

**Review of South African Private Sector Saving  
(1965 – 2007)**

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Masters Dissertation

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The aim of the study is to assess the shortage of personal saving in South Africa. The analysis shows that net household saving has been impacted on by high levels of consumption of fixed capital. At a gross level, personal saving, albeit still low, has not imploded. Levels are low compared to most international countries, both developing and industrialised.

Corporate saving played a key role in keeping gross national saving stable. A recovery in government saving is will be helpful and is already underway.

Structural and demographic factors negate against a short term recovery in household saving. Saving incentives are insufficient. High dependency ratios and a skew income distribution are demographic factors which play a role in low personal saving levels.

In addition, both the changing composition in household sector wealth and financial deepening has had an impact on growth in consumer debt, which reflects in low personal saving. Should these debt levels be of concern? The conclusion of this analysis is that debt levels in South Africa are still below those of other countries. Rising mortgage debt has contributed to higher overall debt levels.

Reference is made to household sector wealth and the impact on personal saving.

The longer term structural impact on economic growth of this changing personal saving environment implies an increased reliance on external funding of a shortfall in saving to finance domestic investment. This is in line with developments in other developing economies. More direct investment than portfolio inflow on the balance of payments would be preferable.

## Table of Contents

<b>I.</b>		<b>Introduction</b>	.....	p.5
<b>II</b>		<b>General overview of Saving in SA and International Comparisons</b>	.....	p.8
	2.1	South African Gross Saving	.....	p.8
	2.2	International Gross Saving	.....	p.10
	2.2.1	Regional Differences in Saving	.....	p.11
	2.2.2	Regional Correlations in Saving and Investment	.....	p.16
<b>III</b>		<b>Theoretical Saving Models</b>	.....	p.18
	3.1	Introduction	.....	p.18
	3.2	Solow's Growth Model	.....	p.19
	3.3	Keynesian Consumption Model	.....	p.20
	3.4	Life-Cycle / Permanent Income Hypothesis	.....	p.23
	3.4.1	The PIH Model	.....	p.23
	3.4.2	Empirical Findings of the PIH and LCH Model	.....	p.26
	3.5	Consumption under Uncertainty	.....	p.27
	3.5.1	The Random-Walk Consumption Model (RWC)	.....	p.27
	3.5.2	The Campbell-Mankiw Model	.....	p.29
	3.6	The Ramsey-Cass-Koopmans Model	.....	p.33
	3.6.1	The Formal Ramsey-Cass-Koopmans Model	.....	p.33
	3.7	Precautionary (Buffer Stock) Saving	.....	p.35
	3.8	Liquidity Constraints	.....	p.35
	3.9	Ricardian Equivalence	.....	p.36
<b>IV</b>		<b>Local and International Household Saving</b>	.....	p.38
	4.1	South African Household Saving and Economic Cycles	.....	p.38
	4.2	Overview of the Determinants of Household Saving	.....	p.41
	4.2.1	Income Growth in South Africa	.....	p.44
	4.2.2	Interest rates and Saving	.....	p.46
	4.2.3	Credit Extension and Saving	.....	p.47
	4.2.4	Demographic Factors in South Africa	.....	P49
	4.2.5	Economic Impact of H.I.V./AIDS in South Africa	.....	p.51
	4.2.6	Public Saving and National Saving	.....	p.51
	4.2.7	Terms of Trade in South Africa and Saving	.....	p.52

	4.2.8	Other Determinants	.....	p.52
	4.3	Public Policy and the Impact on Household Saving	.....	p.53
	4.4	Household Saving Conclusion	.....	p.54
<b>V</b>		<b>Corporate Saving in South Africa</b>	.....	p.56
	5.1	Introduction	.....	p.56
	5.2	“Piercing the corporate veil”	.....	p.58
	5.3	Determinants of Corporate Saving	.....	p.59
	5.3.1	Financing Investment	.....	p.59
	5.3.2	Role of Corporate Profits	.....	p.59
	5.3.3	Cyclical Factors	.....	p.61
	5.4	Econometric estimates for Corporate Saving	.....	p.61
	5.5	Policy and Economic Implications of Corporate Saving	.....	p.62
<b>VI</b>		<b>Impact of Financial Liberalisation on Household Saving Behaviour</b>	.....	p.63
	6.1	Introduction	.....	p.63
	6.2	Financial Market Liberalisation and Economic Growth	.....	p.65
	6.2.1	Financial Market Liberalisation and Developing Economies	.....	p.67
	6.2.2	Financial Market Liberalisation in OECD countries	.....	p.68
	6.2.3	Financial Market Liberalisation in South Africa	.....	p.70
	6.3	Household Debt in South Africa	.....	p.71
	6.3.1	Mortgage Debt	.....	p.72
	6.3.2	Other household debt	.....	p.74
	6.3.3	Household Debt and Interest Payments	.....	p.75
	6.3.4	Consumption of Fixed Capital and Net Saving	.....	p.77
	6.3.5	Conclusion	.....	p.79
<b>VII</b>		<b>Estimating SA Household Sector Wealth</b>	.....	p.80
	7.1	Introduction	.....	p.80
	7.2	Household Balance sheets for G-6 countries	.....	p.81
	7.3	Importance of Household sector property	.....	p.82
	7.4	Estimating South African household balance sheets	.....	p.84
	7.5	Conclusion	.....	p.86
<b>VIII</b>		<b>Summary and Conclusions</b>	.....	p.88
		<b>List of References</b>	.....	p.90
		<b>Appendix I Definitions</b>	.....	p.92
		<b>Appendix II Tables and Graphs</b>	.....	p.97
		<b>Appendix III Ramsey-Cass-Koopmans Model</b>	.....	p.99

## I.

### INTRODUCTION

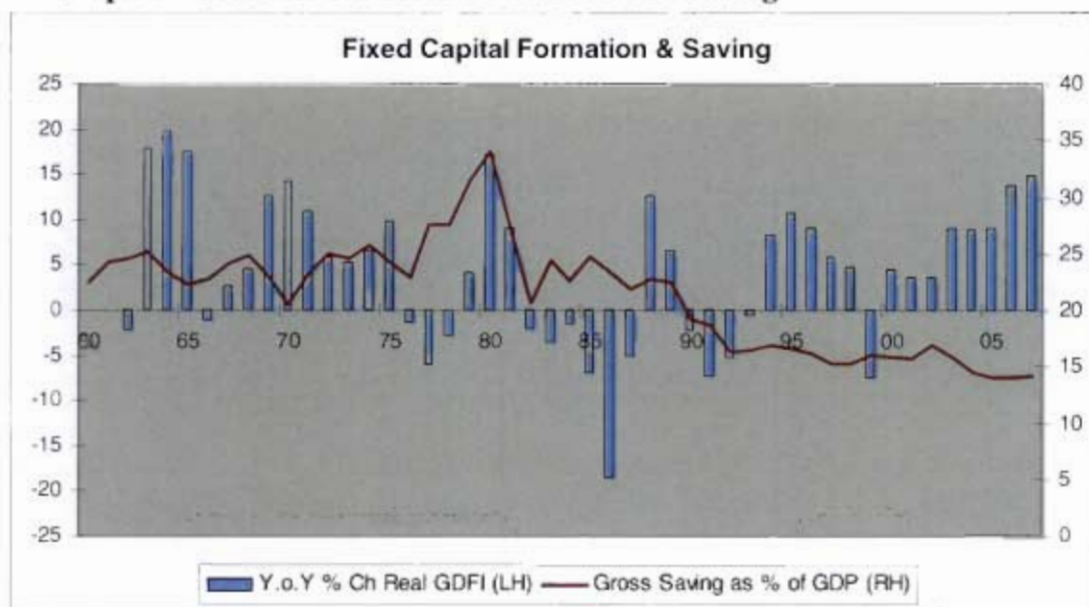
Low saving in South Africa contributed to weak fixed investment spending over decades. Insufficient investment rates over an eighteen year period from 1976 to 1993 resulted in a shortage in infra-structure and job opportunities. (See Graph 1). Consensus economic theory prescribes a high savings rate in order to lift investment growth rates more permanently. The question is what level of saving is appropriate for a country like South Africa given the stage of its development?

Deregulated financial systems have provided households worldwide with more access to finance. In many countries this has resulted in increased home ownership, with the concomitant positive impact on house prices, creating concerns about asset bubbles developing. Often the impact of deregulated financial systems has been felt on lower saving. As households experienced an improvement on their balance sheets, the need for savings to finance short- or long term, planned or unplanned expenditure reduced. This of course will only hold for as long as the balance sheets remain positive and the cost of utilising credit extended against these balance sheets remain low. The question therefore is to what extent has financial deregulation negated high savings levels in order to finance growth?

In the case of South Africa savings are at lower levels compared to other emerging markets. Private sector saving has behaved more in line with those of industrial countries. The need for fixed capital expenditure and job creation after decades of a stagnating economy have culminated in a large shortfall on the current account of the balance of payments and relatively high cost of capital. The question as to how crucial this shortage of saving is in an open economy with sophisticated financial markets, given a worldwide decline in private sector saving? Put another way, is the deficit on the balance of payments as critical as is generally believed?

In reviewing gross saving (see Graph 1), the decline as a percentage of GDP from above 20% for most of the seventies and eighties to 14% during the nineties and the current decade is evident and appears to be structural. However, at the same time the growth in Gross Domestic Fixed Investment (GDFI) recovered following a contraction for 13 years intermittently from 1975 to 1995. The shortfall between saving and GDFI over the last decade has to be explained. Foreign financing played a major role, but there are other variables which need to be considered, such as lower interest rates and a magnanimous credit environment.

**Graph 1 South Africa Fixed Investment and Saving**

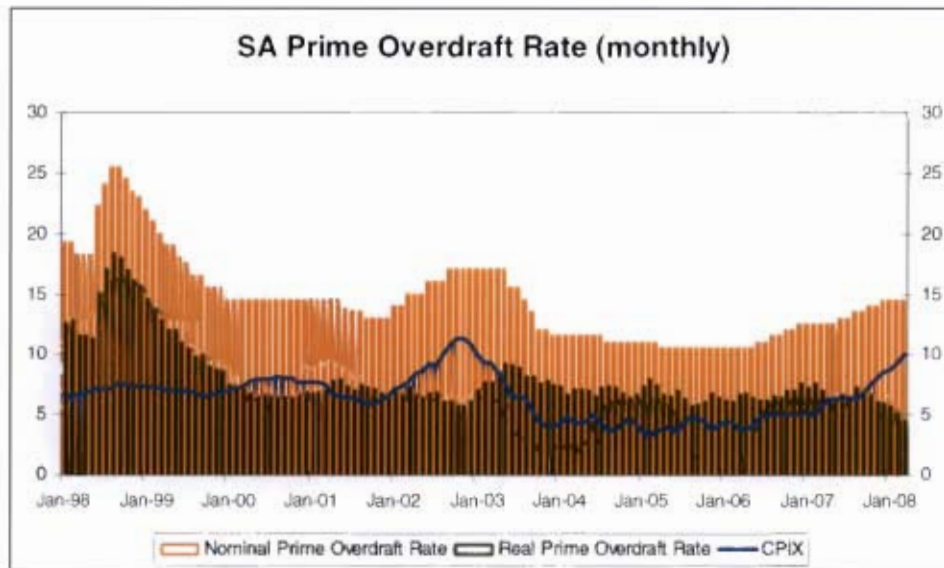


Source SARB

According to Prinsloo (SARB Occasional Paper, No 14, 2000), various studies indicate that in order to achieve a sustainable economic growth rate in excess of 3%, a saving rate of over 20% of GDP is required. Currently Gross Saving as a percentage of GDP stands at 13.7% in the 1st quarter of 2008. Most of the saving and debt statistics are worrying and the deficit on the current account of the balance of payments has consistently crept into the red over the last few years. Given that saving is not near the 20% level, foreign finance and credit extension are some of the financing solutions for investment spending.

Lower interest rates, following after a long period (1981 to 1998) of a politically enforced restrictive monetary policy, combined with a more secure macro-economic environment, resulted in a higher fixed investment growth rate.

**Graph 2 SA Prime overdraft rate**



Source SARB

Another variable which has been put forward in defence of lower saving rates is the change in household balance sheets. Numerous studies have been undertaken to consider the evidence of stronger household balance sheets and increased wealth on household saving. None of them have been conclusive, but it does raise the question as to whether we are scrutinizing the right variables and asking the right questions. This research will show that financial deepening has had an impact on South African debt and thus personal saving.

Given higher nominal interest rates and a tighter credit environment it can be expected that GDFI will come under pressure, unless additional foreign finance becomes available and/or domestic saving improves.

This study attempts to consider some of these questions against the very specific background of South Africa's economy, which is perhaps best described as an open developing economy with sophisticated financial markets.

## II.

### General Overview of Saving in SA and International Comparisons

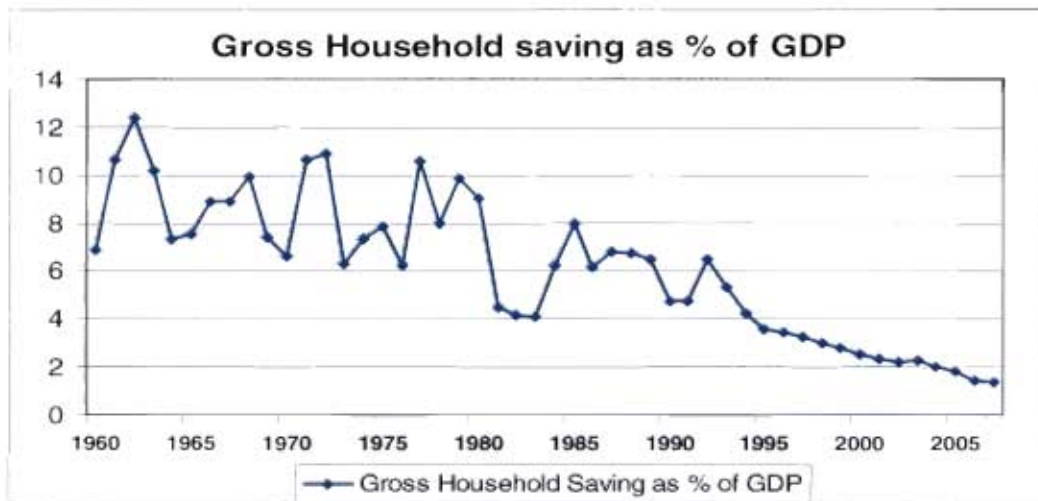
#### 2.1. South African Gross Saving

In national account terminology gross saving is essentially retained income. However, using this term is slightly misleading as it is calculated as a balancing item, from after-tax income and expenditure. The margin for error is therefore amplified as both income and expenditure measurements can impact on the saving statistic. What is also notable is that capital gains and losses made from the revaluation of financial or fixed assets are excluded from saving in the national accounts. None of this is particular to South Africa and therefore should not have any undue influence on comparing savings between countries.

