated (Trend in %)(B)	Absolute Deviation(A-B)	Relative Deviation (A-B)/A in %
1980	15	5	10	67
1985	3	3	0	0
1988	7	2	5	71
1992	3	3	0	0
1994	6	1	5	83
2001	3	3	0	0
2003	12	5	7	58
2006	7	7	0	0

Source: Author's calculations based on SA Reserve Bank Statistics.

A closer examination of the case of South Africa reveals also that the credit “boom” for each episode is, at least in part, the result of a rebound from a period of credit

contraction. South Africa experienced a credit boom from 1980 to 1985, 1988 to 1992, 1994 to 2001 and 2003 to 2006, with a consequent reduction of the bank credit to private sector ratio respectively in 1985, 1992, 2001 and 2006.

Analysts stressing the risks associated with credit booms have often focused on credit flowing to particular sectors of the economy, such as mortgage lending or consumer lending. A fast credit expansion in a particular sector can occur through a reallocation of bank portfolios, even in the absence of an aggregate credit boom. These sectoral booms may entail risks that are similar to those associated with aggregate booms. Furthermore, “excessive” credit to particular sectors of the economy may result in macroeconomic imbalances and lead to asset price bubbles; this is the case of the South African property sector. Mortgage loans can fuel an asset price bubble; while consumers’ credit can lead to an expansion of demand not matched by a rise in potential output. Both these forms of credit are likely to be key components of credit to households.

A more direct analysis of asset prices, and real estate prices in particular, would be useful but is severely limited in the case of South Africa by data availability. Admittedly, credit to household includes, in some countries, also credit to small enterprises, and thus does not necessarily allow fully for finance consumption or house purchases. Data availability does not permit further investigations of credit developments.

In summary, the evolution of bank credit to private sector relative to its trend component in South Africa does reveal a credit “boom” picture. Furthermore, we have to notice that in this model, our analysis focused primarily on overall credit trends rather than the aggregated credit and disregarded important factors that affect credit and the fragility of the banking system, such as the currency composition of bank and corporate balance sheets, maturity mismatches in the banking system, and real estate and stock market exposure.

Chapter 05: EMPIRICAL EVIDENCE ON CREDIT GROWTH IN SOUTH AFRICA

This chapter uses the econometric evidence to explain the credit development in South Africa. On the basis of key quantitative variables, we constructed and estimated the factors driving the credit expansion in South Africa. The qualitative variables such as behaviour of South African consumers, the effects of the political transformation which, while playing a role in terms of credit demand in South Africa were not included.

5.1 Arguments in Favour of Variables Choice

- **GDP:** There are very robust arguments in favour of a positive relationship between credit demand, supply and economic growth. The economic reasoning starts with the effect of economic growth on expected income and profit, improving the financial conditions of the private sector, allowing for higher levels of indebtedness.
- **Interest:** Interest rates also simultaneously determine the demand and supply of loans. It is, however, a less straightforward matter to define the time series of the interest rate that is the most relevant for total credit (nominal or real interest).
- **Inflation:** The argument on inflation is based on credit constraints. With the higher nominal rate, even if the real rate is low, households or firms cannot have loans of a sufficiently long duration.

5.2 Dataset and Time Series Analysis

Empirical work based on time series data assumes that the underlying time series is stationary. Broadly speaking, a stochastic process is said to be stationary if its mean and variance are constant over time and the value of the covariance between the two time periods depends only on the distance or gap between the two time periods and not the actual time at which the covariance is computed (Gujarati, 2003). In short, if a time series is stationary, its mean, variance and autocovariance remain the same no matter at what point we measure them; that is, they are time invariant.

The stationary time series will be important for this paper otherwise any regression done will be spurious or nonsense regression(Gujarati,2003).

There are several tests of stationarity, but we will use only those that are prominently discussed in the literature: Graphical analysis (see Appendix 1) and *ADF test (Unit Root Tests)* (Appendix. 1). The Augmented Dickey Fuller test (ADF) tests whether a unit root is present in an autoregressive model. A simple AR (1) model is $Y_t = pY_{t-1} + U_t$, where Y_t is the variable of interest, t is the time index, p is coefficient, and U_t is the error term. A unit root is present if $|p|=1$.

ADF unit root tests were used to verify stationarity and all unit root tests were satisfactory at 1 percent level.

Table 2: Unit root tests of variables in growth rates and I (1)

Variables	ADF test Stats.
Mortgage Loans	-6.451480
Other Loans	-6.229018
Instalment Sale	-4.265188
Total Credit	-7.922294
Gross Domestic Expenditure	-10.16387
GDP	-4.116572
Critical values:	
1% :-4.057528	
5% :-3.457808	
10%:-3.154859	

Table 3: Unit root tests of variables with I (1)

Variables	ADF test Stats.
Nominal Interest	-6.880763
Real interest	-9.401021
Critical values:	
1%: -4.050509	
5%: -3.454471	
10%:-3.152909	

5.3: Presentation of Models and Regression Results

As mentioned above, in the standard model in South Africa, we consider in our empirical investigation that the bank credit to private sector depends on GDP cycle, gross domestic expenditure and interest rates (nominal and real). In order to measure the significance of the explanatory variables or effect of interest rates and economic boom on credit level, we consider having three models with seven linear regressions, assessing the effect of the economic activity and interest rates level on each component of credit extended to the private sector in South Africa.

We have to remind the reader that the regression results presented in this paper are the results from what we consider as best models by using GDP and interest rates as key explanatory variables in the context of the South African economy.

5.3.1: Model 1

1.1 Mortgages Advances Function of Real Interest Rates and Gross Domestic Product

$$Y_t = \beta_0 + \beta_1 X_{1t-1} + \beta_2 X_{1t-2} + \beta_3 X_{1t-3} + \beta_4 X_{2t} + \beta_5 Y_{t-1} + \mu_t$$

Where:

Y_t = Mortgages advances (DMORTGG)

X_{1t} = Real Interest Rates (DRINTEREST)

X_{1t-1} = Lag of real interest (DRINTEREST (-1))

X_{1t-2} = Lag of real interest (DRINTEREST (-2))

X_{1t-3} = Lag of real interest (DRINTEREST (-3))

X_{2t} = Gross Domestic Product (DGDPG)

Y_{t-1} = Mortgages advances of previous period (DMORTGG (-1))

μ_t = Residual term or mortgages advances explained by other variables

The following hypotheses regarding the signs of the coefficient are to be tested:

- Ho: $\beta_0 > 0$: Autonomous credit to be positive

- Ho: $\beta_1 < 0$; $\beta_2 < 0$; $\beta_3 < 0$; we assume the negative relationship between mortgages advances and real interest rates.

- Ho: $\beta_4 > 0$, we assume the positive relationship between mortgages advances and GDP

- $H_0: \beta_5 > 0$, we assume the positive relationship between mortgages advances and its previous level.

Estimation and results

The estimates presented below were computed using the quarterly data covering the period from 1970 to 2006, in terms of growth rates with first order difference to ensure that all variables are stationary.

Table 4: Output Regression (Regression 1)

Dependent Variable: DMORTGG				
Method: Least Squares				
Date: 10/15/07 Time: 21:09				
Sample (adjusted): 1982Q3 2006Q4				
Included observations: 98 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.105782	0.139317	0.759290	0.4496
DRINTEREST(-1)	0.066063	0.076685	0.861485	0.3912
DRINTEREST(-2)	-0.183501	0.076600	-2.395580	0.0186
DRINTEREST(-3)	-0.095097	0.076165	-1.248566	0.2150
DGDPG	0.291120	0.130242	2.235224	0.0278
DMORTGG(-1)	0.521214	0.086883	5.999022	0.0000
R-squared	0.455624	Mean dependent var		0.202275
Adjusted R-squared	0.426038	S.D. dependent var		1.808850
S.E. of regression	1.370390	Akaike info criterion		3.527338
Sum squared resid	172.7731	Schwarz criterion		3.685601
Log likelihood	-166.8395	F-statistic		15.40016
Durbin-Watson stat	1.916441	Prob(F-statistic)		0.000000

The F-statistic being greater than critical F and based on the t-statistics; nearly all coefficients are statistically significant at 5% excluding the coefficient of the first lag of the real interest. While all the coefficients have the expected signs, the slope of the first lag of the real interest is opposite to what could be expected. This confirms that

an increase in the real interest affecting the credit demand (mortgages advances) from the second quarter, which means after more or less six months from the time the decision is made to change interest rates.

To test the presence of autocorrelation, the Breusch-Godfrey Serial Correlation LM test (Appendix 2) was used; it was found there is no evidence of autocorrelation with p-value associated with F stats at 0.053. The analysis of White's test confirms the assumption of homoskedascity. The p-value associated with obs*is 0.37.