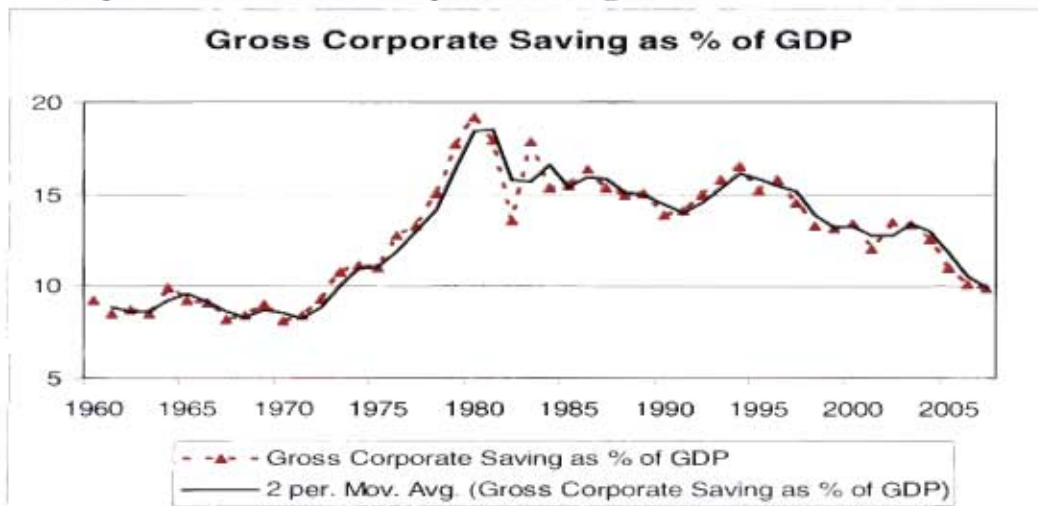
Gross saving comprises personal saving by the household sector as well as saving by the corporate sector and government saving. For detailed definitions of gross saving and the various sub-sectors, please refer to Appendix I. (Prinsloo, SARB Occasional Paper No. 14, 2000)

Reviewing the trend from 1960, it can be seen that during the sixteen years from 1990 to 2007 gross saving stands in contrast to the previous decades. Fitting a linear trend line to the respective components of gross saving as a percentage of GDP, household savings continue to decline. (See Graph 3). The trend in corporate saving, after rising for over three decades, has also started to turn down over the last decade, and more specifically since 1997. (See Graph 4). On the positive side, the downward trend in general government saving has reversed since 1994. (See Graph 5).

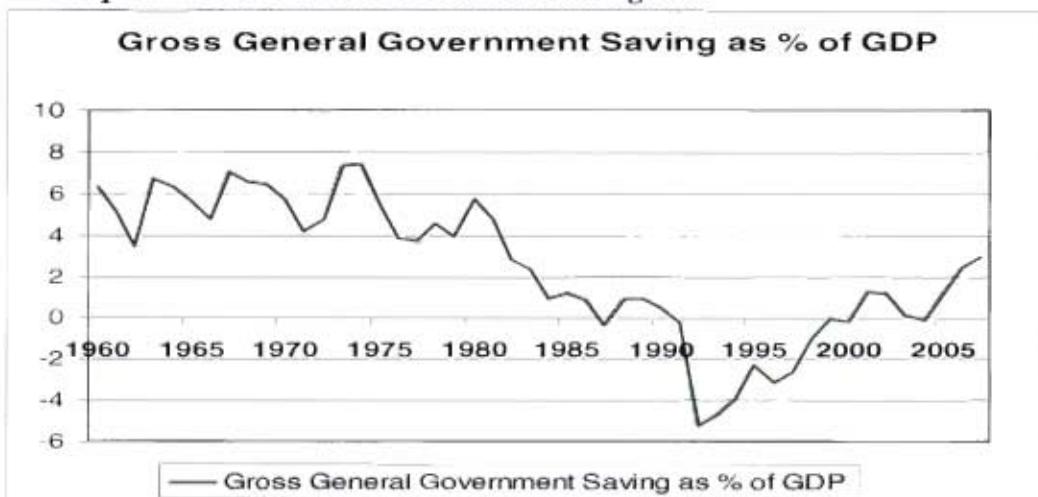
**Graph 3 South Africa Household Saving ratio**



**Graph 4 South Africa Corporate Saving ratio**



**Graph 5 South Africa Government saving ratio**



Source: South African Reserve Bank Quarterly Bulletin

## 2.2 International Gross Saving

South Africa kept pace with most OECD countries and middle income countries in terms of gross saving as % of GDP until the mid-80's. (See Table1) Worldwide saving rates have declined since the 70's, with the most accentuated declines during the 90's. The world economy has witnessed this downward trend in saving whilst current account imbalances have widened. At the same time real long term interest rates have remained low in most countries against expectations. This anomaly should be better understood, if perhaps difficult to explain. Therefore the fall in gross saving in South Africa has to be seen within the context of global trends in savings.

**Table 1: International comparisons of gross saving as percentage of GDP  
OECD countries and South Africa**

Period	Canada	France	Japan	United Kingdom	Germany	United States	<i>South Africa</i>
1961-72	22.5	25.7	35.3	19.3	26.5	16.2	<b>23.6</b>
1973-78	22.9	25.4	33.6	19.2	21.8	16.8	<b>25.4</b>
1979-84	21.2	21.1	30.3	18.1	23.3	16.5	<b>26.7</b>
1985-89	19.7	20.9	33.2	17.4	24.4	17.3	<b>22.9</b>
1990-94	15.0	20.0	33.4	15.0	22.54	15.4	<b>17.4</b>
1995-98	18.9	20.1	30.1	16.6	20.8	17.1	<b>15.3</b>
1999-05	22.4	20.1	26.9	15.1	20.3	15.0	<b>15.4</b>
2006-09 (forecast 08/09)	23.1	19.9	28.2	13.8	23.1	13.2	

Source: *South African Reserve Bank Quarterly Bulletin*  
*International Monetary Fund*

Although high oil prices also had a destructive impact on the South African economy during the 70's, a higher gold price boosted corporate profits and retained income.

Gross private sector saving has been stable in the OECD economies. Thus, the decline in the overall gross saving ratio (GNS/GNDISP) can mainly be explained by the decline in public sector saving. Given the ageing population in these countries,

funding of generous pension schemes is under pressure. Budget deficits widened in most of these countries.

Within private sector saving household saving in some regions, such as North America and the UK, has been most affected. The majority of the OECD countries show a decline in household saving. This decline happened at the same time as household assets showed an increase in value, with a concomitant improvement in access to capital gains through the financial system (see Hiebert 2006). At the time of writing the international financial system is undergoing a time of turmoil and uncertainty, which is affecting asset prices globally. This can be expected to have an impact on the availability of credit to households and as such economic growth.

By contrast, public sector saving has been on the rise in developing economies. According to the Loayza, López study (see Loayza, López et al, 1998), the median public saving rate halved during the latter half of the 1970's and early 80's, where after it has recovered and surpassed previous levels. Again, there are contrasts across regions. The take-off countries such as the Pacific-region countries performed better than Latin America and Africa.

The question remains how to explain the decline in gross saving in developing countries, given an increase in public saving. The obvious answer lies with the decline in private sector saving, but this is misleading as it is only the Latin American and Sub-Saharan Africa groups of countries which showed a significant decline in private saving.

As a result of these diverging trends, the share of industrial countries in global saving and investment has dropped from 85% in 1970 to 70% at present.

### **2.2.1. Regional Differences in Saving**

Regional differences in saving and investment behaviour are central to global imbalances. Bernanke (2005) postulates that the excess global supply of saving in Asia has been channelled to the United States and financed the large current account imbalance. Investment in Asia, excluding China, has declined from levels of

approximately 34% of GDP in the early nineties to current levels of 24% of GDP. Saving in these East Asian economies, on the other hand, declined by far less as a percentage of GDP than in developing countries.

In a study by the IMF (2006) the recent movement in saving and investment in 46 industrial, emerging market and oil-producing countries was undertaken. This analysis assessed whether the change in savings and investment in each country was due to country-specific factors or more the result of global and regional trends. The findings were meant to assist policymakers in reducing the global imbalances. South Africa was included in the study under “Other Emerging Market” economies together with Egypt, India and Turkey, to name a few of the bigger economies. However, saving in South Africa often behaves more like those of industrial countries, perhaps because of the level of sophistication in financial services. In reviewing the study by the IMF, reference shall be made to both these regional groupings. (See Table 2)

Of all the developing economies, China has shown the most remarkable increase in saving. It already had a high saving rate of 29% during the 70's (see Loayza, López et al, 1998), which has risen to the 40% - level in the last decade due to elements of economic reform. Most recently over the last five years gross domestic saving in China rose to close to 50% of GDP. (See IMF, World Economic Outlook, 2005). An interesting feature of the rise in saving is that it emanates predominantly from the corporate sector in both state-owned and non-state-owned enterprises due to increasing profitability. A lack of access to financial markets probably contributes to the very high level of saving. Government saving also rose, though less dramatically than corporate saving.

The discrepancy between saving and investment amongst these various regions is indicative of what has been happening to current account imbalances. Consider Graphs 6(a – e) below, where it is evident that in the “Advanced” economies, especially in the US, investment growth has outstripped the domestic supply of saving, resulting in growing current account deficits.

**Table 2: International comparisons of gross saving as percentage of GDP  
Regional breakdown (see footnote <sup>1</sup> for countries specified)**

Period	World	Advanced economies	Newly Industrialised Asian economies	Emerging and developing economies	Africa Sub-Saharan economies	Developing Asia
1980-84	22.8	21.9	29.8	25.2	16.9	25.1
1985-89	23	22.4	35.7	25.1	16	27
1990-94	22.1	21.7	34.7	23.6	15.5	31.1
1995-98	22.3	21.9	33.7	23.9	15.1	33.5
1999-05	21.6	20.2	31.4	26.7	17.2	35.9
2006 – 09*	23.6	19.8	31.3	33.2	20.8	44.7

Source: International Monetary Fund (\* denotes forecast for 2008/09)

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**Advanced economies:**

Composed of 31 countries: Australia, Austria, Belgium, Canada, Cyprus, Denmark, Finland, France, Germany, Greece, Hong Kong SAR, Iceland, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Malta, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovenia, Spain, Sweden, Switzerland, Taiwan Province of China, United Kingdom, United States

**Newly industrialized Asian economies**

Composed of 4 countries: Hong Kong SAR, Korea, Singapore, Taiwan Province of China

**Developing Asia**

Composed of 23 countries: Bangladesh, Bhutan, Cambodia, China, Fiji, India, Indonesia, Kiribati, Lao People's Democratic Republic, Malaysia, Maldives, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Samoa, Solomon Islands, Sri Lanka, Thailand, Tonga, Vanuatu, Vietnam

**Emerging and developing economies**

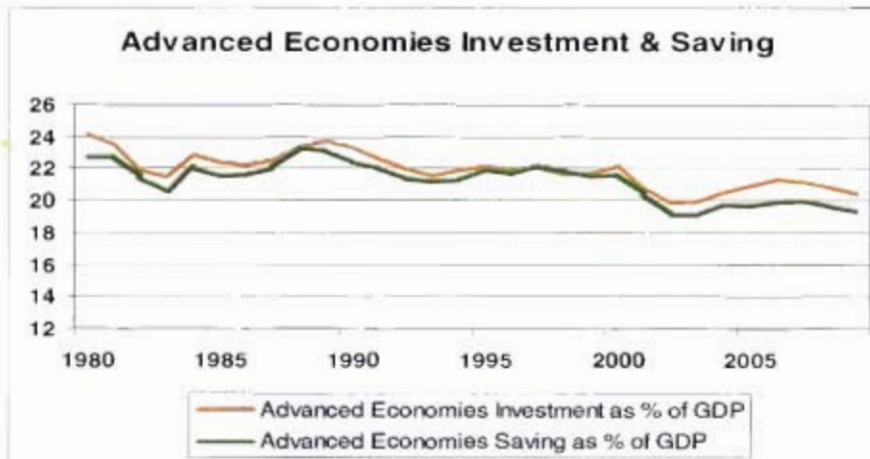
Composed of 142 countries: Albania, Algeria, Angola, Antigua and Barbuda, Argentina, Armenia, Azerbaijan, Bahamas, The, Bahrain, Bangladesh, Barbados, Belarus, Belize, Benin, Bhutan, Bolivia, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Chile, China, Colombia, Comoros, Congo, Democratic Republic of, Congo, Republic of, Costa Rica, Côte d'Ivoire, Croatia, Czech Republic, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Estonia, Ethiopia, Fiji, Gabon, Gambia, The, Georgia, Ghana, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hungary, India, Indonesia, Iran, Islamic Republic of, Jamaica, Jordan, Kazakhstan, Kenya, Kiribati, Kuwait, Kyrgyz Republic, Lao People's Democratic Republic, Latvia, Lebanon, Lesotho, Libya, Lithuania, Macedonia, Former Yugoslav Republic of, Madagascar, Malawi, Malaysia, Maldives, Mali, Mauritania, Mauritius, Mexico, Moldova, Mongolia, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, Oman, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Qatar, Romania, Russia, Rwanda, Samoa, São Tomé and Príncipe, Saudi Arabia, Senegal, Seychelles, Sierra Leone, Slovak Republic, Solomon Islands, South Africa, Sri Lanka, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Sudan, Suriname, Swaziland, Syrian Arab Republic, Tajikistan, Tanzania, Thailand, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, United Arab Emirates, Uruguay, Uzbekistan, Vanuatu, Venezuela, Vietnam, Yemen, Republic of, Zambia, Zimbabwe

**Africa: Sub-Sahara**

Composed of 45 countries: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Democratic Republic of, Congo, Republic of, Côte d'Ivoire, Djibouti, Equatorial Guinea, Ethiopia, Gabon, Gambia, The, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, São Tomé and Príncipe, Senegal, Seychelles, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe

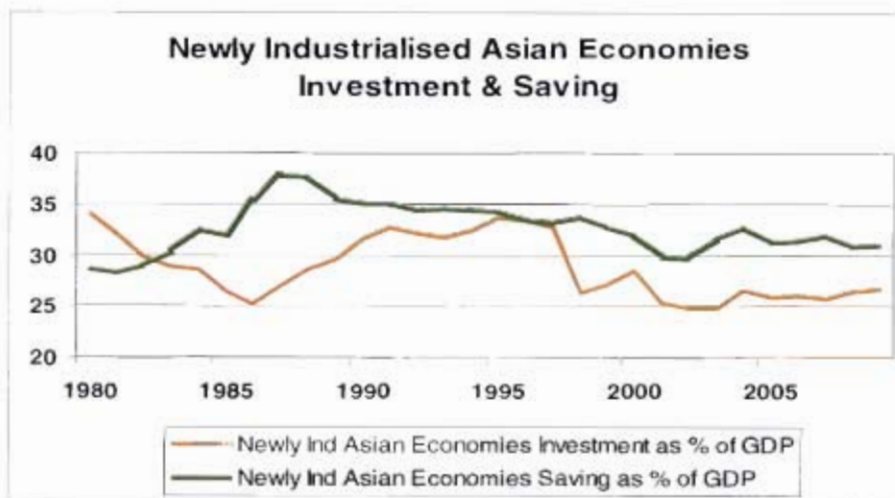
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**Graph 6 (a) Investment and Saving as % of GDP – Advanced Economies**



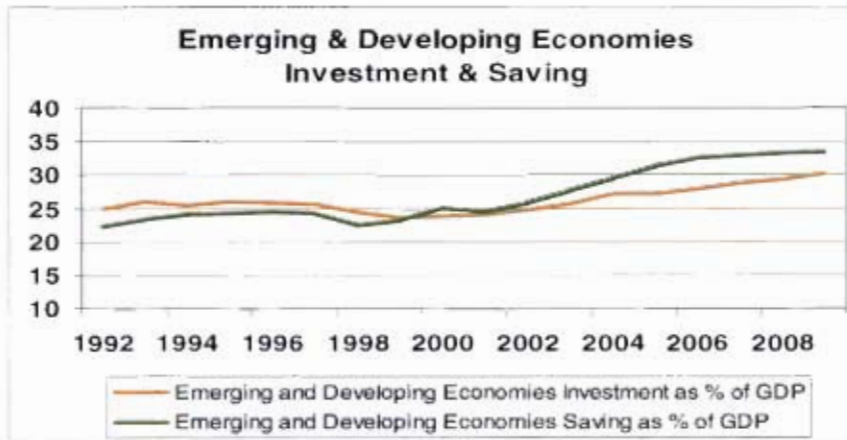
In contrast the newly industrialised Asian economies, after a surge in investment spending from 1985 to 1997, has shown investment declining from 34% of GDP to as low as 25% in 2002, recovering slightly in the last five years. Saving on the other hand declined very little in these Asian economies and has been consistently above investment.

**Graph 6 (b) Investment and Saving as % of GDP – Newly Industrialised Asian Economies**

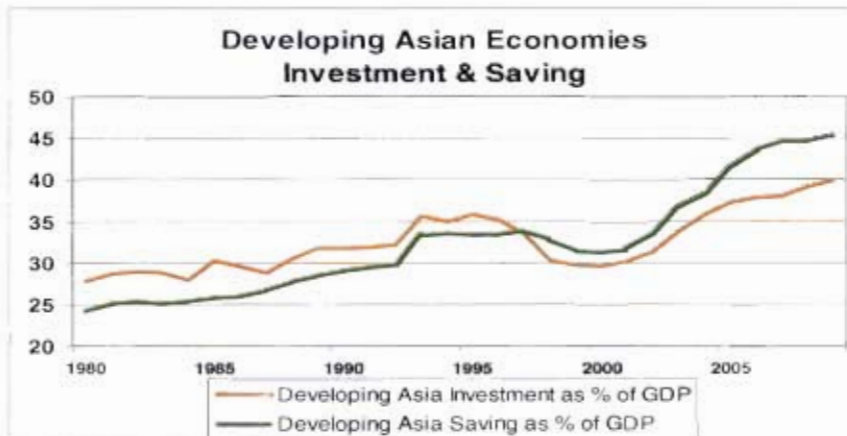


Emerging and developing economies are also still generating an excess of saving. Developing Asia, of which China is a significant portion, has witnessed growth in both investment as well as saving prior to 2009, with saving still outstripping investment. (See graph 7(d))

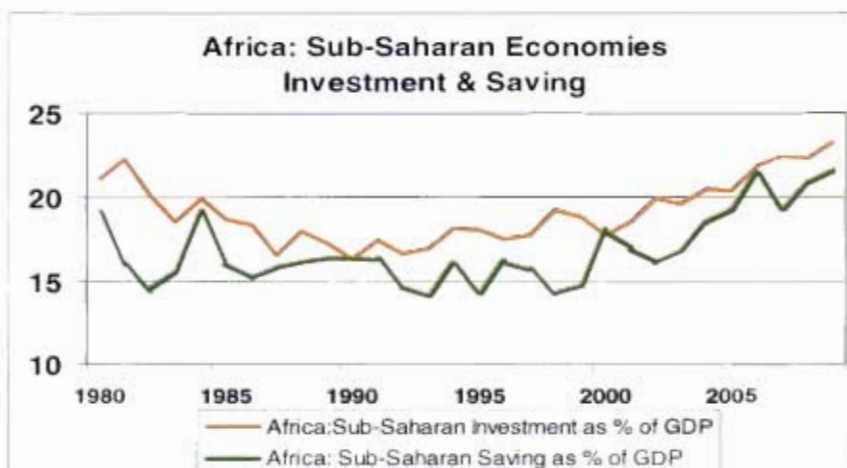
**Graph 6 (c) Investment and Saving as % of GDP – Emerging & Developing Economies**



**Graph 6 (d) Investment and Saving as % of GDP – Developing Asian Economies (incl. China)**



**Graph 6 (e) Investment and Saving as % of GDP – Sub-Saharan Economies**



Source: IMF Statistical database (2008)

Sub-Saharan Africa is one of the few developing regions that still imports capital from wealthier economies. It is encouraging that the recovery in investment evident from 1990 has been accompanied by a recovery in gross saving.

These global imbalances primarily emerged since 1997. Declining total saving in industrial countries has predominantly been the result of lower private sector saving. Corporate saving has overtaken household saving. Although it can be expected that households as the ultimate owners of corporations should be able to ‘pierce the corporate veil’, this has not been fully assessed. (See Poterba, 1987). This issue is also discussed in Chapter V of this document.

Public saving in the emerging market and oil-producing countries was the main driver behind increased total saving following on the Asian financial crisis in 1998. Higher oil prices have played an important role in the recovery of saving in oil-producing countries, whilst lower investment rates in most of the Asian economies, excluding China, have been the flip-side of improved balance of payments.

These changes in saving and investment behaviour have implications for current account imbalances and the level of real interest rates across the different regions.

### **2.2.2. Regional Correlations in Savings and Investment**

Over the last three decades investment rates across regions have become more correlated, perhaps reflecting the more global nature of businesses as well as the impact of technology (IT) with the concomitant productivity shock. Savings however has shown little correlation between industrial and emerging market countries. The following table from the IMF study illustrates the diverging trends across the regions:

**Table 3 Average Correlations of Saving and Investment Ratios**

<b><u>Saving</u></b>	<b><u>1970 – 2004</u></b>	<b><u>1970 – 96</u></b>	<b><u>1997 - 2004</u></b>
Across all regions	0.15	0.18	0.22
Between industrial regions	0.58	0.68	0.48
Between emerging market regions	0.03	0.04	0.27
Between Industrial and emerging market regions	-0.16	-0.19	-0.08
<b><u>Investment</u></b>			
Across all regions	0.27	0.22	0.36
Between industrial regions	0.68	0.69	0.53
Between emerging market regions	0.12	0.11	0.30
Between Industrial and emerging market regions	...	-0.14	0.24

*Source: IMF, Global Imbalances, Chapter 2 2006*

From the above, it can be seen that the correlation among emerging market countries is improving, but still relatively low, whilst the correlation in saving between industrial and emerging markets is still negative.

This lack of correlation has enabled the advanced economies, in particular the US, UK, Australia and some European economies to run current account deficits. In other words, excess saving over investment in emerging market regions have been exported to industrial countries. This can be attributed to policy decisions by some emerging markets entailing a built-up of foreign exchange reserves. According to Bernanke (2005), this is a precaution against turbulent financial markets. Traditionally capital was exported to less developed economies from wealthier countries. The reversal of traditional capital flows has been attributed to the lack of profitable investment opportunities in emerging market economies. National accounts data does not support this theory and still shows returns in emerging markets exceeding those of the G-7. However, in a study by the IMF an internal rate of return (IRR) was calculated for non-financial publicly traded companies. Although the study has to be interpreted with caution it highlighted a lower return in emerging markets relative to the G-7 and substantially lower than in the US. (See IMF, World Economic Outlook, 2005)

### III.

## Theoretical Saving Models

### 3.1. Introduction

It is widely accepted that savings are important in any economy because, at least over the long run, the level and growth rate of savings determine the level and growth rate of investment. The causal relationship however also runs in the opposite direction, i.e., the level and growth rate of savings is strongly influenced by the level and growth rate of income. It follows immediately that an understanding of income growth models is important to an understanding of savings. There are two general classes of income growth models: those in which the savings rate is given exogenously as typified by the Solow model and those in which the savings rate is endogenous as typified by the Ramsey-Cass-Koopmans model. A brief outline of these models is presented below.

A second necessary consideration or understanding is how this income or income growth is divided between savings and consumption. Again there are two general classes of theoretical models: those in which consumption is related to *current* income as typified by Keynes and those in which consumption is related to *permanent* income or *life cycle* income as typified respectively by Friedman and Modigliani. Since savings is defined as income minus consumption, various consumption theories entail different savings behaviour. Both the *current* and *permanent* income theories of consumption imply that the level of savings and the savings rate increase (decrease) with income. However since the *permanent* income theories imply a marginal propensity to save of approximately one(1) and the *current* income theory imply a much smaller propensity, the level and rate of savings are much more volatile when the former model (hypothesis) is assumed. Brief summaries of these two classes of consumption theories are also outlined below.

### 3.2. Solow's Growth Model

The Solow growth model begins by assuming a constant returns-to-scale aggregate production function, of which one common form is the Cobb-Douglas function. In this model the rate of growth of capital is determined by a fixed exogenously given rate of savings and the rate of growth of labour is similarly exogenous. Because of the implied diminishing marginal productivity of capital, the growth rate of output will eventually converge on the growth rates of labour and technology.

Solow also estimated a variant of this function and found that the rate of technological growth or the Solow residual was vitally important in determining the growth rate of GDP. This hints of a higher return to savings invested in technology than in savings invested in capital deepening. Is this a possible explanation of the widespread decline of the savings rate without a commensurate decline in GDP growth?

Solow's model also implies that if there are no barriers to capital movement, there is no reason why countries with high saving should also in the long term have high investment growth. As the marginal product of capital in one country falls below that of others, capital will flow towards the others until the marginal product of capital has equalised.

Empirical evidence on the other hand indicates that significant barriers to capital do exist and differences in saving and investment worldwide could be the result of differences in the rates of return. Other variables such as high tax rates can reduce both saving and investment. Some countries may have citizens who have low discount rates ( $\rho$ ), with which future consumption expenditure is discounted, resulting in high saving rates. Governments can also have an aversion to a large gap between saving and investment as manifested in a trade deficit, if investment exceeds domestic saving.

Related studies have focussed on the direction of causality, not just on the impact of saving on growth. Booms in income growth can lead to a permanent increase in

saving rates. A move to higher saving rates is associated with a temporary increase in economic growth. Harjes and Ricci (2006) quote from a study by Angus Deaton, "Saving and Growth" (1999), in which he concludes that the empirical correlation between growth and saving emanated from the response of growth to investment. Deaton posits that saving respond passively to investment through mechanisms not yet understood. Other empirical applications of the Solow model have also shown that the transition period, following a change in saving, can be very slow. Saving rates are capable of explaining a large fraction of the international variance in growth rates. (See Harjes and Ricci, 2006)

### **3.3. Keynesian Model of Consumption**

The depression of the 1930's was characterised by persistent unemployment and this played a major role in motivating Lord Keynes to build an economic model from which to derive a solution to the economic woes of the world. (See Wykoff, p67, 1981). Large exogenous shocks took too long to make classical equilibrium analysis á la Adam Smith useful under these circumstances. In essence Keynes' challenged the accepted doctrine that market mechanisms are inherently self-correcting and stabilizing.

In 1936 Keynes stated that consumption is a function of current disposable income. Aggregate consumption thus depends on aggregate income and this relationship is fairly stable. (See Romer, p. 333-337, 2001). In addition he argued "... that a higher absolute level of income ..... will lead, as a rule, to a greater *proportion* of income being saved." (Keynes, 1936, pp. 96-97).

While empirical studies were consistent with Keynes' main claim that across households, at a point in time, consumption is a fairly stable function of income, these studies questioned his claim that saving increases more than consumption (C) with an increase in income (Y), particularly over time.

Keynes focussed on consumption expenditures rather than savings in modelling household financial decisions. (See Wykoff, p.74, 1981). Saving by households is

defined as a residual from income after consumption. The standard textbook rendition of these arguments results in

$$s_t \equiv S_t / Y_t = (1 - b) - c_0 / Y_t \quad (K1)$$

where  $c_0$  is autonomous consumption and  $b$  is the marginal propensity to consume out of income. Note that the savings rate denoted by  $s_t$  in (K1) does indeed increase as  $Y_t$  increases.

The classical school always assumed an interest rate linkage between saving and investment to assure an outcome of full employment. Keynes used his theory of the “propensity to consume” to shatter this linkage. The severity of economic instability depends upon the marginal propensity (MPC) to consume, when such instability is generated by random shocks to investment spending. (See Wykoff, p. 80, 1981).

In a very simple comparative static model the marginal propensity to consume determines the size of the investment multiplier. The most important proposition relating to savings is that the MPC increases with income. Thus the MPC is positive and less than one. “...men are disposed, as a rule and on the average, to increase their consumption as their income increases, but not by as much as their income.” (See Keynes, J. M., *The General Theory of Employment, Interest and Money*, p. 96, 1935)

Budget studies or cross section data analysis undertaken in 1950 by the Wharton School of Finance confirmed that consumption responded in a Keynesian fashion to changes in income over short term cyclical fluctuations. (See Wykoff, p. 123, 1981). When longer term studies were undertaken other demographic factors pointed to an upward drift in the level of consumption associated with each level of income.

To resolve some of the problems encountered in cross-section analysis of consumption behaviour, time series analysis were undertaken. Again short term analysis for the United States during the period 1929 to 1941 confirmed that Keynesian consumption hypotheses could not be rejected by the evidence. However doubts were cast on the long-run stability of the Keynesian consumption function, in turn questioning the behaviour of savings in the long run. Estimating a consumption

function for the US economy using data compiled by the Nobel Laureate Simon Kuznets for a long period from 1869 to 1938, it emerged that the average propensity of consumption (APC) appears to be constant and that APC equals MPC. For the depression years (1930's), APC increased, which was when per capita income actually fell. Overall it appears that income and consumption are proportional over long periods of time, but in short term analysis consumption's relationship to income is non-proportional. (See Wykoff, p. 134, 1981).

Savings over a long period of time does not increase by more than consumption. An enigma became apparent from the Kuznets study. Short term and long term consumption functions differ.

Economists continued to attempt to reconcile this enigma with numerous hypotheses, some of which will be discussed in the following sections. As far as the Keynesian model goes, the only way to make the model fit the data is to allow autonomous consumption  $c_0$  to increase over time and more specifically to increase faster than GDP over the last twenty years. Also following from (K1) it is expected that an increase in the savings rate denoted by  $s_t$  will follow as a result of an increase in  $Y_t$ . Various studies indicate that for a long time in many countries including South Africa the trend savings rate remained rather constant and over the last two decades has actually fallen.

As we shall see in the next section Modigliani replaced  $c_0$  in (K1) with the term  $c_0A_t$  where  $c_0$  is the marginal propensity to consume out of wealth or assets  $A_t$ , which implies that saving is also determined by  $A_t$ . Friedman replaced  $c_0$  with  $c_0C_{t-1}$  where  $c_0C_{t-1}$  is derived from estimating permanent income by using lagged income and a Koyck transformation (estimation of the lag parameter where consumption spending may react with a distributed lag to a once and for all change in income). Note that if  $c_0 = 1$  and  $b = 0$ , it follows that  $C_t = C_{t-1}$  or a constant level of consumption.