1.2 Mortgages Advances Function of Nominal Interest Rates and Gross Domestic Product

$$Y_t = \beta_0 + \beta_1 X_{1t-1} + \beta_2 X_{1t-2} + \beta_3 X_{1t-3} + \beta_4 X_{2t} + \beta_5 Y_{t-1} + \mu_t$$

Where:

Y_t = Mortgages advances (DMORTGG)

X_{1t} = Nominal Interest Rates (DINTEREST)

X_{1t-1} = Lag of nominal interest (DINTEREST (-1))

X_{1t-2} = Lag of nominal interest (DINTEREST (-2))

X_{1t-3} = Lag of nominal interest (DINTEREST (-3))

X_{2t} = Gross Domestic Product (DGDPG)

Y_{t-1} = Mortgages advances of previous period (DMORTGG (-1))

μ_t = Residual term or mortgages advances explained by other variables

The following hypotheses regarding the signs of the coefficient are to be tested:

- Ho: $\beta_0 > 0$: Autonomous credit to be positive

- Ho: $\beta_1 < 0$; $\beta_2 < 0$; $\beta_3 < 0$; we assume the negative relationship between mortgages advances and nominal interest rates.

- Ho: $\beta_4 > 0$, we assume the positive relationship between mortgages advances and GDP

- Ho: $\beta_5 > 0$, we assume the positive relationship between mortgages advances and its previous level.

Estimation and results

Table 5: Output Regression (Regression 2)

Dependent Variable: DMORTGG				
Method: Least Squares				
Date: 10/15/07 Time: 21:21				
Sample (adjusted): 1982Q3 2006Q4				
Included observations: 98 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.077645	0.136493	0.568853	0.5708
DINTEREST(-1)	-0.043259	0.108024	-0.400459	0.6897
DINTEREST(-2)	-0.183785	0.111104	-1.654170	0.1015
DINTEREST(-3)	-0.257500	0.115825	-2.223177	0.0287
DGDPG	0.153453	0.136507	1.124133	0.2639
DMORTGG(-1)	0.491142	0.084574	5.807254	0.0000
R-squared	0.478296	Mean dependent var		0.202275
Adjusted R-squared	0.449942	S.D. dependent var		1.808850
S.E. of regression	1.341550	Akaike info criterion		3.484799
Sum squared resid	165.5776	Schwarz criterion		3.643062
Log likelihood	-164.7551	F-statistic		16.86901
Durbin-Watson stat	2.028667	Prob(F-statistic)		0.000000

Overall, the results indicate that there is an income and interest rates effect on the home loans market in South Africa. The regression confirms the negative relationship between the credit (mortgages advances) and the nominal interest rates and positive relationship between mortgages advances and GDP.

Using the Breusch-Godfrey Serial Correlation LM test to check the presence of autocorrelation (F: 082 with p-value: 0.44); we conclude that there is no evidence of autocorrelation; while White's test confirms the assumption of homoskedasticity (obs*27.83 and p-value: 0.113).

5.3.2: Model 2

2.1 Other Loans (Credit card, overdraft and general advances) Function of Real Interest Rates and Gross Domestic Product

$$Y_t = \beta_0 + \beta_1 X_{1t-1} + \beta_2 X_{1t-2} + \beta_3 X_{1t-3} + \beta_4 X_{2t} + \mu_t$$

Where:

Y_t = Other Loans (DOTHERLOANG)

X_{1t} = Real Interest Rates (DRINTEREST)

X_{1t-1} = Lag of real interest (DRINTEREST (-1))

X_{1t-2} = Lag of real interest (DRINTEREST (-2))

X_{1t-3} = Lag of real interest (DRINTEREST (-3))

X_{2t} = Gross Domestic Product (DGDPG)

μ_t = Residual term or other loans and advances explained by variables other than the real interest and GDP

The following hypotheses regarding the signs of the coefficient are to be tested:

- $H_0: \beta_0 > 0$: Autonomous credit to be positive
- $H_0: \beta_1 < 0; \beta_2 < 0; \beta_3 < 0$; we assume the negative relationship between other loans and real interest rates.
- $H_0: \beta_4 > 0$, we assume the positive relationship between other loans and GDP

Estimation and results

Table 6: Output Regression (Regression 3)

Dependent Variable: DOTHERLOANG				
Method: Least Squares				
Date: 10/15/07 Time: 21:37				
Sample (adjusted): 1982Q2 2006Q4				
Included observations: 99 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.083545	0.449349	-0.185925	0.8529
DRINTEREST(-1)	0.224945	0.248409	0.905545	0.3675
DRINTEREST(-2)	0.142935	0.243890	0.586064	0.5592
DRINTEREST(-3)	0.000903	0.244456	0.003694	0.9971
DGDPG	0.832992	0.368710	2.259208	0.0262
R-squared	0.063631	Mean dependent var		-0.052515
Adjusted R-squared	0.023785	S.D. dependent var		4.518587
S.E. of regression	4.464527	Akaike info criterion		5.879388
Sum squared resid	1873.608	Schwarz criterion		6.010455
Log likelihood	-286.0297	F-statistic		1.596932
Durbin-Watson stat	1.920320	Prob(F-statistic)		0.181578

The coefficients are statistically not significant at 5% except the coefficient of GDP. The coefficient of GDP is the only coefficient giving the expected sign. We can confirm from the regression (3) that there is no interest rates effect on other loans and general advances, while income (GDP) remains the key variable explaining the increase in credit in terms of credit card and overdraft facilities.

Using white's test, the result confirms the assumption of homoskedascity (obs*R 12.80 and p-value: 0.542). The Durbin Watson statistic (DW: 1.90320) confirms that there is no evidence of autocorrelation.

2.2 Other Loans (Credit card, overdraft and general advances) Function of Nominal Interest Rates and Gross Domestic Product

$$Y_t = \beta_0 + \beta_1 X_{1t-1} + \beta_2 X_{1t-2} + \beta_3 X_{1t-3} + \beta_4 X_{2t} + \mu_t$$

Where:

Y_t = Other Loans (DOTHERLOANG)

X_{1t} = Nominal Interest Rates (DINTEREST)

X_{1t-1} = Lag of nominal interest (DINTEREST (-1))

X_{1t-2} = Lag of nominal interest (DINTEREST (-2))

X_{1t-3} = Lag of real interest (DINTEREST (-3))

X_{2t} = Gross Domestic Product (DGDPG)

μ_t = Residual term or other loans and advances explained by variables other than the nominal interest and GDP

The following hypotheses regarding the signs of the coefficient are to be tested:

- $H_0: \beta_0 > 0$: Autonomous credit to be positive
- $H_0: \beta_1 < 0; \beta_2 < 0; \beta_3 < 0$; we assume the negative relationship between other loans and nominal interest rates.
- $H_0: \beta_4 > 0$, we assume the positive relationship between other loans and GDP

Estimation and results

Table 7: Output Regression (Regression 4)

Dependent Variable: DOTHERLOANG				
Method: Least Squares				
Date: 10/15/07 Time: 21:43				
Sample (adjusted): 1982Q2 2006Q4				
Included observations: 99 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.034770	0.443216	-0.078449	0.9376
DINTEREST(-1)	0.480859	0.345837	1.390420	0.1677
DINTEREST(-2)	0.305738	0.363818	0.840359	0.4028
DINTEREST(-3)	-0.269735	0.377512	-0.714506	0.4767
DGDPG	0.816861	0.408260	2.000835	0.0483
R-squared	0.088560	Mean dependent var		-0.052515
Adjusted R-squared	0.049775	S.D. dependent var		4.518587
S.E. of regression	4.404695	Akaike info criterion		5.852404
Sum squared resid	1823.726	Schwarz criterion		5.983471
Log likelihood	-284.6940	F-statistic		2.283376
Durbin-Watson stat	1.918535	Prob(F-statistic)		0.066079

The results of the regression 4 are not different from the regression 3. The estimation confirms the interest rates (nominal) insensitive and income sensitive in South African markets in terms of credit card, overdraft facilities and general advances.

We conclude there is a strong link between economic growth boosting the household income, emergence of the middle class and credit card uses, overdraft facilities and general advances. The education of consumers in term of interest rates and bank responsibilities in offering these facilities should be questionable in our model.