### 3.4 Life-Cycle / Permanent Income Hypothesis (LC/PIH)

One of the most important hypothesis to emerge was from Milton Friedman in which he proposed that permanent income is the appropriate constraint variable. Friedman argued that the Permanent Income Hypothesis could explain most of the findings outlined in 2.3. The PIH argued that in short-run analysis or cross section studies both income and consumption can be over-or understated. This results in a non-proportional line that does not characterise consumption behaviour. These errors cancel each other out over the very long run. This temporary change to permanent income, if viewed by individuals as transitory will result in MPC being zero. If this change in income is viewed as a permanent change, MPC will be large. MPC is therefore not stable, which potentially delivered a challenge to Keynesian theory. If Keynesian theory is used as a policy framework, counter-cyclical measures could be used to regulate economic cycles. Friedman argued against such measures.

In the most straightforward manner, this hypothesis can be described as saving representing future consumption. The type of consumption in future may even be a bequest to children. Deciding how to divide income between saving and consumption is driven by deciding whether to consume now or in the future. The theory requires information about an individual's future income.

Permanent income is defined as that which can be spent without depleting wealth. Wealth in turn is calculated by the present value of one's future income stream which is not known with any certainty. Consumption behaviour is depicted by the proportional component of permanent income which was observed by the long-run Kuznets data,  $C_t = gY_t$ .

#### 3.4.1. The PIH model

Lifetime utility ( $U$ ) over lifespan ( $T$ ) is specified as follows:

$$U = \sum_{t=1}^T u(C(t)), \quad u'(\cdot) > 0; u''(\cdot) < 0$$

The budget constraint over an individual's lifetime is given the value of initial wealth plus the sum of expected lifetime income.

$$\sum_{t=1}^T C_t \leq A_0 + \sum_{t=1}^T Y_t$$

Solving for consumption (C) it can be seen that the marginal utility of consumption (MUC) is constant and positive. The level of consumption is uniquely determined by the MUC, thus C is also constant :  $C_1 = C_2 = \dots C_T$

Lifetime resources are spread equally among each period of life. Friedman (1957) described the right hand side as permanent income, as opposed to transitory income. Current income, if it is more or less than permanent income, will have little impact over a long time horizon on consumption. Any windfall income Z, will raise consumption only by Z/T. This windfall income will be saved in order to smooth consumption over a lifetime.

This has implications for public policy. If a tax cut is perceived as temporary and not permanent, it will have little impact on consumption. The impact on saving is different. Saving (S) being the difference between Income (Y) and Consumption (C) will look as follows in period (t):

$$S_t = Y_t - 1/T \sum_{\tau=1}^T Y_{\tau} - 1/T A_0$$

Saving will increase if income in period t is higher than the average income. The opposite also holds true. Consumption is smoothed over a lifetime by using saving and borrowing.

This hypothesis, proposed by Modigliani, Ando and Brumberg (MAB theory) in 1954 and Friedman in 1957, has interesting implications for commonly held views on saving. Lower income groups do not save less of their income (a smaller fraction), compared to higher income groups. If a person in a low income group perceives that this level of income is part of his/her lifetime pattern of income, they will consume and save according to this lifetime pattern of income.

Choosing between consumption and saving is described as inter-temporal optimisation. The PIH is set out above, with general assumptions on how individuals smooth consumption over a lifetime and set it equal to the annuity value of the sum of assets and the present value of expected future labour income, net of taxes.

A further development of this model is the life-cycle hypothesis (LCH), developed by Modigliani et al. This model is based on the aggregation of finitely lived overlapping generations. Individuals smooth consumption over their working and retirement periods. The Keynesian constraint variable, disposable income, is replaced by a wealth constraint. This wealth constraint unlike permanent income reflects the value only of non-human assets. The consumer simultaneously determines his wage income and his consumption pattern so that consumption does not depend upon income. (See Wykoff, p. 146, 1981) The conclusions are similar to the PIH.

The main difference between these two inter-temporal optimization models lie with the role of demographic factors, which are explicitly modelled in the LCH. These demographic factors can however be very important. In the LCH model most of the savings are made during years of highest income when individuals are between ages 40 and 60 and are employed. If that group should decline as a percentage of the population, then the average savings rate will also decline. Issues such as AIDS, increasing unemployment and income equality are closely related to the dependency ratio arguments and should impact on saving. The main similarity are the differentiation between permanent and temporary changes in current income - temporary changes in income will be saved, whilst permanent changes in income will be consumed.

As a result of consumption being dependant on wealth, a long run proportional consumption function is obtained. Their argument was that income tracks wealth closely in the long run and realized income is in line with expected income. The latter corresponds with wealth, as expected income is the expected return on wealth and the rate of return on wealth is probably fairly constant in the long run. In summary, the returns on non-human wealth plus labour income which comprise expected income grow at some steady secular trend rate. Life cycle spending plans made by consumers are proportional to these steady secular trend values. An interesting component of

this hypothesis is that a sudden change in for example equity prices produces an adjustment to life cycle plans. Another important input in the LCH theory is the reintroduction of interest rates. The intertemporal spending decisions imply that at high interest rates, consumers would choose to save rather than spend and vice versa.

The essence of the LCH theory is that consumers will smooth their spending patterns over a lifetime in response to fluctuations in both wages and the return on earned wealth. The bulk of income is earned during an individual's mid-life cycle, tapering off towards death. Consumption is far more stable, rising only gradually over the life cycle of an individual or family. During the peak-earnings period substantial savings need to be generated in order to sustain spending patterns, albeit smoothed spending. (See Wykoff, p. 147, 1981).

### **3.4.2. Empirical Findings of the PIH and LCH models**

Some problems were encountered with both models at the empirical level. Taking the PIH model at its most basic, an expected decline in income should be reflected in higher saving. Saving should be a good predictor of changes in income. Empirical work showed that the productivity slowdown in the US in the early 1970's was not preceded by an increase in saving, although the decline in the growth of income was well anticipated. (See Harjes and Ricci, 2006)

Empirical work has also shown that cross-sectional differences in consumption are better explained by differences in current income, rather than cross-sectional differences in lifetime resources. Thus most studies on saving have focussed on current income or growth as determinants.

Inter-temporal optimization models also have a role for real interest rates, but with opposite effects on saving. A change in interest rates can have an effect on income, for example higher interest rates make people wealthier if they already are "savers"., therefore they can theoretically consume more and save less. Higher return on saving increase the incentive to save and thus delay consumption. The net effect is theoretically ambiguous and most empirical studies support this view.

### 3.5. Consumption Under Uncertainty

The Random-Walk Hypothesis was first proposed by Hall and ran counter to existing views about consumption and thus saving. Traditionally, it is assumed that consumption declines when output declines during a business cycle, where after it is expected to recover. Consumption behaves in a predictable way. Hall proposed that when output declines unexpectedly, consumption declines only by the amount of the fall in permanent income. As a result consumption is not expected to recover even when output (income) returns to normal. Instead consumption in period  $t+1$  is just as likely to go down as up. This is a random walk.

#### 3.5.1. The Random Walk Consumption Model (RWC)

Numerous empirical tests have been devised in order to test whether predictable changes in income produce predictable changes in consumption. Mathematically the model can be summarised as follows, starting with the assumptions:

- i. Interest rate ( $r$ ) and discount rate ( $\rho$ ) equals zero.
- ii. Instantaneous utility function,  $u(\cdot)$  is quadratic.
- iii. Marginal utility ( $\theta$ ) is positive.
- iv. Outstanding debts must be paid off at the end of an individual's life.
- v. Budget constraint remains the same as in the PIH.

The individual maximises utility given

$$E[U] = E \left[ \sum_{t=1}^T (C_t - a/2 (C_t^2)) \right] \quad a > 0 \quad (\text{RW0})$$

It follows from (RW0) that for period  $t$ , marginal utility is  $1 - aC_t$ , and a change in  $C$  has an expected utility benefit of  $E [1 - aC] dC$ .

Consumption in period one is equal to expected expenditure in period one of all future consumption.

$$C_1 = E_1[C_t] \quad (\text{RW1})$$

Thus the budget constraint of both sides must therefore be equal so that the individual consumes  $1/T$  of his or her expected lifetime resources. But equation RW1 states that in each period, expected next period consumption equals current consumption so that:

$$C_t = E_{t-1}[C_t] + e_t,$$

where  $e_t$  is a variable whose expectation as of period  $t-1$  is zero.

As a result

$$C_t = C_{t-1} + e_t \quad (\text{RW2})$$

It follows immediately from (RW2) that changes in consumption are unpredictable. Simply put, this equation states that if an individual expects consumption to change, he can do a better job of smoothing consumption by either saving less or consuming savings. Consumption according to Hall, follows a random walk within the framework of the PIH. For example if consumption is expected to rise, the **current** marginal utility of consumption is greater than the expected future marginal utility of consumption. The individual can be better off by raising current consumption.

Consumption in period 2 will simplify to:

$$C_2 = C_1 + 1/T-1 \left( \sum_{t=2}^T E_2[Y_t] - \sum_{t=2}^T E_1[Y_t] \right) \quad (\text{RW3})$$

Expectation of period 2 income over the remainder of life can be written to read as the expectation of income in period 1 plus the information learned between 1 and 2.

This equation states that the change in consumption between period 1 and 2 is equal to the change in the person's estimate of his/her lifetime resources divided by the number of periods of life remaining. A predictable change in income does not produce a predictable change in consumption. Any increase in predicted income, if not viewed as permanent, will have an unpredictable impact on saving and consumption.

Behaviour is typified by certainty-equivalence. A person consumes only that amount which he would **if** his future income were to equal his means. Uncertainty about future income has no impact on consumption and saving.

Hall tested his RW hypothesis by regressing the change in consumption on variables known at  $t-1$ . If the RWH is correct, the coefficients of these variables should not be systematically different from zero. He found that lagged values of income or consumption cannot predict changes in consumption. The RWH could not be rejected. But lagged stock price movements were found to have a significant impact on predicting changes in consumption.

Hall's result deviated substantially from existing views in that an unexpected decline in output leads to a decline in consumption only concomitant to the decline in permanent income. A recovery in output does not imply a full recovery in consumption. Campbell and Mankiw tested Hall's theory by assuming that a fraction of consumers spend current income and a fraction behaves according to Hall's theory. This is discussed in more detail in 3.5.2.

### 3.5.2. The Campbell-Mankiw Model

The hypothesis put forward by Hall that consumption is a random walk, is firmly rooted in the realm of rational expectations. It was also sometimes called the 'Euler equation approach'. In 1989 John Campbell and N. Gregory Mankiw (see Campbell and Mankiw, 1989) proposed a simple alternative model. They argued that time-series data on consumption, income and interest rates fit a model with two types of consumers better than just a single representative.

They approached their alternative model in two ways. First the basic model as was explained under the PIH is tested and then adjusted to incorporate their alternative views. Secondly, the method of testing the model is changed from a standard test for a random walk to a more structural estimation technique, using an instrumental-variables (IV) method. They start out by analysing the representative consumer behaviour as maximising utility when

$$E_t \sum_{s=0}^{\infty} (1+\delta)^{-s} U(C_{t+s}) \quad (\text{CM1})$$

where  $C$  is consumption,  $\delta$  is the subjective rate of discounting and  $E_t$  is the expectation conditional on information at time  $t$ .

Making the assumption that  $\delta$  is equal to  $r$  and that marginal utility is linear, it follows from the first order condition for utility that

$$E_t U'(C_{t+1}) = (1 + \delta / (1 + r)) U'(C_t) \quad (\text{CM 2})$$

$$E_t (C_{t+1}) = C_t \quad (\text{CM 3})$$

Therefore  $\Delta C_t = \varepsilon_t$  where  $\varepsilon_t$  is a rational forecast error.

Change in consumption is unforecastable. These three equations (CM1 to CM3) are exactly the same as those discussed above in 2.4.1. In evaluating how well the data fits this model, they assume that a fraction of income,  $\lambda$  accrues to individuals who consume their current income and the balance  $(1 - \lambda)$  to consumers who behave according to the PIH. The PIH consumers are set up as the null hypothesis and the other group as the alternative hypothesis. Total income  $Y_t = Y_{1t} + Y_{2t}$  represents the two groups and  $Y_t$  then equals  $\lambda Y_{1t} + (1 - \lambda) Y_{2t}$ .

Change in consumer spending for the current group C1 will be

$$\Delta C_{1t} = \Delta Y_{1t} = \lambda Y_{1t}$$

Change in consumer spending for the null hypothesis group is

$$\Delta C_{2t} = \Delta Y_{1t} = (1 - \lambda) \varepsilon_t$$

Total change in consumer spending is the sum of these two groups which is a weighted average of the change in current income and the unforecastable innovation in permanent income, represented by  $\varepsilon_t$ , the rational forecast error. The authors proceeded to estimate  $\lambda$  directly and test the null hypothesis that it equals zero. In the IV method, lagged stationary variables have to be found which can predict future income growth.

The data used was quarterly US disposable income per capita ( $Y_t$ ) and US consumer spending on non-durables and services per capita ( $C_t$ ), both in 1982 dollars for the period 1953:1 to 1986:4. In their results they found that lagged consumption forecasts income growth more strongly than lagged income itself does, which meant that  $\lambda$  could be estimated more precisely. This implies that some consumers have better

information on future income growth and are prepared to spend more. This change in spending was not based on historical growth in income.

In addition to using lagged income and consumption, some financial variables were considered as instruments. Lagged changes in the average quarterly 3-month nominal Treasury bill rates were found to be significant for consumption growth.

Campbell and Mankiw found strong evidence that  $\lambda$  is not zero, which points to a strong rejection that all consumers behave according to the PIH. The estimates for  $\lambda$  are spread around 0.5, which implies that half of consumers spend according to their current income. Data for other countries in the G-7 group was tested and for six out of the seven countries the results were similar.

One of the assumptions crucial to the “random walk” theorem for consumption and saving is that the real interest rate is constant. Campbell and Mankiw wanted to make sure that a rejection of the PIH for all consumers is not due to the failure of this assumption, rather than a real deviation from the PIH. A log-linear version of the Euler equation was used to allow for changes in real interest rates so that

$$\Delta C_t = \mu + \sigma r_t + \varepsilon_t \quad (\text{CM 4})$$

where  $r_t$  is the real interest rate and estimates for expected growth in consumption is obtained. The error term  $\varepsilon_t$  may be correlated with  $r_t$ , but it is uncorrelated with the lagged variables. According to this equation (CM4) high ex ante real interest rates should be associated with rapid growth in consumption.

The coefficient  $\sigma$  in (CM 4) represents the intertemporal elasticity of substitution. A small value for  $\sigma$  indicates that the intertemporal elasticity of substitution is close to zero, which is what the PIH proposes, showing that consumers are extremely reluctant to substitute intertemporally. Campbell and Mankiw argue that the results they obtained by estimating (CM 4) point to the alternative hypothesis and that consumption is not a random walk. In particular they argue that if  $\sigma$  is zero and the PIH is true, then consumption should be a random walk. Statistically they could not

find evidence of this. In addition, although estimates for  $\sigma$  were small, they were highly unstable.

Overall their empirical work indicates that the model underlying the Euler equation (CM 4) should be rejected.

After real interest rates were included in the model, their results still indicated that once they allow for current income consumers there is no evidence that ex ante real interest rates are associated with growth in consumption for permanent income consumers. The estimate obtained for  $\theta$  is indicative of very little intertemporal elasticity of substitution for permanent income consumers. Thus consumers do not save more when real interest rates are rising.

In summary these results showed that there is little relationship between expected changes in consumption and ex ante changes in interest rates. However, most importantly this cannot be ascribed to a very low value for  $\sigma$  (small elasticity) but rather that expected changes in consumption are dependant on expected changes in income. And as such a change in income has an impact on saving. As soon as they include these 'rule-of-thumb' consumers the model is consistent with a very small value for intertemporal elasticity of substitution in the PIH group.

In general most households have little wealth and their consumption matches their income patterns. Yet, most of these households have a little balance of savings, which is used in the event of sharp falls in income or for emergencies. This is a case of buffer-stock saving. A small portion of households worldwide hold the vast majority of wealth.

As a result of some empirical challenges posed by the PIH, certain extensions have been proposed, starting with precautionary saving, liquidity constraints and departures from full-optimisation by consumers. The work done by Campbell and Mankiw has implications for policymakers, considering that current income plays a big role in consumer spending. The notion of Ricardian equivalence is also questioned by the work of Campbell and Mankiw. The so-called 'rule-of-thumb' consumers are unlikely to save if government deficits increase. In their view an old-

fashioned Keynesian consumption function may provide a better benchmark for analysing fiscal policy than a model with infinitely-lived consumers.

### 3.6. The Ramsey-Cass-Koopmans Model

In the Solow model saving is presumed exogenous. What Ramsey, Cass and Koopmans developed is a model where there are a fixed number of infinitely lived households. The interaction between these households and firms determine the evolution of the capital stock. Saving is not an exogenous variable anymore. Saving is derived from the behaviour of households whose utility depends on their consumption.

Up to this point we have maximised utility associated with a stream of consumption subject to a stream of exogenously given income. In fact that stream of income is endogenous because our consumption choice implies a savings/investment choice which in turn implies a stream of income. A more complete analysis of the optimal savings rate can be seen in the Ramsey-Cass-Koopmans (R-C-K) model. As we shall see this R-C-K model also implies a smooth consumption path like the PIH and LCH models. However this is not necessarily a constant level of consumption path.

#### 3.6.1. The Formal Ramsey-Cass-Koopmans Model

As in the PIH and LCH models consumer utility is maximised over a lifetime. A discount factor  $\rho$  is included and a constant elasticity utility function is assumed:

$$\text{Max } U = \int_{t=0}^T e^{-\rho t} U(c_t) dt = \int_{t=0}^T e^{-\rho t} (c_t^{1-\theta}) / 1-\theta$$

subject to the following budget constraint / savings-investment argument

$$dk/dt = y_t - c_t - \delta k_t$$

where  $c_t$ ,  $k_t$  and  $y_t$  denote consumption, capital stock and aggregate output (GDP) in per capita (worker) terms and where the aggregate production function is given by

$$y_t = A_t f(k_t)$$

with the technology coefficient  $A_t$  growing at rate  $g$ . The implied constrained optimization policy can be *solved* using either the Pontryagin maximum principle or the calculus of variations. The *solution* is given by

$$\dot{c}_t / c_t = (r_t - \rho - \theta g) / \theta \quad (RCK 1)$$

where the net rate of return  $r_t = f'(k_t) + g + \delta$ .

It follows from (RCK 1) that if there is no technological progress per capita consumption grows over time at the rate,  $(r_t - \rho) / \theta$ . Furthermore if the net rate of return  $r_t$  (also the competitive interest rate) equals the discount rate  $\rho$ , per capita consumption growth equals 0, as in the PIH and LCH. Recall that  $\theta$ , the coefficient of risk aversion measures the willingness to shift consumption across periods, and also as  $\theta$  approaches 1 the utility relation reduces to  $\ln c_t$ . A formal derivation of the Euler relationship (RCK 1) is given in Appendix III and follows that of Romer.

The initial choice of the level of consumption is crucial to the outcome of household behaviour. Households cannot increase lifetime utility by re-arranging consumption if initial consumption levels were chosen too low. If chosen too high, consumption spending uses more than lifetime resources and the optimal path for  $c$  is not feasible.

With the R-K-C model a fall in the discount rate implies lower preference for current consumption. This is similar to a rise in the savings rate in the Solow model. If this fall in the discount rate is permanent it produces temporary increases in growth rates per worker and output. During this adjustment process the fraction of output that is saved is not constant.

This model implies that a balanced growth path is not feasible with the capital stock above the golden-rule level. If capital stock is greater than the optimal level, savings will be less than optimal saving on the balanced growth path. Consumer spending will be too high and lifetime resources will be exhausted too quickly.

### **3.7. Precautionary (Buffer Stock) Saving**

These new models highlight that if households are risk averse, they will increase their savings if there is more uncertainty about future income. Essentially this is to protect themselves from big swings in their income. (See Harjes & Ricci, 2006). The main question is whether precautionary savings has an important impact on growth in consumer spending. Empirical work suggested that precautionary saving raises expected consumption growth, which implies a decrease in current consumption and thus higher saving. But households save very little. According to the literature in Romer, (2001) a combination of the precautionary motive and a need for high consumption levels, (a high discount rate), will lead to households saving very little early in life. Individuals are prepared to go into debt to sustain consumption and have only a small portion of precautionary saving. Towards middle-age more is saved for retirement. This result is also strongly related to the LCH.

### **3.8. Liquidity Constraints**

The PIH, LCH and R-C-K models assume that individuals can borrow at the same interest rate at which they can save, as long as all debt is repaid over the life-cycle. But most households in reality face higher interest rates on their debt than on their savings. In addition, there are numerous households who cannot get credit at any interest rate. Any actual or expected declines in income may thus be difficult to finance with new debt. As a result of these binding liquidity constraints, consumption may decline more than the models suggest. Consequently households cannot spend according to their long run wants, but instead consumption follows income patterns more closely.

Easing of liquidity constraints, given financial liberalisation should tend both to smooth consumption and reduce the level (rate) of precautionary savings.

### 3.9. Ricardian Equivalence

One of the central issues when reviewing savings is the role of government finances in private sector saving. According to Harjes and Ricci (IMF, 2006) Ricardian Equivalence (RE) states that consumption is affected by government spending, but not by how spending is financed. Any changes in taxation are anticipated and individuals adjust their savings. The Ricardian Equivalence argument started with David Ricardo, who first suggested that government's financing decisions in choosing between debt and taxes were irrelevant. As a theoretical baseline case it has value and is closely connected to the PIH.

For example, a government issues a bond (D) at time  $t_1$  and plans to retire the bond at  $t_2$  by raising future taxes. Households will be taxed at a rate of:  $e^{R(t_2)-R(t_1)}D$  at  $t_2$ . The household has acquired an asset, the bond, with a PV of D at time  $t_1$ . The households also have a future liability in the form of higher taxes, with a PV of D at time  $t_1$ . No 'net wealth' is accumulated by the households and consumption is not affected. The households save the bond and interest payments until the bond needs to be retired with higher taxes.

If RE holds it has different policy implications. In practice there may be many reasons why it does not hold exactly. Continuous new entries of households into the economy imply that current households experience the bond as net wealth and it affects their consumption/saving behaviour. This however, was not viewed as a good enough rejection of the Ricardian Equivalence as a series of individuals can behave as if they are a single household. Especially if households bequest saving to their descendants, they will behave though as if their net wealth has not been changed by the bond they received.

The insight of intergenerational links with finite lifetimes and infinite horizons started the debate on Ricardian Equivalence. In reality, large parts of the future tax obligation are levied over many years due to taxes being a function of income. Secondly, any increase in wealth is normally spread over a long life time. It has been

estimated in the US that for every \$1 increase in unexpected wealth, individuals spend only 3 cents if that person has 30 years left to live.

The central theme between RE and PIH is the concept that it is only the lifetime budget constraint that matters. Consumption and saving behaviour is not determined by the path of after-tax income. Similarly, repaying a bond affects after-tax income and not the lifetime budget constraint. Government financing can therefore not impact on consumer spending. If however the PIH fails due to liquidity constraints faced by individuals, there will be substantial deviations from the RE. Realistically however, households' ability to borrow is seldom affected by government's borrowing.

Another departure from the PIH and RE is the potential impact of a lump-sum tax cut, which will be saved in order to bolster income at a later stage. As taxes are a function of income, the slightly higher future income and thus taxes liability may render the present value of lifetime after-tax income higher and current consumption will increase. Thus RE will not describe consumers' behaviour accurately.

It is difficult to obtain estimates of the magnitude of the departure from RE. As a result it is also difficult to obtain estimates of the impact of government deficits on the paths consumption and savings. It is argued that deficits raise aggregate consumption, reduce aggregate saving and thus future wealth of an economy. Rough estimates indicate that private saving increases to offset half the decline in government saving which results from running deficits.

Some economists question the application of Ricardian Equivalence. In part because of the alternative views presented immediately above but perhaps more so for the belief that even among those households prone to maximise lifetime consumption utility, they themselves discount the more distant future than the near future, at a much higher rate, i.e. hyperbolic discounting. Furthermore the great uncertainty about any plan to retire the debt makes it a much more remote consideration than an immediate need to increase savings.

## IV.

### Local and International Household Saving

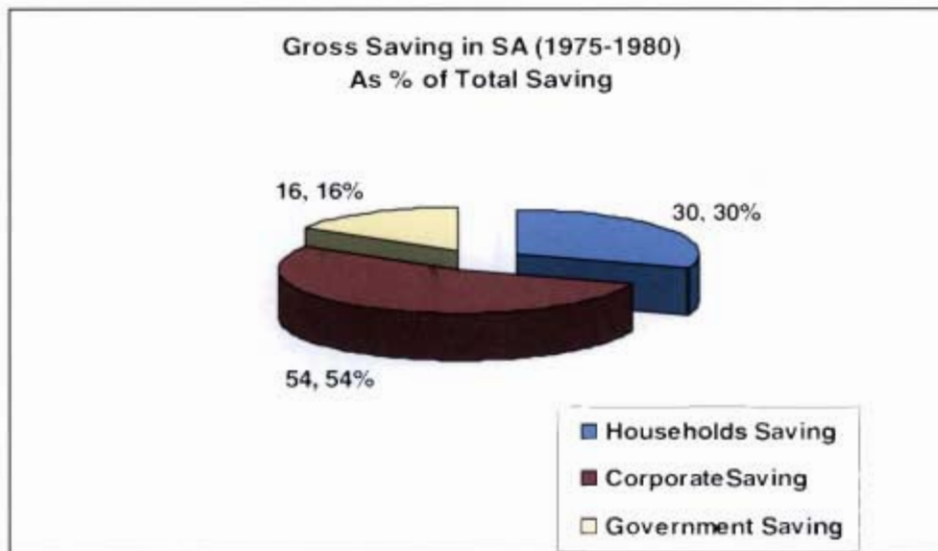
#### 4.1. South African Household Saving and Economic Cycles

Saving by households is the balancing item after current expenditure is deducted from current income, after payment of direct taxes. It includes regular and recurring employer and employee contributions to pension and insurance funds. Household saving also reflects the retained income from unincorporated businesses, which are often family businesses. This number can be potentially quite large and is not presented separately in the National Accounts.

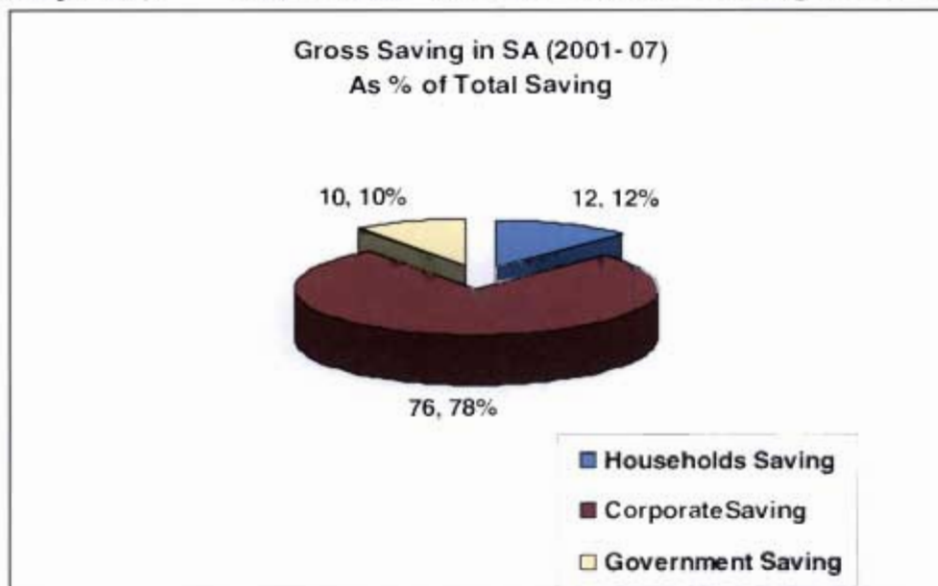
One further distinction is necessary when referring to personal saving. Although the SARB does not publish separate statistics for contractual versus discretionary saving, some estimates have been prepared. (See Appendix I for a complete definition). Suffice to say that contractual saving has increased, which includes capital repayments on mortgage loans, whilst discretionary saving has declined. (Aron and Muellbauer, 2006) Although *total* personal saving may be left unchanged, the policy implications and impact on the savings industry are highlighted.

Just looking at a snapshot of savings in current rand millions, it is clear that as a percentage of gross saving, household saving has more than halved since 1975. (See Graphs 7a, b). Even up to 1985, households were a significant factor in total gross saving. By 2007, household saving has more than halved over three decades to only 12% of gross saving. There are a few causes, of which the high inflation rates and low or negative after-tax returns on liquid assets are only a few.

**Graph 7(a) 1975: Sector Breakdown of Gross Saving in South Africa**



**Graph 7(b) 2007: Sector Breakdown of Gross Saving in South Africa**



Theory tells us that during times of uncertainty about future income, higher savings should result. It is thus conceivable that consumers should increase saving during economic upswings, anticipating lower levels of income growth somewhere during a full business cycle. It appears however though as if households only start to save once the downswing is underway. The following table and graphs below illustrate this point:

**Table 4: Household Saving during up- and downswings since 1975.**

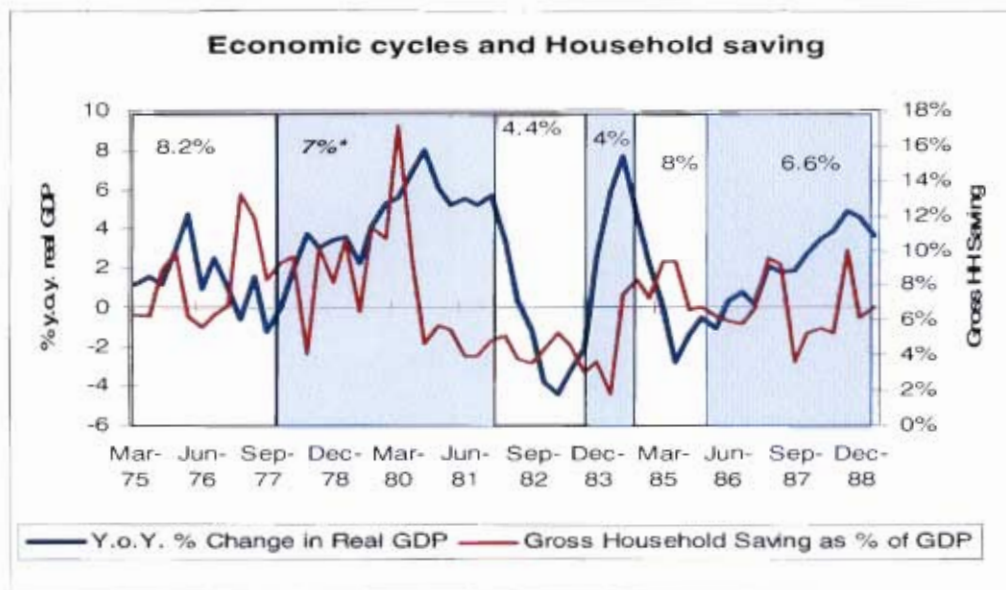
DOWNSWING	GROSS HH SAVING RATE AS % OF GDP	UPSWING	GROSS HH SAVING RATE AS % OF GDP
Mar '75 - Dec '77	8.2	Mar '78 - Sept. '81	7.0*
Dec '81 - Mar '83	4.4	Jun '83 - Jun '84	4.0
Sept '84 - Mar '86	7.7	Jun '86 - Mar '89	6.6
Jun '89 - Jun '93	5.5	Sept '93 - Dec '96	4.0
Mar '97 - Sept '99	3.0	Dec '99 - Mar '06	2.2

Source: SARB, various issues

\* Denotes the exclusion of one data point, March 1980=17%

In Graph 8(a) below, the period 1975 to the middle of 1989 is surveyed. Although the actual level of household saving deteriorates from above 8% to 6.6%, the pattern of higher savings during downswings and lower savings during upswings hold true. It is only the gold boom in 1980 that caused an outlier in savings in one quarter, in excess of normal levels, which went against the trend.