5.3.3: Model 3

3.1 Instalment Sale Credit Function of Real Interest Rates and Gross Domestic Product

$$Y_t = \beta_0 + \beta_1 X_{1t-1} + \beta_2 X_{1t-2} + \beta_3 X_{1t-3} + \beta_4 X_{2t} + \beta_5 Y_{t-1} + \mu_t$$

Where:

Y_t = Instalment sale credit (DINSTALMG)

X_{1t} = Real Interest Rates (DRINTEREST)

X_{1t-1} = Lag of real interest (DRINTEREST (-1))

X_{1t-2} = Lag of real interest (DRINTEREST (-2))

X_{1t-3} = Lag of real interest (DRINTEREST (-3))

X_{2t} = Gross Domestic Product (DGDPG)

Y_{t-1} = Instalment Sale credit of previous period (DINSTALMG (-1))

μ_t = Residual term or Instalment sale credit explained by other variables

The following hypotheses regarding the signs of the coefficient are to be tested:

- Ho: $\beta_0 > 0$: Autonomous credit to be positive

- Ho: $\beta_1 < 0$; $\beta_2 < 0$; $\beta_3 < 0$; we assume the negative relationship between Instalment sale credit and real interest rates.

- Ho: $\beta_4 > 0$, we assume the positive relationship between Instalment sale credit and GDP

- Ho: $\beta_5 > 0$, we assume the positive relationship between Instalment sale credit and its previous level.

Estimation and results

Table 8: Output Regression (Regression 5)

Dependent Variable: DINSTALMG				
Method: Least Squares				
Date: 10/15/07 Time: 21:52				
Sample (adjusted): 1982Q3 2006Q4				
Included observations: 98 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.215807	0.274006	-0.787597	0.4330
DRINTEREST(-1)	0.017750	0.151583	0.117099	0.9070
DRINTEREST(-2)	0.251547	0.149965	1.677373	0.0969
DRINTEREST(-3)	-0.100292	0.148738	-0.674288	0.5018
DGDPG	1.262413	0.232700	5.425058	0.0000
DINSTALMG(-1)	0.301967	0.084121	3.589681	0.0005
R-squared	0.371348	Mean dependent var	-0.244168	
Adjusted R-squared	0.337182	S.D. dependent var	3.306755	
S.E. of regression	2.692149	Akaike info criterion	4.877827	
Sum squared resid	666.7853	Schwarz criterion	5.036090	
Log likelihood	-233.0135	F-statistic	10.86898	
Durbin-Watson stat	2.202562	Prob(F-statistic)	0.000000	

From the regression above (regression 5), the results indicate the overall significance of explanatory variables (F-stat: 10.869 with p: 0.0000). Based on t-test the model confirms the strong income effect on the instalment sale credit and less real interest rates effect (at 5 %).

The diagnostic tests of the model confirm no heteroskedasticity by using White's test (Obs*R: 26.81867 and p: 0.140443) and lack of autocorrelation (Breusch-Godfrey test: F-stat: 1.5657 and p: 0.2147)

3.2 Instalment Sale Credit Function of Nominal Interest Rates and Gross Domestic Product

$$Y_t = \beta_0 + \beta_1 X_{1t-1} + \beta_2 X_{1t-2} + \beta_3 X_{1t-3} + \beta_4 X_{2t} + \beta_5 Y_{t-1} + \mu_t$$

Where:

Y_t = Instalment sale credit (DINSTALMG)

X_{1t} = Nominal Interest Rates (DINTEREST)

X_{1t-1} = Lag of real interest (DINTEREST (-1))

X_{1t-2} = Lag of real interest (DINTEREST (-2))

X_{1t-3} = Lag of real interest (DINTEREST (-3))

X_{2t} = Gross Domestic Product (DGDPG)

Y_{t-1} = Instalment Sale credit of previous period (DINSTALMG (-1))

μ_t = Residual term or Instalment sale credit explained by other variables

The following hypotheses regarding the signs of the coefficient are to be tested:

- $H_0: \beta_0 > 0$: Autonomous credit to be positive
- $H_0: \beta_1 < 0; \beta_2 < 0; \beta_3 < 0$; we assume the negative relationship between Instalment sale credit and nominal interest rates.
- $H_0: \beta_4 > 0$, we assume the positive relationship between Instalment sale credit and GDP
- $H_0: \beta_5 > 0$, we assume the positive relationship between Instalment sale credit and its previous level.

Estimation and results

Table 9: Output Regression (Regression 6)

Dependent Variable: DINSTALMG				
Method: Least Squares				
Date: 10/15/07 Time: 22:00				
Sample (adjusted): 1982Q3 2006Q4				
Included observations: 98 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.204792	0.273424	-0.748991	0.4558
DINTEREST(-1)	-0.095085	0.219173	-0.433833	0.6654
DINTEREST(-2)	0.391865	0.223333	1.754619	0.0827
DINTEREST(-3)	-0.260276	0.232358	-1.120151	0.2656
DGDPG	1.192211	0.258973	4.603612	0.0000
DINSTALMG(-1)	0.322835	0.084207	3.833848	0.0002
R-squared	0.373225	Mean dependent var		-0.244168
Adjusted R-squared	0.339161	S.D. dependent var		3.306755
S.E. of regression	2.688127	Akaike info criterion		4.874836
Sum squared resid	664.7944	Schwarz criterion		5.033100
Log likelihood	-232.8670	F-statistic		10.95663
Durbin-Watson stat	2.257850	Prob(F-statistic)		0.000000

Using the F-statistic, the results indicate the overall significance of explanatory variables (F-stat: 10.95663 with p: 0.0000). Overall interest rates (nominal) effect and strong income effect. While all the coefficients have the expected signs, the sign of the second lag of the nominal interest rates is opposite to what could be expected.

We conclude the interest rates and income effect on the instalment sale credit (Vehicle finance, etc...).

5.3.4: Model 4

Total Credit to Private Sector function of Real Interest rates and Gross Domestic Expenditure

$$Y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{1t-1} + \beta_3 X_{1t-2} + \beta_4 X_{1t-3} + \beta_5 X_{1t-4} + \beta_6 X_{2t-1} + \beta_7 X_{2t-2} + \beta_8 Y_{t-1} + \mu_t$$

Where:

Y_t = Total credit to private sector (DLNTOTCREDIT)

X_{1t} = Real Interest Rates (DRINTEREST)

X_{1t-1} = Lag of real interest (DRINTEREST (-1))

X_{1t-2} = Lag of real interest (DRINTEREST (-2))

X_{1t-3} = Lag of real interest (DRINTEREST (-3))

X_{1t-4} = Lag of real interest (DRINTEREST (-4))

X_{2t} = Gross Domestic Expenditure (DLNGDE)

X_{2t-1} = Lag of Gross Domestic Expenditure

X_{2t-2} = Lag of Gross Domestic Expenditure

Y_{t-1} = Total credit to private sector of previous period (DLNTOTCREDIT (-1))

μ_t = Residual term or Total credit to private sector explained by other variables

The following hypotheses regarding the signs of the coefficient are to be tested:

- $H_0: \beta_0 > 0$: Autonomous credit to be positive
- $H_0: \beta_1 < 0; \beta_2 < 0; \beta_3 < 0; \beta_4 < 0; \beta_5 < 0$; we assume the negative relationship between total credit to private sector and real interest rates.
- $H_0: \beta_6; \beta_7 > 0$, we assume the positive relationship between total credit to private sector and GDE
- $H_0: \beta_8 > 0$, we assume the positive relationship between total credit to private sector and its previous level.

Estimation and results

Table 10: Output Regression (Regression 7)

Dependent Variable: DLNTOTCREDIT				
Method: Least Squares				
Date: 10/17/07 Time: 20:04				
Sample (adjusted): 1979Q2 2006Q4				
Included observations: 111 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.027996	0.003926	7.131097	0.0000
DRINTEREST	0.001161	0.001044	1.111409	0.2690
DRINTEREST(-1)	-0.000650	0.000976	-0.666462	0.5066
DRINTEREST(-2)	-0.000620	0.000985	-0.629637	0.5303
DRINTEREST(-3)	0.000608	0.000950	0.639704	0.5238
DRINTEREST(-4)	0.002644	0.001012	2.611319	0.0104
DLNGDE(-1)	0.155984	0.077170	2.021307	0.0459
DLNGDE(-2)	0.205156	0.075267	2.725705	0.0076
DLNTOTCREDIT(-1)	0.199152	0.093750	2.124275	0.0361
R-squared	0.214571	Mean dependent var		0.038167
Adjusted R-squared	0.152969	S.D. dependent var		0.020119
S.E. of regression	0.018516	Akaike info criterion		-5.062709
Sum squared resid	0.034972	Schwarz criterion		-4.843018
Log likelihood	289.9804	F-statistic		3.483168
Durbin-Watson stat	2.039204	Prob(F-statistic)		0.001361

Based on F-statistic (F-Stat: 3.483 and p: 0.001), we can confirm that real interest rates and gross domestic expenditure which are the measure of the demand side of the economy are overall statistically significant. The results indicate the lag interest rates effect and strong income effect on the credit extended to private sector in South Africa. The analysis of R-square (adjusted R-square) shows that the interest rates and the economic boom explain the change in credit to private sector by only 20 percent. We conclude that there other qualitative factors explaining the credit to private sector such as: banks behaviour, political transformation and other such factors.