**Graph 8(a) Economic Downswings and Upswings from 1975 to 1989 in South Africa**

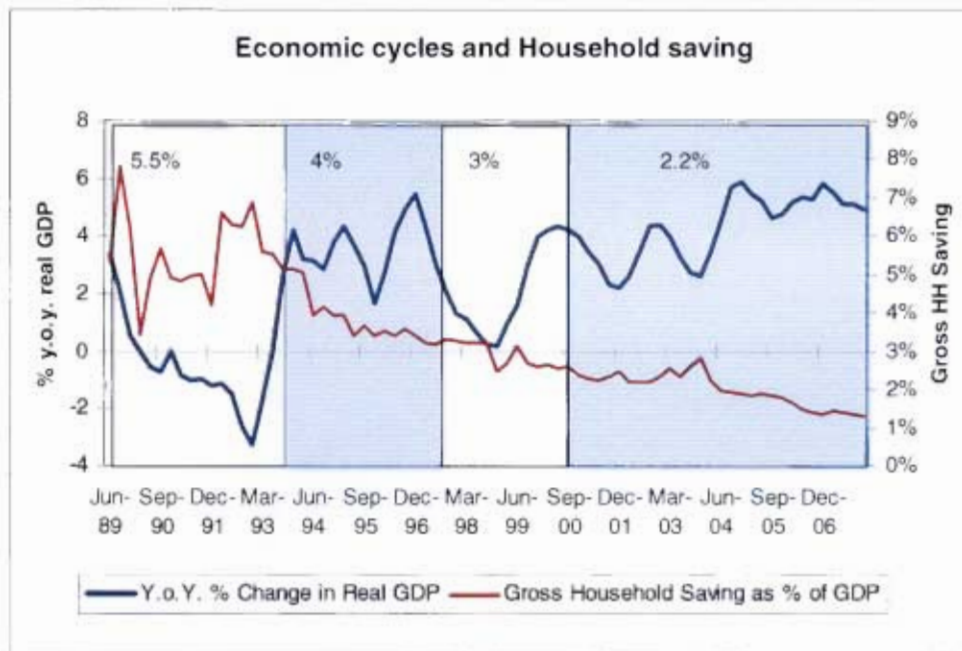


Source: SARB various bulletins. Upswings are shaded.

In Graph 8(b) the latter half of 1989 up to 2006 is surveyed. The pattern in saving behaviour is as expected up to 1997. The structural change mentioned earlier is evident in the continuing deterioration in savings during the last downswing, while a recovery was expected.

The Reserve Bank states that it appears though as if the decline in personal savings have at least stabilised. (SARB Occasional Paper, No 14, 2000). Currently the long upswing in economic activity is again evident in weak savings.

**Graph 8(b) Economic Downswings and Upswings from 1989 to 2007 in South Africa**



Source: SARB various bulletins. Upswings are shaded.

#### 4.2. Overview of the Determinants of Household Saving

The overall decline in household saving is part of the global weakening in saving. (See Loayza, López et al, 1998). But high levels of inflation and the concomitant low or negative after-tax returns in South Africa, have added to the dismal saving rate. In addition, demographic factors, with a high population growth rate and low growth rate in income had an equally important influence as borne out by the various econometric studies done on the determinants of saving.

Private sector saving in South Africa has behaved similarly to private saving in most industrial countries, excluding Japan. Compared to the other emerging market economies such as Egypt, India and Turkey, private sector saving is almost 5% lower as a % of GDP. However, it is household saving in South Africa that stands out as one of the lowest in the world, ranking with that of the US. Although a combination of sophisticated financial

markets, increasing home-ownership and rising household balance sheets can contribute to explain this precipitous drop to some extent, there are more determinants of savings which need to be assessed.

In an econometric study by the IMF (2005), spanning a period of 32 years from 1972 to 2004, a model for national saving and investment was calculated for industrial and emerging markets. Although this model was estimated for national saving, most of the determinants are theoretically applicable to private sector saving. As it is one of the most comprehensive studies on saving, the results are included in this section. By constructing a dynamic panel model, the following equation was postulated for saving:

$$S_{it} = \gamma S_{i(t-1)} + X_{it}\beta + v_i + \eta_t + \mu_{it} ,$$

( $i=1, \dots, N$ ;  $t=2, \dots, T$ )

Saving in the current period is deemed to be correlated with past saving rates. The matrix of determinants ( $X_{it}$ ) is as follows:

<b><u>Variable</u></b>	<b><u>Expected impact on saving</u></b>
Per capita output growth	Positive
Real interest rate	Positive
Credit to private sector	Negative
Terms of trade growth	Positive
Public sector saving	Positive
Elderly & youth dependency ratio	Negative

The remainder of the right hand side of the equation comprises of a country-specific effect ( $v_i$ ) and a time-specific effect ( $\eta_t$ ) which should capture the rest of the world trends. The results obtained in this study are reproduced in the table below.

**Table 5 Global Saving: Panel Regression**  
Saving (percent of GDP)

	All	Industrial countries	Emerging market economies
Lag-dependent variable			
Percent of GDP saving	<b>0.62</b>	<b>0.70</b>	<b>0.71</b>
Main determinants			
Real per capita GDP growth	<b>0.17</b>	<b>0.28</b>	<b>0.13</b>
Real interest rate	0.01	-0.07	0.01
Credit (percent of GDP)	<b>-3.47</b>	<b>-1.53</b>	-2.51
Change in credit (annual percent of GDP)	-2.17	-0.94	<b>-7.93</b>
Elderly dependency ratio	<b>-0.44</b>	<b>-0.43</b>	-0.66
Public saving (percent of GDP)	<b>0.27</b>	<b>0.15</b>	<b>0.24</b>
Terms-of-trade growth	<b>0.08</b>	<b>0.06</b>	<b>0.08</b>

*Source: IMF, Global Imbalances: A Saving and Investment Perspective, 2005*

*Note: Bold-faced values are statistically significant at the 5% level.*

From the table above it can be calculated that a one percent increase in output growth per capita over a long period of time in the industrial countries leads to an almost one percent increase in saving as a percentage of GDP. (This effect is calculated as the ratio of the estimated coefficient over one minus the coefficient of the lagged dependent variable) In emerging market economies the response is far less at almost 0.5%.

Government saving on the other hand has a much bigger impact on national saving in emerging markets than in industrial countries. According to the IMF study this in part reflects the less developed financial markets in emerging economies which does not enable households to smooth consumption over time as easily as in developed countries. Credit as a percentage of GDP has a negative impact on saving. Estimates of the impact of a 10% increase in credit (as percent of GDP) range from half a percent reduction in savings in industrial countries to almost one percent reduction in emerging markets when credit as a percent of GDP increases by 10%. This increase in credit has been named as one of the main drivers behind the decline in saving as it is linked to the increase in

home-ownership, resulting in rising house prices. The current credit crunch combined with a beleaguered mortgage industry may just moderate credit extension.

Terms of trade has a stronger impact on saving over a longer period of time than is generally deemed. A one percentage point improvement in terms-of-trade growth implies an improvement in saving of a  $\frac{1}{4}$  percent of GDP in developing countries.

The last factor considered in the IMF World Economic Outlook (2005) has particular relevance for South Africa. It is generally acknowledged that an ageing population should reduce saving. Declining fertility rates and increasing life expectancy can cause the elderly dependency ratio to increase. This is the portion of the population over 65 as a ratio of the working population. The results in the study showed that in industrial countries an increase in the elderly dependency ratio of 1% should over time reduce saving by  $1\frac{1}{2}$  of GDP.

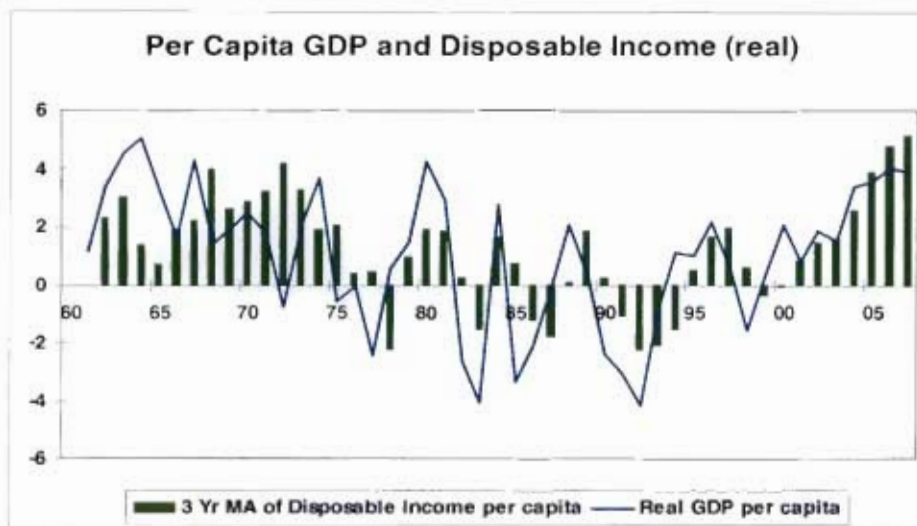
Each determinant is discussed in more detail below with specific reference to South Africa.

#### **4.2.1 Income Growth in South Africa**

From the analysis above by the IMF (see IMF, 2005), real per capita GDP growth stands out as one of the important determinants of gross national saving as a percentage of GDP, albeit less so for emerging economies. If real disposable income per capita is taken as a proxy for real GDP per capita to assess the impact on household savings, a similar picture emerges.

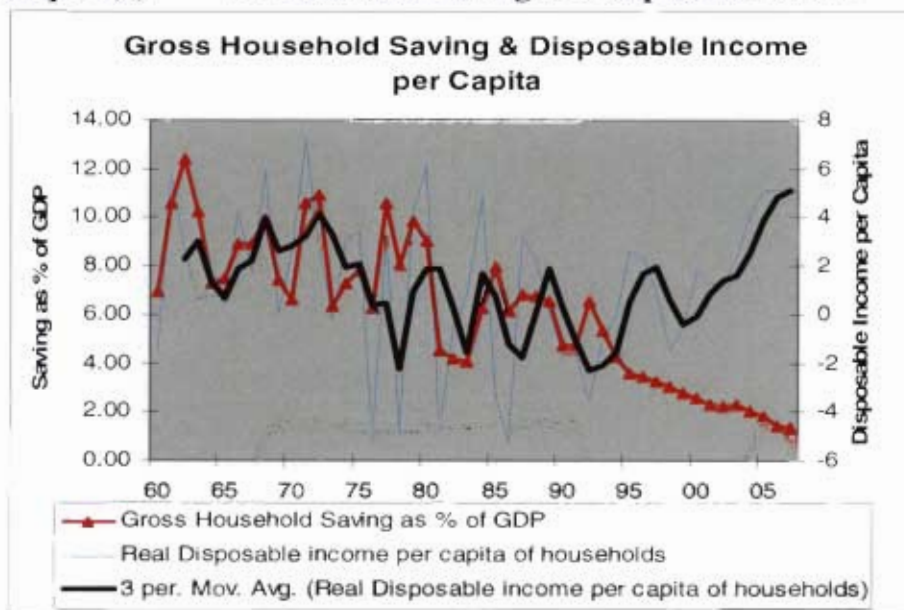
The correlation between household saving and income per capita is evident until 1994. (See 9(b)). Statistically, this correlation was sound, with a correlation coefficient of 58% from 1960 to 1993. From 1994 to date, the correlation has turned negative at -67%. For the period as a whole, the correlation coefficient is not meaningful at 15.5%. There is a possibility of a structural breakdown in this trend from 1994 onwards, which happened to coincide with the new political dispensation and increased household debt levels.

**Graph 9(a) SA Real Per Capita GDP and Real Per Capita Disposable Income**



Source: SARB various bulletins.

**Graph 9(b) SA Household Saving and Disposable Income**



Source: SARB various bulletins.

Low income growth is a significant factor in explaining the steady decline in savings. In Graph 9(b) above, the real disposable income per capita declined from an average of 2.1% growth in the 60's to a negative growth rate in the 90's of -0.4%. In the last seven years since the beginning of 2000, the rate of growth has recovered to 3.3%. Given this solid recovery in household finances, the lack of a recovery in household saving is particularly disconcerting. Therefore more of the determinants need to be analysed in conjunction with the structural changes underway in financial systems.

#### 4.2.2. Interest rates and saving

Referring the life-cycle model of saving is required in order to highlight the extreme divergence in saving between various income groups in a country like South Africa and the relevance of interest rates. This “permanent income” hypothesis (PIH) proposes there is inevitably a trade-off between current and future consumption, with demographic patterns and wealth stated as important inputs in the determination of this trade-off. (SARB Occasional Paper, No 14, 2000). The pricing-mechanism by which this trade-off is measured is local interest rates.

Before the demographic patterns and household wealth are considered, the role of interest rates needs to be expanded on briefly. The IMF study (2005) showed that the real interest rate does not have a statistically significant positive impact on saving in either developed or emerging countries. The study does note that the bigger the net asset position of households tend to be, the stronger the relationship between saving and rates of return.

In South Africa where the skew distribution of income is evident in a Gini-coefficient, measuring 0.59 in 2000, the impact of interest rates is expected to be limited. It is worth noting that the Gini coefficient has improved from 1997, when it was 0.68. (See Horton, 2006) This coefficient must be seen against those of other countries such as Sweden (25), Pakistan (33), Argentina (52.2) and Mexico (54.6), all published by the US Department of Labour’s Census Bureau on Income Statistics in 2005.