The major diagnostic tests of the model are satisfactory. At 5% level we cannot reject the hypothesis of normality, lack of autocorrelation and no heteroskedasticity (Appendix 2).

Chapter 06: FACTORS LEADING TO CREDIT GROWTH IN SOUTHAFRICA

6.1. Economic Boom and Capital Flows

There are many competing views on credit expansion. One of the views is that credit expansion is part of the real business cycle which means that they are simply a manifestation of the fact that productivity shocks create a need for the capital stock to grow faster than GDP over the period of time. Over the past few years, a combination of global growth, favourable financial conditions and buoyant asset growth has boosted domestic economic growth. Innovation in the credit market has allowed lower and middle income groups access to credit and the increased housing prices, low interest rates and strong real income growth have affected positively the household consumption expenditure. A key feature of South African economic growth has been the increased appetite for spending, particularly credit-led consumption spending. This research supports the view that credit expansion in South Africa is part of a natural GDP cycle, resulting to an increase in the credit demand for some goods and services in short supply such as real estate, vehicles and the use of some facilities offered by the South African credit market.

Furthermore, we argue with Gourinchas et al. (2001) that a lending boom is the domestic counterpart of a large surge in capital inflows triggered by so called external factors. Episodes occur in waves because of common external fundamentals. International real interest rates are rather low during the lending upswing. The

banking system intermediates the funds by increasing credit to the private sector, which raises both consumption and investment. The low level of prime rate in South Africa of less than 10 percent since 2003 from more than 20 percent in the 1980s was considered as one of the factors contributing to the credit expansion in South Africa.

6.2. Emerging of Middle Class

The strength of the economy has resulted in a period of general economic stability for the majority of South Africans. This has led to an increase in personal wealth and disposal income as we see a trend to save less and spend more. Since the end of Apartheid and with the African National Congress (ANC) coming to power in 1994, a strong policy of black economic empowerment and equality in the workplace has been implemented by government and business. This policy has been the leading factor for the increase in disposable income among the black majority, resulting in the rise of the black middle income bourgeoisie and opportunities for the banking sector.

From the consideration above, we may note that the substantial growth in credit extension in South Africa is not only explained by a cyclical phenomenon linked to a decline in interest rates. It is also the result of a structural change that seeks to accommodate large parts of the population that were historically excluded from the formal economy and accessing the credit market. This research revealed that the purchases on credit of vehicles, furniture, clothing and other items by the emerging middle class South African are most of the time interest rate inelastic compared with

the historically established credit market. Recent statistics show that motor vehicles, furniture, property, clothing, media and cellphone retailers are all benefiting from the South African booming middle class. While the numbers are still small, especially compared with the millions of unemployed people in the country, they are considered the first hard evidence that the country's racially divided economy is moving towards equilibrium.

6.3. Financial Market Participants

This theory holds that a lending boom is the natural outcome of a significant liberalization of a repressed financial system. If a country has interest rate caps, lending that is centrally allocated, or an overregulated banking industry, then the credit to GDP ratio is considerably lower than in a country that does not have any of these regulations. With the non-regulation of the South African financial system, the emergence of a financial sector charter, the gradual effects of democracy and the associated change in wealth distribution led to the expansion of the credit market and an increase in bank credit to the private sector.

Furthermore, it can be asserted that South Africa's explosion in consumer credit is "madness" in banks' behaviour, and commercial banks should be given more time to adhere to a code of conduct on lending. South Africa's main commercial banks have agreed to tone down what has been described as the aggressive marketing of credit to sometimes cash-strapped clients.

Chapter 07: CREDIT EXPANSION IN SOUTH AFRICA AND TRENDS IN OTHER COUNTRIES

This section contrasts the experience of South Africa with the development of credit growth in the Eastern and Central European Countries (CEE) and emerging markets in Latin America

7.1. Credit Expansion in the CEE Countries

Given the framework presented by Hilbers et al. (2005), many of the CEE countries have been experiencing a rapid expansion of bank credit to the private sector in the period starting from 2000. From 2000 to 2004, bank credit to the private sector increased by more than 20 percent, year on year, in two groups of countries. The first group are countries with real credit growth higher than the sample average of 16 percent and the second are countries with real credit growth lower than the sample average of 16 percent. The sample of CEE countries includes: Albania, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Macedonia, Moldova, Poland, Romania, Russia, the Slovak Republic, Slovenia, and Ukraine.

The average duration of the continuing boom episodes in CEE countries is about 6 years compared with more or less 5 years for lending episodes in South Africa. The average level of the credit to GDP ratio at the beginning of the boom for the CEE countries is 11.3 percent compared with 49 percent in South Africa. However, it should be noted that the low initial credit to GDP ratios in CEE countries reflect the

underdeveloped nature of the domestic financial sector at the beginning of the transition.

Assessing the situation in CEE countries, Hilbers et al.(2005) have mentioned that in a number of these countries, incentives created by the prevailing monetary and exchange rate policy mix, as well as fiscal or quasi-fiscal policies, may have stimulated certain types of bank credit. In most of these countries, the banking sector is the most important channel of funds to support increased demand for credit, with capital and equity markets still small and relatively underdeveloped.

7.2. Credit Expansion in Latin America

Latin America experienced a relatively large number of lending booms in the 1980s and 1990s. These experiences occurred in several countries of Latin America such as Chile in 1982, Argentina in 1981 and Mexico 1994. Their sample consists of ninety-one countries over the period 1960-1996. All the countries in the sample have more than 500,000 inhabitants, have more than twelve years of credit data available from the International Financial Statistics (IFS), and show a ratio of private credit to GDP of 15 percent or more in one or more years while the average credit to GDP ratio is more or less 50 percent in South Africa.

Table 11: Number of Lending Boom Episodes in Latin America (percent)

Criterion	Threshold	Number of cases
Relative deviation	12	125
	18	92
	24	60
	30	44
	36	31
	42	23
Absolute deviation	3	111
	4	89
	5	65
	6	51
	7	38
	8	33

Source: Gourinchas et al. (2001)

Table 13 presents the number of cases that appear in the Gourinchas et al. (2001) sample, considering both types of deviation criteria. As expected, the number of cases decreases with the size of the boom threshold under both measures. With a relative deviation equal to 24 percent (relative to credit to GDP ratio) there are sixty cases, while with an absolute deviation of 5 percent (relative to GDP) there are sixty-five cases even with relatively high thresholds (42 percent under the relative criterion or 8 percent under the absolute one).

Compared with the situation in South Africa, three main factors explained the lending boom in Latin America countries: Financial deregulation; large capital inflows and capital account liberalization; and a failed exchange rate based stabilization policy.

One of the important ingredients in the Latin American lending booms is the role of international factors due to a higher level of interest rates in Latin America with the

domestic interest rates of more 10 percent compared with approximately 4 or 5 percent in the rest of the world, while the world real interest rate tends to be significantly lower.

As shown by the analysis of credit expansion in the CEE countries and lending booms in Latin America, this study supported the view that the favourable economic conditions, combined with a robust growth in South Africa have played a key role in the credit expansion as compared with the situation in other economies. As mentioned above, a key feature of this growth has been the increased appetite for spending, particularly credit-led consumption spending. The financial position of households has deteriorated, with both household debt as percentage of income as well as debt servicing costs being on a firm upward trend. In addition, the political change in the country and international factors are not negligible In effect.

Finally, the question of determining the relationship which must exist between the phenomenon of rapid credit growth and real estate market development in South Africa remains very important. The fact that the South African property market is still largely off limits to most low-income households may translate into it being more robust and less sensitive to higher interest rates, which leads to an increase in credit demand. The housing market in South Africa remains supported by years of supply shortages and growth in demand from an enlarged middle class. South African consumers of a certain age, for example more or less 35, have no prior experience of

an environment of low inflation and cheap credit, and have enjoyed the party of the past few years, as people hope to benefit from the recent housing boom in South Africa.

Mortgage debt has been the debt instrument taken up by households to the largest extent. As revealed by ABSA, in the last quarter of 2006, mortgage debt accounted for 47 percent of total private sector debt compared with 40 percent in 2002. Mortgage debt, as a portion of total household debt, increased from 55 percent in 2002 to 60 percent in 2005 and more than 60 percent currently..

Compared with US property markets, the saving grace for the local property market may be the relative lack of sophistication of property finance instruments in South Africa. The greatest concerns in the US property market stem from the weaknesses in the sub-prime market, largely made up of lower income earners who were offered mortgages at highly variable rates. These buyers, many of them first-time homeowners, were able to enter the property market when interest rates were at low levels, but became disproportionately penalized when interest rates started to rise. Concerns around the housing market in South Africa may not be as deep as in the US, but are not any less important. The slowdown in house prices in South Africa will have a significant impact on household consumption expenditure via credit market effects. Moreover, the rate of debt accumulation will slow down, as will the growth in mortgage advances, which was the biggest driver behind the acceleration in

household debt. However, the high debt levels remain a concern, especially in view of the possibility of economic shocks arising.

CONCLUSIONS

In this research we have analyzed the phenomenon of rapid growth in bank credit to the private sector using South Africa as a case study. This research was particularly important in the context of the growing concerns around the world about the implications for macroeconomic and financial stability, in particular in South Africa where credit expansion has coincided with a weakening current account and constraints from the supply side of the economy not able to respond sufficiently to the growth from the demand side of the economy.

This study has identified four lending episodes (1980 to 1985, 1988 to 1992, 1994 to 2001 and 2003 to 2006) that could be detected and defined as lending booms in South Africa. The build-up and ending phases appear highly clear, independently of whether we define lending booms as a relative or an absolute deviation of the credit to GDP from the trend.

As a second step, we used econometric evidence to foresee the factors leading to credit growth in South Africa. On the basis of linear regression models we found a strong link between economic growth boosting the household income, the emergence of the middle class and credit card uses, overdraft facilities and general advances. The results indicate also that there is a strong interest rates effect on the home loans market in South Africa with less effect on other components of bank credit to the private sector.

There are many views on credit expansion and one of them is that credit expansion booms are part of the real business cycle which means that they are simply a manifestation of the fact that productivity shocks create a need for the capital stock to grow faster than GDP over the period of time. Over the past few years, a combination of global growth, favourable financial conditions and buoyant asset growth has boosted domestic economic growth.

The rapid pace of credit expansion continues to be a key challenge for the South African economy. A key feature of South African economic growth has been the increased appetite for spending, particularly credit-led consumption spending. The growth in bank credit to the private sector in South Africa is part of a natural GDP cycle, resulting to an increase in the credit demand for some goods and services such as real estate, vehicles and the use of some facilities offered by the South African credit market.

A strong policy of black economic empowerment and equality in the workplace has been implemented by government and business. This policy has been the leading factor for the increase in disposable income among the black majority, resulting in the rise of a black middle income bourgeoisie and an opportunity for expansion for the banking sector. Furthermore, the low level of the prime rate in South Africa of less than 10 percent compared with the situation in the 1980s was considered as one of

the factors contributing to the credit expansion in South Africa. An important finding of the research is the strong income effect on the credit level in South Africa while the changes in interest rates do negatively affect the home loans and have less effect on other components of bank credit to private sector (credit card, overdraft facilities, and similar components).

Compared with the credit expansion in the CEE countries and lending booms in Latin America, in this research we find it necessary to support the view that the favourable economic conditions, combined with a robust growth in South Africa, have played a key role in credit expansion as compared with the situation in other economies.

From the policy perspective, the empirical results suggest that, although both income and interest rates are determinants of credit expansion in South Africa, just changing interest rates is insufficient to guarantee a structurally lower level of credit to the private sector. An interest rate policy should be part of the package including the reinforcement of the national credit act, education of consumers, a change in the reserve requirements for banks and an increase in banks' capital adequacy. Other interesting and unexplored fields are the macroeconomic consequences of lending booms in South Africa. Increased loan creation can result in demand and wage pressure, inflation, loss of competitiveness and higher current account deficits. All these are interesting topics for future research.

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List of abbreviations

ADF: Augmented Dickey-Fuller

ANC: African National Congress

BESA: Bond Exchange of South Africa

CEE: Central European Countries

CPI: Consumer price index

GDP: Gross domestic product

GLS: Generalised least squares

JSE: Johannesburg Stock Exchange

PPP: Purchasing power parity

SAFEX: South African Futures Exchange

Appendix 1: Time Series Analysis (ADF test)

Null Hypothesis: DMORTGG has a unit root		
Exogenous: Constant, Linear Trend		
Lag Length: 3 (Automatic based on SIC, MAXLAG=11)		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.451480	0.0000
Test critical values:	1% level	-4.057528
	5% level	-3.457808
	10% level	-3.154859
*MacKinnon (1996) one-sided p-values.		

Null Hypothesis: DRINTEREST has a unit root		
Exogenous: Constant, Linear Trend		
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-9.401021	0.0000
Test critical values:	1% level	-4.050509
	5% level	-3.454471
	10% level	-3.152909
*MacKinnon (1996) one-sided p-values.		

Null Hypothesis: DINTEREST has a unit root		
Exogenous: Constant, Linear Trend		
Lag Length: 0 (Automatic based on SIC, MAXLAG=12)		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.880763	0.0000
Test critical values:	1% level	-4.050509
	5% level	-3.454471
	10% level	-3.152909
*MacKinnon (1996) one-sided p-values.		

Null Hypothesis: DGDGP has a unit root		
Exogenous: Constant, Linear Trend		
Lag Length: 8 (Automatic based on SIC, MAXLAG=11)		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.116572	0.0086
Test critical values:	1% level	-4.063233
	5% level	-3.460516
	10% level	-3.156439
*MacKinnon (1996) one-sided p-values.		

Null Hypothesis: DOTHERLOANG has a unit root		
Exogenous: Constant, Linear Trend		
Lag Length: 3 (Automatic based on SIC, MAXLAG=11)		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.229018	0.0000
Test critical values:	1% level	-4.057528
	5% level	-3.457808
	10% level	-3.154859
*MacKinnon (1996) one-sided p-values.		

Null Hypothesis: DINSTALMG has a unit root		
Exogenous: Constant, Linear Trend		
Lag Length: 7 (Automatic based on SIC, MAXLAG=11)		
	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-4.265188	0.0054
Test critical values:	1% level	-4.062040
	5% level	-3.459950
	10% level	-3.156109
*MacKinnon (1996) one-sided p-values.		

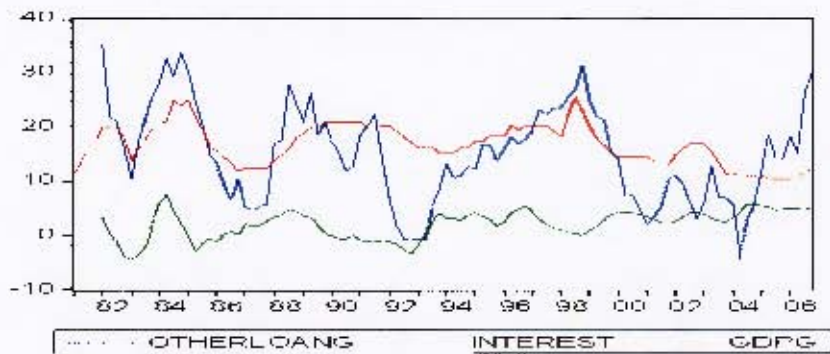
Null Hypothesis: DLN1OTCREDIT has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