**Graph 10 SA Real Prime Overdraft Rate and Gross Household Saving as % of GDP**



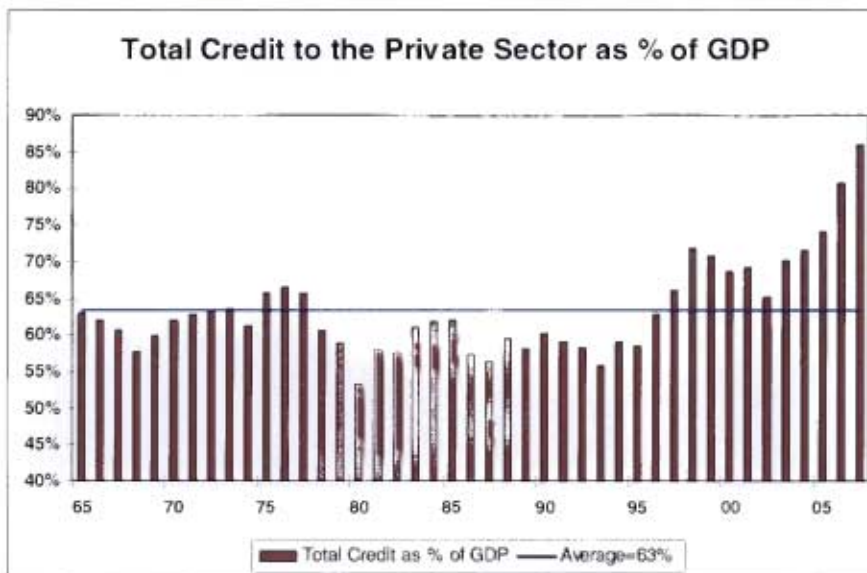
Source: SARB various bulletins

During the 60's up to 1972, there is a reasonable correlation between real interest rates and household saving, but thereafter the correlation breaks down. (See Graph 10) High inflation and tax policies at the time worked against discretionary saving and as a result many of the higher income groups directed their saving towards contractual saving. The ratio of pension assets to income rose from 20% in the early 70's to over 50% by the 1990's. (Aron, J., and Muellbauer, J., February 2006.)

### 4.2.3. Credit Extension and Saving

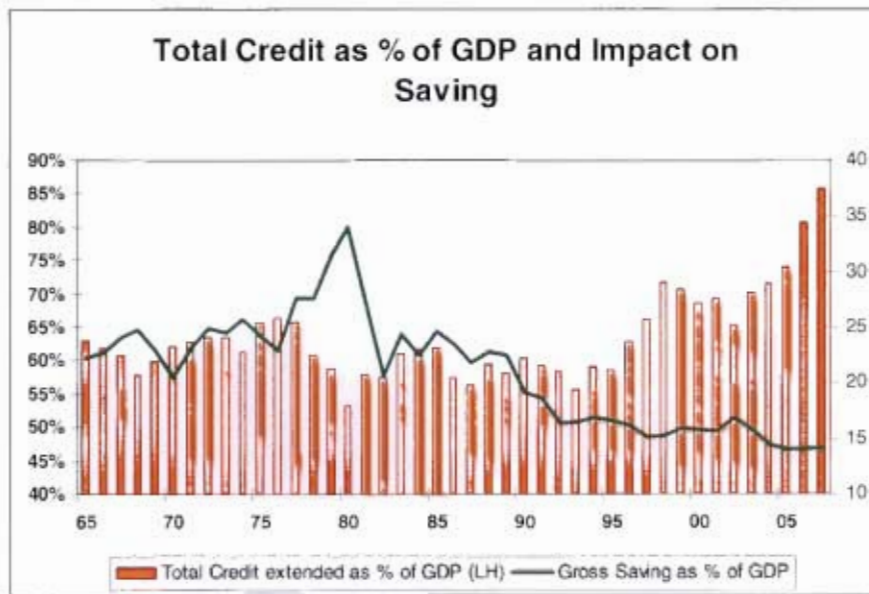
A rising middle income group, some of whom in South Africa qualified for the first time for credit following the 1994 democratic elections gave rise to a burgeoning appetite for credit by individuals. Graph 11 highlights private sector credit growth since 1994/95. As mentioned in section 3.2, the IMF study (2005) showed a substantial negative impact on saving when credit extension as a % of GDP is used. (See Graph 12). This process of financial deregulation and innovation will be dealt with in more detail in Chapter 5 as part of the financial deepening process and the implications for saving.

**Graph 11 Total Credit to the Private Sector as a % of GDP (1966 – 2007)**



Source: SARB various bulletins

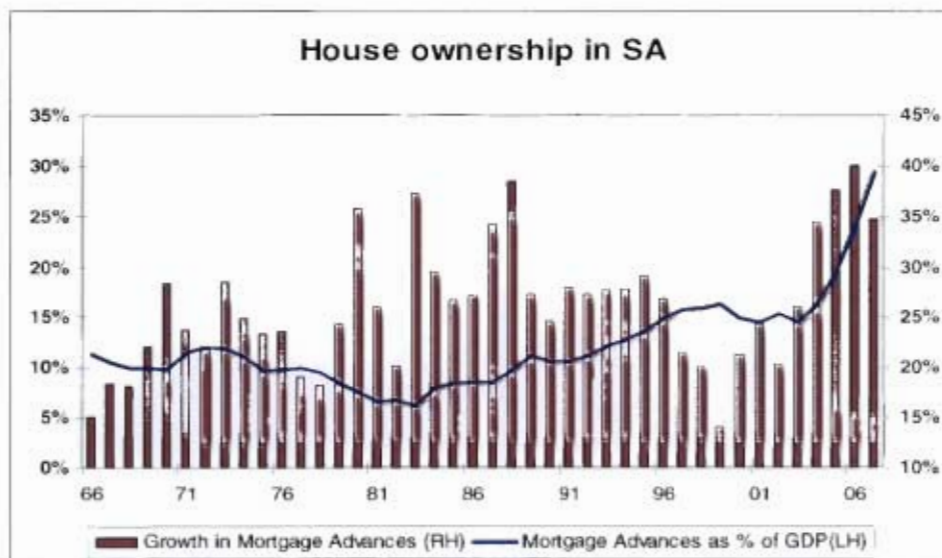
**Graph 12 Growth in Total Credit and Saving (1966 – 2007)**



Source: SARB various bulletins

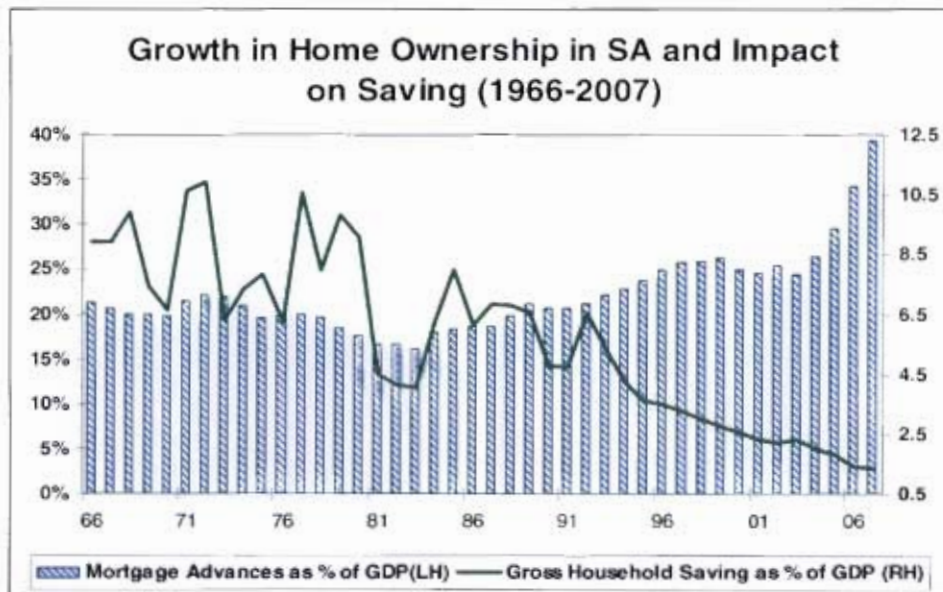
The availability of credit to the private sector has enabled households to obtain assets, such as houses more easily, without putting down deposits. Hundred percent home loans were unheard of until the 90's. For many new home-owners the current decline in house prices implies negative equity and they cannot utilise a positive balance sheet to finance expenditure on durable or non-durable items. Graph 13 below highlights the extent of growth in home ownership and mortgage advances in South Africa.

**Graph 13 Growth in Mortgage Advances in South Africa (1966 – 2007)**



Source: SARB various bulletins

**Graph 14 Growth in Mortgage Advances in South Africa and Saving (1966 – 2007)**



Source: SARB various bulletins

In Chapter 6 further analysis of household sector balance sheets and property ownership is undertaken.

#### 4.2.4. Demographic factors in South Africa

The decline during the 90's up to 2000 in the growth rate of real disposable income in South Africa captures both the lack of growth in real income as well as the change in demographics. As discussed in chapter II, various theoretical models of saving behaviour attempts to explain households' saving motives. These motives can broadly be grouped together as follows:

- Providing for retirement and bequests.
- Financing large lifetime expenditures such as houses and obtaining or providing for education.
- Precautionary saving, to provide for unexpected losses in income.
- Smoothing financial resources over a life time to ensure a stable consumption pattern. (Callen, T. and Thimann, C., December 1997)

In the case of South Africa all the motives mentioned above are impacted on by changing demographic patterns. A high **dependency ratio** implies there are more people who do not or cannot save relative to the working population. Simply put, the age distribution of households determines who saves. Young adults are mostly engaged in education. Working adults are also not necessarily saving, unless it is through acquiring assets, such as property or contractual saving. Older working adults are the saving generation and retired people usually dissave from their accumulated saving.

In South Africa the ratio of young and old people that are not working and thus not accumulating saving relative to the working age group of 20-64 are high. The ratio stood at 0.99 in 1996; however it has improved from 1.07 in 1970. (SARB Occasional Paper, No 14, 2000). Saving should improve as the dependency ratio declines. In addition the population growth rate is high relative to other middle-income countries. However, the steady progress in urbanisation and education should reduce the average size of households.

HIV/AIDS is a significant contributing factor to a high dependency ratio in South Africa. Numerous studies have been conducted and the estimates range from 10% to 15% of the population potentially being infected with the virus by 2010. The Actuarial Society of South Africa, in their most recent report (2006) estimates that 11% of the population is H.I.V. - positive, of which 600 000 (11%) is sick with AIDS. Currently the epidemic is reaching a plateau.

A key result from the high dependency ratio has been an increase in **social transfers**, also re-addressing the inequitable distribution of the past. Large social transfers undermine the necessity for households to save. In addition, research by the Bureau of Market Research at the University of South Africa concluded that saving amongst lower-income groups is rare. Considering that 33% of households in South Africa live below the poverty line, it is understandable that the lower income groups do not save as income is spent on basic necessities. (Nowak, M., Ricci, L.A., IMF, January 2006). A high proportion of low-income households, combined with rising social transfers by the general government, negate the precautionary motive for saving.

#### **4.2.5. Economic Impact of HIV/AIDS in South Africa**

A critical problem with the epidemic is the funds required to be spent by the public sector on prevention and treatment programmes for HIV. It is estimated that in the 2003/04 budget up to a quarter of public health spending was directly and indirectly related to HIV/AIDS. In 2003 the World Bank concluded in a study that the long run economic costs of AIDS are likely to be much more devastating than what is currently estimated. (See Bell, Devrajan and Gersbach, 2003) Most studies estimate an annual loss of 1% in GDP growth.

A more positive outlook comes from the Centre for Actuarial Research, who in their latest report (2006), indicates that the rapidly increasing number of people on antiretroviral treatment (ARV) should raise life expectancy from an average of 46 years to 51 years by 2010. This should be beneficial to saving in the long run.

Previous studies in 1999 and 2001 indicated that domestic saving could decline by approximately 2% as a percentage of GDP for the period 2006 to 2010 as a result of AIDS. The demographic trend is however improving, albeit gradually as witnessed by the dependency ratio.

#### **4.2.6. Public Saving and National Saving**

Saving by the public sector has been dismal in South Africa since the early 80's. A situation where current expenditure exceeds current income has been the norm for most of the 90's. It is only since 2000 that government saving has turned positive.

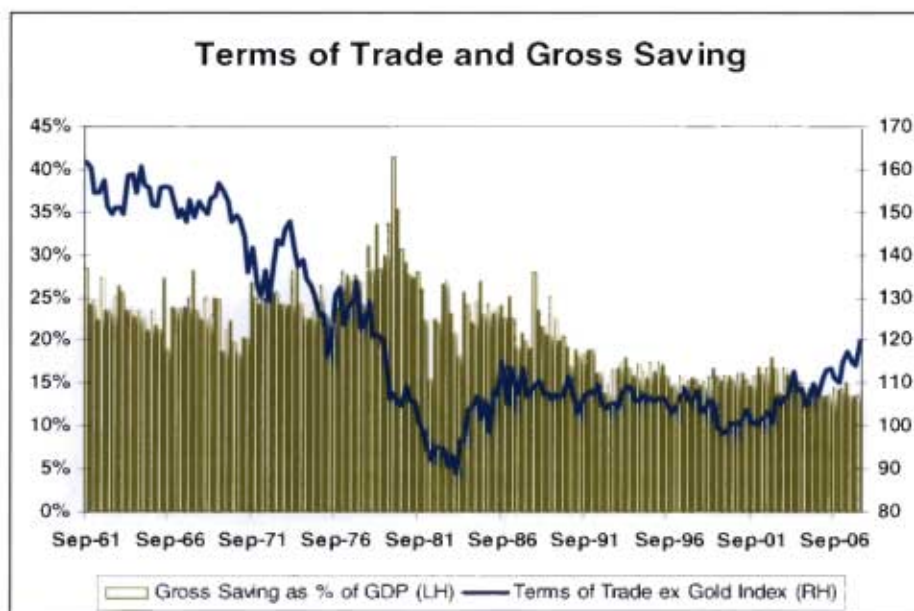
The study by the IMF (2006) shows that higher government saving has a positive impact on national saving, and by definition on household saving. The fact that an increase in government saving has more than one and a half times stronger impact on saving in emerging economies may be an indication of less developed financial markets. Households, according the authors of this study may find it difficult to smooth consumption over time and therefore reliance on government is bigger.

#### 4.2.7. Terms of Trade in South Africa and Saving

The terms of trade ratio is a proxy for the external accounts of a country, without taking capital movements into account which may often be associated with political and bureaucratic decisions.

As gold exports have such a significant and distorting impact on export prices, the series used in Graph 15 below is 'terms of trade excluding gold'. The long period of decline in South Africa's terms of trade from early 1960 has only been brought to halt and reversed with the recovery in commodity prices. This decline did not bode well for saving and over a period of time was bound to have a negative impact on saving. The recovery, which is visible since 2000 should in the long term have a positive impact on saving or at the very least contribute to arresting the decline in saving that has been so prominent.

**Graph 15 Terms of Trade and Saving (1961 – 2007)**



Source: SARB various bulletins

#### 4.2.8. Other determinants

Other trends, such as financial deepening and the impact on consumer debt will be discussed in Chapter V. Increases in consumer debt levels only imply dissaving if current expenditure exceeds current income. If the net asset value of a household increases,

higher consumer debt will not necessarily imply lower savings. Measuring household wealth in current rand terms is notoriously difficult. Most developed countries have extensive household surveys to ascertain household wealth, based on property, shares and other assets. South Africa lacks a comprehensive survey. Failing this, Aron and Muellbauer (Aron, J., and Muellbauer, J., February 2006), have attempted to quantify these numbers. In Chapter VI, estimating household wealth and the impact on saving will be discussed.