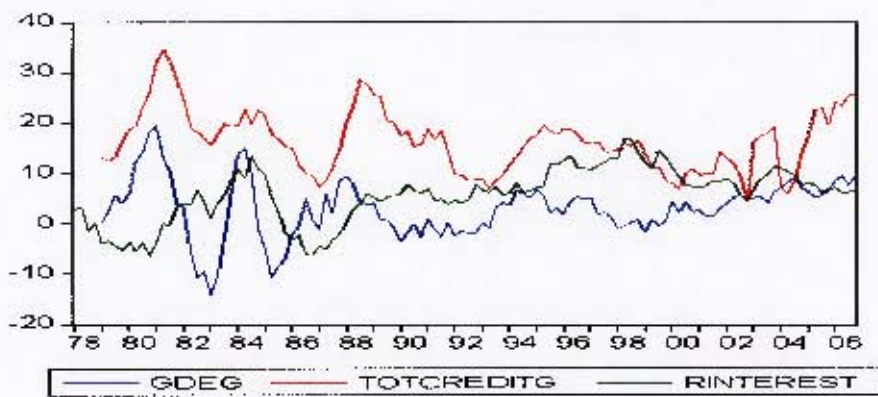
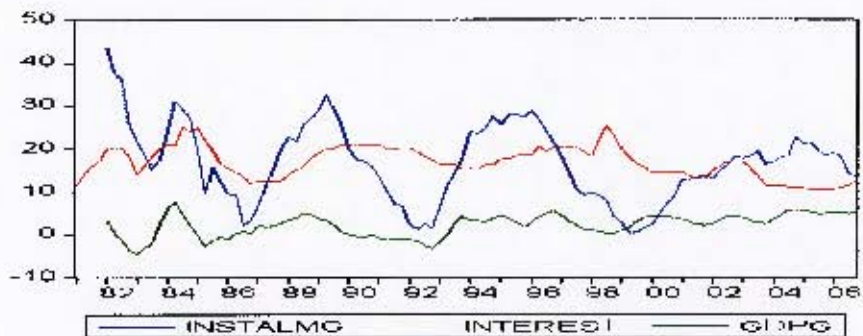
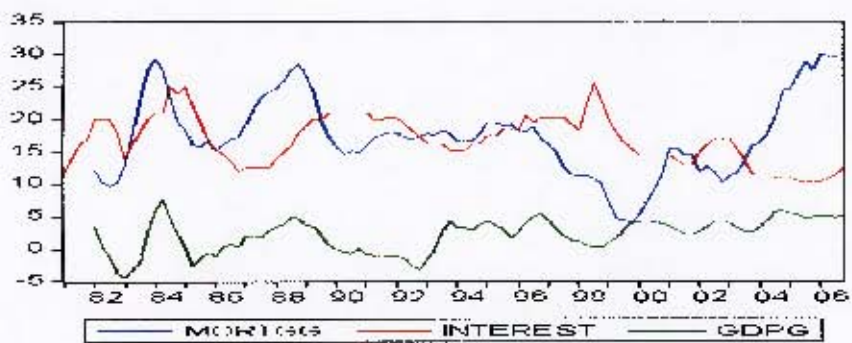
	t-Statistic	Prob.
Augmented Dickey-Fuller test statistic	-7.922294	0.0000
Test critical values:		
1% level	-4.040532	
5% level	-3.449716	
10% level	-3.150127	

Null Hypothesis: DLNGDE has a unit root
 Exogenous: Constant, Linear Trend
 Lag Length: 0 (Automatic based on SIC, MAXLAG=12)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-10.16387	0.0000
Test critical values:		
1% level	-4.040532	
5% level	-3.449716	
10% level	-3.150127	

*MacKinnon (1996) one-sided p-values.





Appendix 2: Heteroskedasticity, Autocorrelation and Normality Test

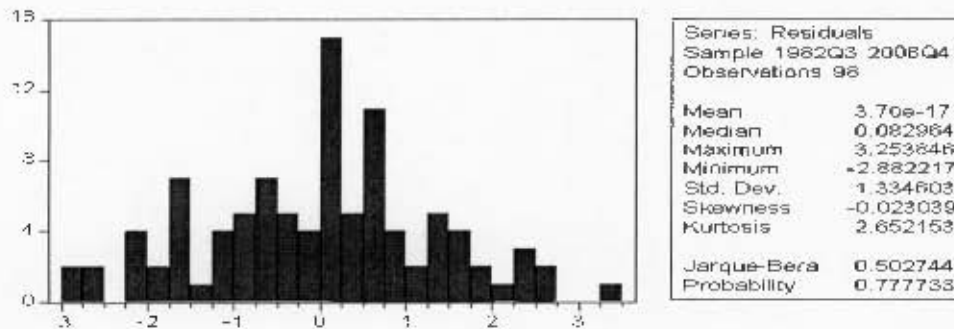
1. Mortgage Function of Real Interest Rates and GDP

White Heteroskedasticity Test:

F-statistic	1.083606	Probability	0.383480
Obs*R-squared	21.52450	Probability	0.366859

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.029248	Probability	0.053309
Obs*R-squared	6.180948	Probability	0.045480



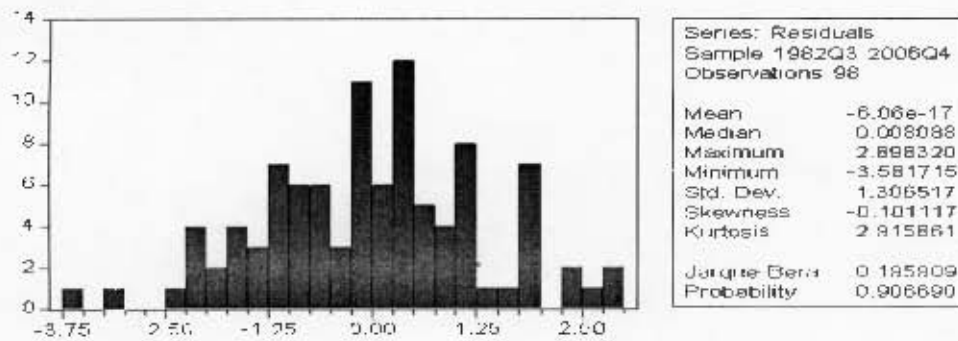
2. Mortgage Function of Nominal Interest Rates and GDP

White Heteroskedasticity Test:

F-statistic	1.526998	Probability	0.096343
Obs*R-squared	27.83074	Probability	0.113467

Breusch-Godfrey Serial Correlation LM Test:

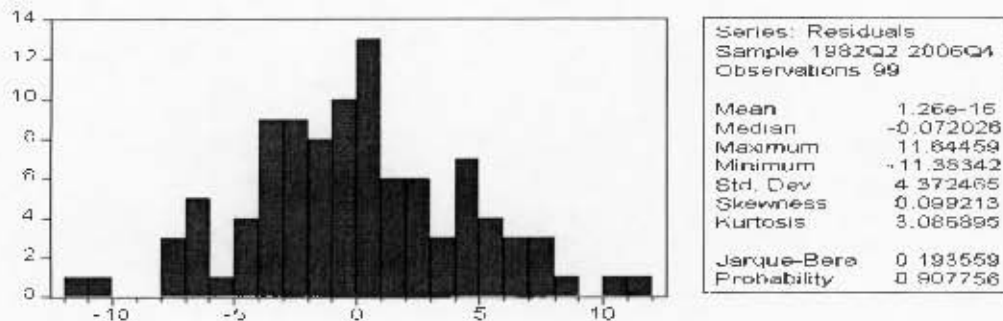
F-statistic	0.825842	Probability	0.441157
Obs*R-squared	1.766088	Probability	0.413522



3. Other Loans Function of Real Interest Rates and GDP

White Heteroskedasticity Test:

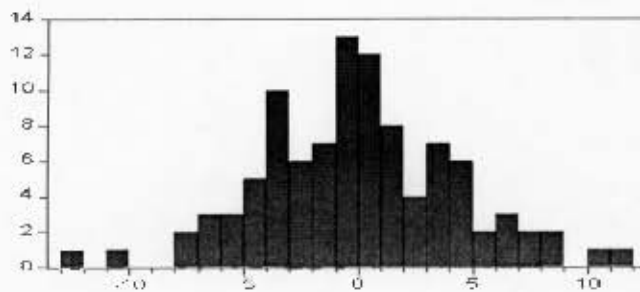
F-statistic	0.891215	Probability	0.570852
Obs*R-squared	12.80330	Probability	0.542067



4. Other Loans Function of Nominal Interest Rates and GDP

White Heteroskedasticity Test:

F-statistic	0.980211	Probability	0.480386
Obs*R-squared	13.90229	Probability	0.457016



Series: Residuals	
Sample 1982Q2 2008Q4	
Observations 99	
Mean	-6.73e-17
Median	-0.062390
Maximum	11.16054
Minimum	-12.02488
Std. Dev.	4.313867
Skewness	0.072684
Kurtosis	3.294479
Jarque-Bera	0.444902
Probability	0.800554

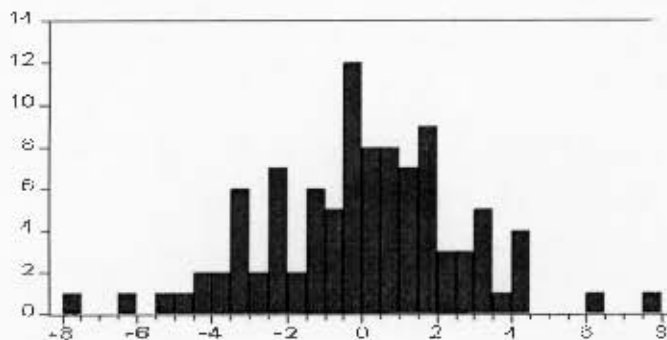
5. Installment Sale Credit Function of Real Interest Rates and GDP

White Heteroskedasticity Test:

F-statistic	1.450547	Probability	0.125456
Obs*R-squared	26.81867	Probability	0.140443

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.565761	Probability	0.214566
Obs*R-squared	3.295222	Probability	0.192509



Series: Residuals	
Sample 1982Q3 2008Q4	
Observations 96	
Mean	-6.31e-17
Median	0.017888
Maximum	7.860321
Minimum	-7.664019
Std. Dev.	2.621846
Skewness	-0.098723
Kurtosis	3.548100
Jarque-Bera	1.385875
Probability	0.500105

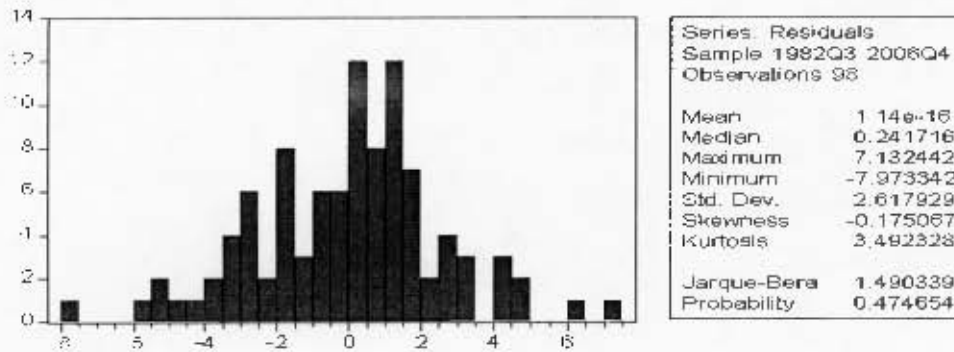
6. Instalment Sale Credit Function of Nominal Interest Rates and GDP

White Heteroskedasticity Test:

F-statistic	1.524609	Probability	0.097153
Obs*R-squared	27.79954	Probability	0.114230

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.358217	Probability	0.100409
Obs*R-squared	4.879941	Probability	0.087163



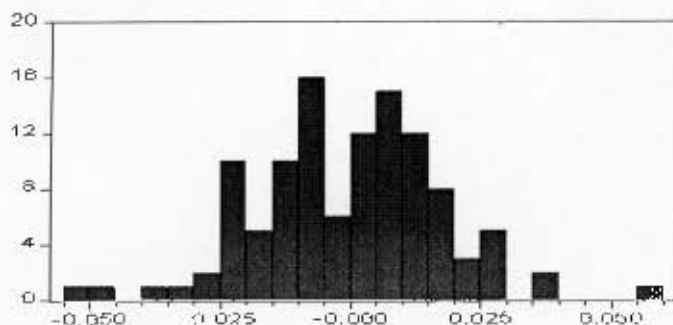
7. Total Credit to Private Sector Function of Real Interest Rates and GDE

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.133949	Probability	0.874791
Obs*R-squared	0.296573	Probability	0.862184

White Heteroskedasticity Test:

F-statistic	0.817296	Probability	0.759839
Obs*R-squared	39.14901	Probability	0.679260



Series: Residuals	
Sample	1979Q2 2008Q4
Observations	111
Mean	-5.20e-18
Median	0.001530
Maximum	0.059138
Minimum	-0.053524
Std. Dev.	0.017630
Skewness	-0.006487
Kurtosis	3.814901
Jarque-Bera	3.072074
Probability	0.215232

Appendix 3:

Code	Instaf	Mortgage	OtherLoans	Totcredit	CPI	Interest	Rinterest	GDP	CreditRatio	GDE
31-Mar-78	701	6782	7510	18328	8.0	12.5	2.9	59221.9	49.73	575544
30-Jun-78	890	6901	7803	19210	8.2	12.5	3.2	603663	51.05	595852
30-Sep-78	953	7047	7977	19791	8.7	11.5	-1.51	597170	50.23	582801
31-Dec-78	1083	7237	7946	20214	8.8	11.5	0.1	602605	49.06	588814
31-Mar-79	1128	7416	8135	20743	9.1	10	-3.8	613153	48.08	577135
30-Jun-79	1237	7654	8323	21587	9.3	10	-3.4	617114	48.43	609663
30-Sep-79	1330	7943	8482	22447	9.9	9.5	-4.3	621720	48.86	615797
31-Dec-79	1519	8280	8847	23498	10.1	9.5	5.3	634479	47.35	612541
31-Mar-80	1664	8640	9235	24640	10.3	9.5	-1.7	647514	44.07	610683
30-Jun-80	1915	9080	9479	25819	10.7	9.5	-5.6	659823	42.90	686512
30-Sep-80	2199	9697	9857	27681	11.2	9.5	-3.6	671120	44.20	703298
31-Dec-80	2458	10411	10373	29655	11.7	9.5	-6.3	672628	45.43	725101
31-Mar-81	2764	10987	11839	32587	11.9	11.5	-4.0	689982	48.3	729290
30-Jun-81	3066	11438	13014	34748	12.2	14	0.0	695854	49.5	778635
30-Sep-81	3317	11800	13881	36582	12.9	16	-0.2	705981	50.3	776224
31-Dec-81	3752	12086	14583	38124	13.3	17	3.3	709386	50.8	753766
31-Mar-82	3971	12323	16027	40535	13.8	20	4.0	703805	52.6	753328
30-Jun-82	4218	12601	15881	41373	14.2	20	3.6	697932	52.3	735322
30-Sep-82	4510	12947	16788	43286	14.6	20	6.8	697754	52.5	693174
31-Dec-82	4704	13314	16945	44686	15.1	18	4.5	689003	52.0	682528
31-Mar-83	4834	13909	17716	46800	15.6	14	1.0	672461	52.9	646636
30-Jun-83	5006	14781	18683	48721	15.9	16	4.0	675254	53.4	657227
30-Sep-83	5191	15902	20368	51906	16.4	18	5.7	683038	54.9	674123
31-Dec-83	5536	16962	21261	53304	16.8	20	8.7	700312	54.7	725769
31-Mar-84	5978	17989	22701	55973	17.2	21	10.7	712246	54.9	736239
30-Jun-84	6564	18844	24785	59222	17.8	21	9.1	727042	56.0	755351
30-Sep-84	6705	19617	26334	62166	18.3	25	13.4	714992	56.1	740447
31-Dec-84	7033	20271	28428	65390	19	24	10.9	716097	57.2	716999
31-Mar-85	7163	21307	29619	68038	19.8	25	9.9	711831	57.4	700243
30-Jun-85	7195	21865	30913	70395	20.8	22	5.1	706655	57.1	673631
30-Sep-85	7766	22697	31647	72546	21.4	19.5	2.6	704791	57.2	677597
31-Dec-85	7891	23671	32655	75411	22.5	16.5	-1.9	712326	57.1	668657
31-Mar-86	7844	24517	33549	78183	23.5	15.5	-3.2	703840	57.1	685079
30-Jun-86	7862	25407	33807	78412	24.3	14.5	-2.3	708699	55.1	669507
30-Sep-86	7928	26531	33734	79806	25.6	13.5	6.1	710294	53.3	711260
31-Dec-86	8151	27732	36053	82604	26.6	12	6.2	713276	52.8	674372
31-Mar-87	8362	29243	35303	83919	27.5	12.5	-4.5	718464	51.5	677202
30-Jun-87	8765	30898	35403	85104	28.6	12.5	-5.2	721026	50.8	710124
30-Sep-87	9133	32721	35542	88764	29.6	12.5	-3.1	723657	51.2	725592
31-Dec-87	9779	34447	38174	94815	30.5	12.5	-2.2	732541	52.2	730785
31-Mar-88	10260	36492	41334	100902	31.3	14	0.2	743551	52.9	742120
30-Jun-88	10662	38928	41590	104702	32.1	15	2.8	748830	52.3	765264
30-Sep-88	11478	41753	45497	114103	33.2	16	3.8	758901	54.3	755678
31-Dec-88	12422	44253	47510	121076	34.2	18	5.9	766027	55.3	758726
31-Mar-89	13220	46226	50623	126806	35.6	19	5.3	770771	55.4	772328
30-Jun-89	14143	48255	52490	131167	37.1	20	4.4	774115	54.6	771921
30-Sep-89	14820	49941	53899	137503	38.1	20	5.2	774737	54.1	760588

31-Dec-89	15600	51894	57372	145516	39.5	21	5.5	769943	55.9	752872
31-Mar-90	15855	53481	58667	148999	41	21	5.8	770559	55.3	744536
30-Jun-90	16601	55319	60621	155329	42	21	7.8	769924	55.0	756177
30-Sep-90	17336	57479	60334	158530	43.6	21	6.6	769276	54.4	760706
31-Dec-90	18054	59506	64711	168341	45.4	21	6.1	769990	56.7	733627
31-Mar-91	17970	61993	69546	177142	46.8	21	6.9	763866	57.7	751472
30-Jun-91	18304	64729	72867	181196	48.4	20	4.8	762142	56.6	748256
30-Sep-91	18588	67566	73831	187787	50.2	20	4.9	761847	56.5	740948
31-Dec-91	19259	70235	73856	192672	52.8	20.25	4.0	760536	56.1	735746
31-Mar-92	18368	73053	74160	194713	54.1	20.25	4.7	755206	54.8	733855
30-Jun-92	18533	75887	74148	198628	55.7	19.25	4.2	750574	54.5	736704
30-Sep-92	19025	78951	73303	203950	57	18.25	4.7	741884	54.9	726688
31-Dec-92	19552	82395	73488	209487	57.8	17.25	7.8	735580	55.1	723406
31-Mar-93	19519	85980	73639	211850	59.3	16.25	6.6	742097	54.2	734522
30-Jun-93	20654	89197	73451	212563	61.3	16.25	6.2	750237	52.1	730217
30-Sep-93	21741	93351	77241	221458	62.1	16.25	7.3	761036	51.9	748746
31-Dec-93	23062	97014	79661	227804	63.4	15.25	5.6	766675	51.7	753760
31-Mar-94	24187	100284	83305	236938	64.7	15.25	6.1	765582	51.6	761300
30-Jun-94	25512	104193	81379	240753	65.8	15.25	7.9	773888	51.1	777794
30-Sep-94	27115	108872	85713	255294	68.4	16.25	6.1	782592	53.2	791787
31-Dec-94	29423	114348	89887	268926	69.6	16.25	6.5	795654	54.5	793949
31-Mar-95	30341	119892	93457	278543	71.4	17.5	7.1	798528	54.1	813243
30-Jun-95	32601	124528	94951	287658	72.5	17.5	7.3	802074	53.8	819215
30-Sep-95	34734	129423	99973	302090	72.9	18.5	11.9	805536	55.0	808215
31-Dec-95	37442	136267	102357	316709	74.4	18.5	11.6	808715	56.4	817440
31-Mar-96	39090	141773	108391	330514	75.8	18.5	12.3	820063	57.1	827484
30-Jun-96	41346	147060	112177	341412	77.5	20.5	13.6	835424	56.8	855805
30-Sep-96	43118	153845	116863	355991	79	19.5	11.1	844904	57.5	851094
31-Dec-96	45380	159241	120582	367213	81.3	20.25	11.0	852917	57.9	858277
31-Mar-97	46169	164620	129600	383208	83.1	20.25	10.6	855368	58.7	868729
30-Jun-97	47274	168871	138160	397120	84.3	20.25	11.5	860600	59.2	871442
30-Sep-97	47709	173260	142997	406823	85.4	20.25	12.1	862397	59.3	869942
31-Dec-97	49537	177442	148982	419872	86.4	19.25	13.0	863699	59.9	869420
31-Mar-98	50640	183322	160165	439020	87.6	18.25	12.8	864791	61.4	859363
30-Jun-98	51611	187843	173426	460828	88.7	22.25	17.0	866014	63.0	867826
30-Sep-98	51501	192096	181417	468950	93	25.5	16.6	864116	63.0	871363
31-Dec-98	51574	195177	195697	489893	94.1	23	14.1	864951	65.1	876072
31-Mar-99	51988	196524	199923	499838	94.4	20	12.2	872905	64.8	844148
30-Jun-99	51707	196843	211330	512993	95	18	10.9	879852	65.0	873775
30-Sep-99	51756	200539	219982	522059	94.9	16.5	14.5	889461	64.2	866924
31-Dec-99	52364	203185	225677	532520	96.3	15.5	13.2	899242	63.6	879937
31-Mar-00	53141	206513	228137	539421	97.6	14.5	11.1	909357	62.6	881941
30-Jun-00	54199	211171	226540	548058	99.9	14.5	9.3	917724	61.6	892173
30-Sep-00	55446	218850	236337	574362	101.5	14.5	7.5	926813	62.2	904986
31-Dec-00	57069	226269	236391	590063	103.1	14.5	7.4	934698	61.8	900476
31-Mar-01	60011	238228	232872	591354	104.7	14.5	7.2	940768	60.3	906210
30-Jun-01	61203	243875	234431	602096	106.1	13.75	7.5	945471	60.2	904967
30-Sep-01	62796	250607	249555	631232	106.1	13	8.5	947982	62.4	919749
31-Dec-01	64901	259162	261157	674047	107.9	13	8.3	955271	64.8	927246
31-Mar-02	67802	266447	258621	668608	111.1	15	8.9	965346	61.5	942136
30-Jun-02	70311	274924	257158	673959	114.6	16	8.0	977594	59.5	950953
30-Sep-02	73115	279949	265343	691265	118	17	5.8	988659	59.2	971094
31-Dec-02	76619	286002	269217	703381	121.3	17	4.6	996885	58.4	971801
31-Mar-03	79839	296468	274662	777866	122.4	17	6.8	1003734	63.3	988638
30-Jun-03	83191	307060	290192	790795	122.3	15.5	8.8	1009319	63.9	1003205
30-Sep-03	87346	318711	284057	815464	122.4	13.5	9.8	1015432	64.9	1010656
31-Dec-03	89208	331842	287988	838300	121.7	11.5	11.2	1022567	65.3	1033345
31-Mar-04	93296	345100	290253	834652	122.9	11.5	11.1	1037630	63.1	1059141
30-Jun-04	98063	362094	278011	837820	123.8	11.5	10.3	1054292	61.7	1085253
30-Sep-04	103410	383692	293135	884361	124	11	9.7	1072820	63.5	1101415
31-Dec-04	109469	412769	304188	954024	125.8	11	7.6	1082338	66.3	1107659
31-Mar-05	112978	430359	323086	979903	126.6	11	8.0	1094886	66.7	1126124
30-Jun-05	119214	459502	330141	1025680	127.3	10.5	7.7	1109663	68.9	1141413
30-Sep-05	123281	494046	335095	1086814	129.4	10.5	6.1	1123378	71.0	1163052
31-Dec-05	129701	526647	347428	1139995	130.3	10.5	6.9	1135341	71.7	1180127
31-Mar-06	134493	559607	382209	1216355	130.9	10.5	7.1	1149256	74.7	1221757

30-Jun-06	140721	596283	380075	1265662	133.5	11	6.1	1164775	76.4	1248406
30-Sep-06	140700	640449	423479	1361614	136.2	11.5	6.2	1177579	79.1	1252721
31-Dec-06	147399	684593	452267	1434673	137.8	12.5	6.7	1193858	79.8	1289668

Appendix 4:

Frequency	Quarterly	Quarterly	Quarterly
Unit of measure	Percentage	Percentage	Percentage
Type	Current prices. Seasonally adjusted at annual rate	Current prices. Seasonally adjusted at annual rate	Current prices. Seasonally adjusted
Description	Ratio of saving by households to disposable income of households	Ratio of final consumption expenditure by households to GDP	Household debt to disposable income of households
Date	Value	Value	Value
1998/01	1.78	63.16	60.87
1998/02	1.87	62.59	60.45
1998/03	1.78	64.05	59.81
1998/04	0.7	63.50	59.68
1999/01	1.07	63.33	58.64
1999/02	1.81	63.46	57.55
1999/03	1.24	63.01	56.8
1999/04	1.16	63.03	55.64
2000/01	1.27	63.49	54.15
2000/02	1.18	63.60	53.26
2000/03	1.29	62.61	52.74
2000/04	0.99	62.31	53.11
2001/01	0.85	62.04	52.84
2001/02	0.76	62.93	52.31
2001/03	0.82	63.39	52.56
2001/04	0.94	62.53	52.73
2002/01	0.81	61.90	51.21
2002/02	0.68	61.79	51.56
2002/03	0.64	61.90	49.96
2002/04	0.65	61.57	49.82
2003/01	0.84	61.88	51.8
2003/02	0.77	62.63	52.12
2003/03	0.81	62.32	53.17
2003/04	0.78	62.43	52.63
2004/01	0.63	62.22	54.61
2004/02	0.53	62.74	55.77
2004/03	0.41	61.94	57.32
2004/04	0.17	62.25	58.52
2005/01	0.16	62.75	59.88
2005/02	0.14	63.31	62.15
2005/03	0.12	62.42	64.63
2005/04	0.09	61.96	67.05
2006/01	-0.25	62.50	69.39

2006/02	-0.44	63.43	70.8
2006/03	-0.51	62.14	73.01
2006/04	-0.62	62.08	73.74
2007/01	-0.57	62.13	75.89