### **4.3 Public Policy and the impact on Household Saving**

Most studies focus on aggregate private saving to avoid the pitfalls of comparing household (HH) saving across countries or regions. In another study in 1997 prior to the one in 2006 by the IMF, household saving across 21 OECD countries was undertaken, analyzing data from 1975 to 1995. (Callen, T. and Thimann, C., IMF, December 1997). This study is by definition less comprehensive than the Loyaza, López et al. study, but the main findings remain the same.

The main thrust of the IMF Working paper by Callen and Thimann is to assess the impact of public policy on household saving. The main findings with regard to public policy indicated that:

- Direct taxes as a ratio to total government revenue have a significant negative impact on personal saving.
- Net government transfers to the household sector, measuring social security benefits paid out, indicate a large and negative correlation with household saving.
- Higher public saving is almost completely offset by a decrease in household saving. In some cases a full Ricardian Equivalence cannot be rejected.

Against such strong evidence of how important public policy is for saving behaviour, structuring an appropriate tax system is important. Household surveys, mentioned in the IMF Working paper by Callen and Thimann, shows that in countries such as Germany and Canada, the top 20% of income-earners account for 17% of household saving, whilst

in the lowest-income quintile, households save nothing or even have negative saving rates. In Japan the top 20% contribute 42% of saving and in the United Kingdom the top quintile accounts for 24% of saving.

Thus income tax changes can have a detrimental effect on saving if the high income group is penalised. Not only can the tax structure impact on lifetime wealth, but also by affecting the rate of return on saving. Lifetime consumption possibilities are reduced by taxation.

One important addition to the taxation discussion hinges on double taxation. Some countries have moved to do away with the effect of taxing capital income and taxing the return on that saving (capital). Combined with inflation, double taxation distorts the intertemporal resource- allocation decision (Callen and Thimann, 1997)

The structure of the social security and welfare systems has an impact on household saving behaviour. Broadly, the more generous the pay-outs, the fewer households tend to save. Callen and Thimann point out that a significant proportion of personal saving is of a precautionary nature. Government benefits that cushion households from unexpected income losses or large health expenditures, replace the degree to which individuals have to save with a precautionary motive in mind.

#### **4.4. Household Saving Conclusions**

- Worldwide gross saving has declined as can be seen from the respective graphs.
- Household saving has declined even more precipitously in most OECD countries.
- Therefore corporate and /or public saving increased in most of these countries to counterbalance the drop in household saving.
- Econometric studies have been fairly unanimous about the determinants of saving, bar a few variables, such as interest rates.
- Most importantly, higher investment rates are associated with higher saving rates.

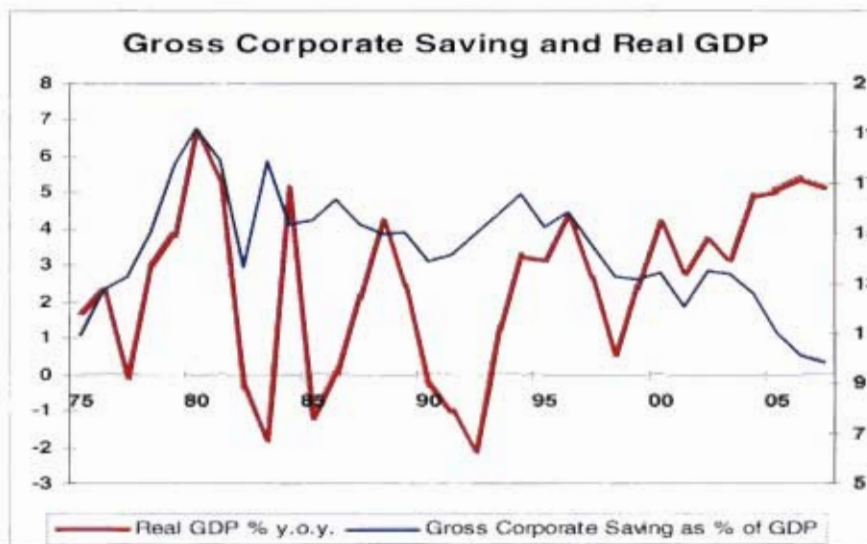
- Countries which have sophisticated banking systems appear to tolerate lower savings for a given investment growth rate.
- China stands in contrast, with an underdeveloped banking system, and high investment growth rates.

## Corporate saving in SA

### 5.1. Introduction

Historically corporate saving played a small part in private sector savings. Until the first oil-shock in 1973, corporate saving averaged around 9% of GDP. During the first oil-shock the rate jumped to 11% and from there continued an upward trend. The next significant shift came about in 1980 when the windfall profits from gold-mining companies boosted corporate coffers to a high of 19%, where-after it stabilised at the 15% level for most of the next two decades.

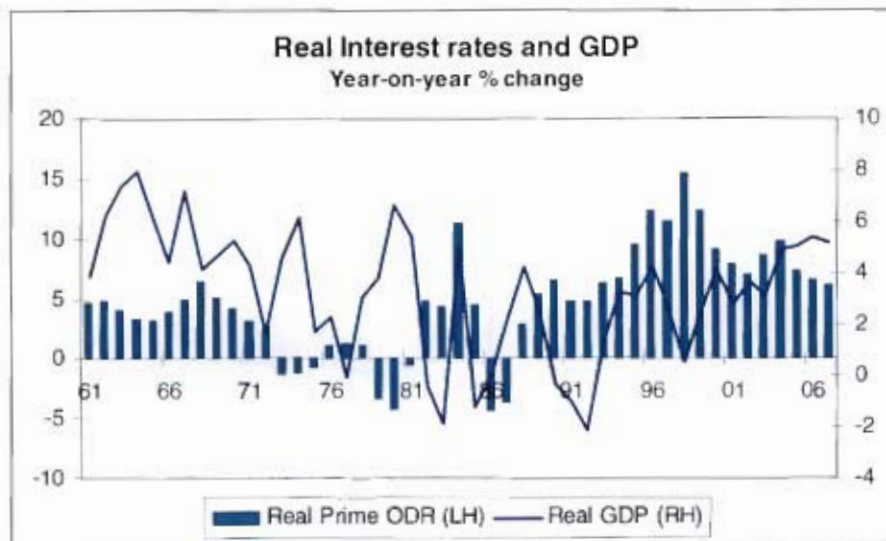
**Graph 16 Corporate Saving and GDP in South Africa**



Source: SARB Bulletins

South African firms retained a fairly high level of income during most of the 80's due to political uncertainty and a perceived lack of investment opportunities. The volatile and uncertain political and economic climate manifested in boom/bust economic growth and erratic interest rates, which at times were exceptionally high. (See Graph 17: Real GDP and interest rates).

**Graph 17 SA Real interest rates and Real GDP**



Source: SARB Bulletins

The prevailing tax structure at the time also contributed to higher corporate saving. Momentous changes in the political environment from 1989 onwards improved economic prospects which resulted in lower inflation and interest rates and combined with changes in taxation led to lower corporate saving. The saving rate is still higher than the rate attained during the 60's.

During economic downswings Corporate SA typically run down their cash reserves, whilst improved retained earnings boost the coffers during upswings. Corporate saving in contrast to previous cycles did not recover in the most recent upswing.

**Table 6 Gross Corporate Saving as % of GDP**

DOWNSWING	GROSS CORPORATE SAVING AS % OF GDP	UPSWING	GROSS CORPORATE SAVING AS % OF GDP
Mar '75 - Dec '77	12.3	Mar '78 - Sept. '81	17.4
Dec '81 - Mar '83	15.2	Jun '83 - Jun '84	17.1
Sept '84 - Mar '86	15.2	Jun '86 - Mar '89	15.4
Jun '89 - Jun '93	14.2	Sept '93 - Dec '96	16
Mar '97 - Sept '99	13.8	Dec '99 - Mar '08	10.9

Source: SARB, various issues

Despite the recent decline in corporate saving, it still constitutes the bulk of saving, exceeding the combined total of household saving and general government saving since 1978.

## 5.2. “Piercing the corporate veil”

Overall private sector saving has remained fairly stable from 1960 to 1995/96. Within this grouping, significant sectoral shifts have taken place. From 1978 corporate saving took over from household saving as the mainstay in private sector saving. But households are the ultimate owners of corporations. Therefore any increase in corporate saving will be seen by households as representing saving on their behalf.

What remains questionable is whether corporate saving completely offset a change in household saving. This assumption of complete rational behaviour by households in South Africa has been proposed by Prinsloo (1994 and 1997), based on international household consumption models. However, Aron and Muellbauer (2006) question this innocuous behaviour and the stability of private saving.

In their study on personal and corporate saving in South Africa (see Aron and Muellbauer, 2006), they mention that studies in the UK, US and Canada have shown that dividend income does not have a zero impact on household saving. If households saw through corporate budget constraints perfectly, dividend income should have no effect on saving behaviour. It is assumed that equity wealth is incorporated in the household consumption model.

What is of more importance when reviewing corporate saving, is that there is no guarantee that corporations will always behave in the way desired by households. Aron and Muellbauer argue that various other factors such as financial liberalisation, change in a country's terms of trade or a shift in government saving could result in a different response from the two sectors. Lower real interest rates can cause a decline in household saving as well as in corporate saving.

Private sector saving and especially the hypothesis on “piercing the corporate veil” is subjected to empirical testing in their study on saving in South Africa. In their model for corporate saving in South Africa, the saving propensity of the corporate sector is specifically included as an endogenous variable as it differs from that of the household sector.

### **5.3 Determinants of Corporate Saving**

Most literature on corporate saving is empirical in nature and lack an agreed theoretical model. Aron and Muellbauer (2006) mention a few models, most featuring a link between net profits and a demand for a dividend payout by the shareholders. But there is more to the drive in corporate saving than shareholders demands, even though ultimately shareholders are the owners and their wishes should be respected.

#### **5.3.1. Financing Investment**

Companies save in order to finance investment through a mixture of retained profits and external financing. Thus theoretically, if expected income growth rates are high, a higher rate of saving is expected as the return on investment (R.O.I.) will be more profitable during these upswings. (See Aron and Muellbauer, 2000)

One would therefore expect corporate saving to be relatively low during downswings. As already indicated earlier (see 5.1) this has not always been the case in South Africa. Isolating the expected determinants of corporate saving should shed some light on the behaviour of firms.

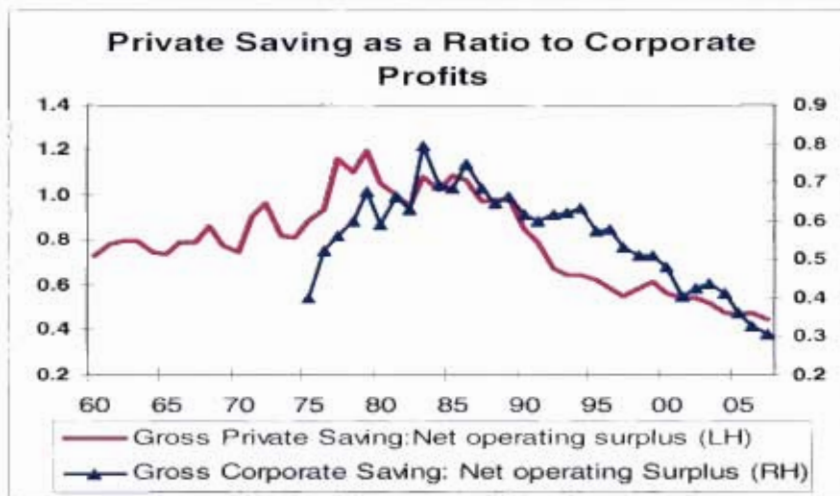
#### **5.3.2. Role of Corporate Profits**

Significant importance is given to the share of corporate profits in national income and the variability of these profits by Aron and Muellbauer in their study on Personal and Corporate Saving in South Africa.

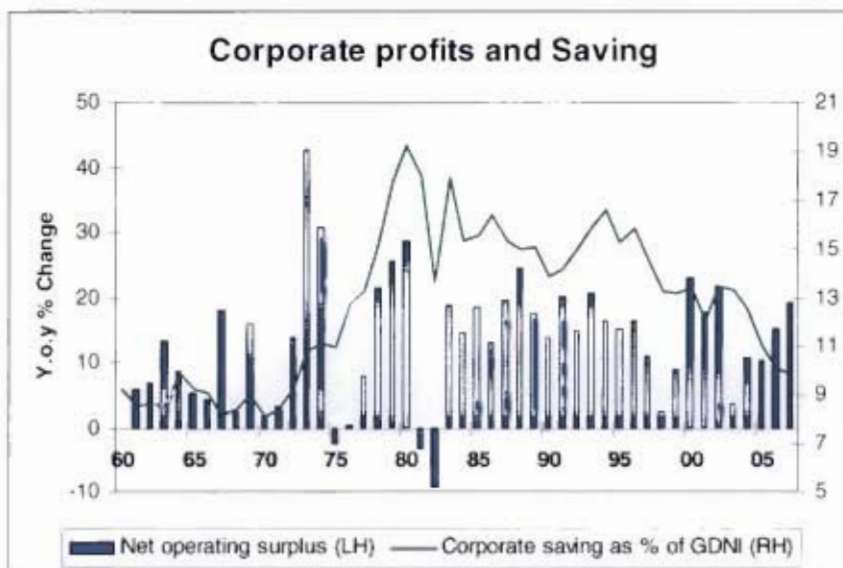
Corporate saving as a ratio to GDNI can increase by either a rise in retained earnings relative to profits as well as a rise in corporate profits relative to national income. Corporate saving and profit are modelled separately, due to the multiple influences foreseen by the authors on both these variables.

In graph 18(a) below, total gross private sector saving as a ratio to the net operating surplus of the corporate sector was used for the period 1975 to 2005. Corporate saving has been declining despite a robust economic period since the beginning of 2000. This can be attributed to a lower interest rate environment and improved investment opportunities. It is especially since 2003 that the divergence between the growth in corporate profits and corporate saving is more evident. (See Graph 18(b))

**Graph 18(a) Gross Domestic Private Saving as a Ratio of Net Operating Surplus of the Corporate Sector**



**Graph 18(b) Corporate Profits and Corporate Sector Saving**



Source: SARB

Aron and Muellbauer in their econometric study on corporate profits, for example found that the share of gross profits in national income rises with the ratio of wholesale prices to unit labour cost. The gold terms of trade and capacity utilisation also have positive coefficients. A higher ratio of personal tax rate to corporate tax improves the ratio of corporate profits to national income. Rising import tariffs and corporate tax rates had a negative impact on the corporate profits ratio. The model was estimated for the period 1971 to 1997.

### **5.3.3. Cyclical factors**

According to the SARB study (Prinsloo, December 2002), the South African mining sector played a major role in corporate saving, contributing 36% to gross saving by private companies during the latter half of the 1970's. It has however declined subsequently to 15.5% during the 1990's. The diminishing role of gold mines, combined with the drop in the gold price, is the driving force behind this big structural shift.

By contrast the manufacturing sector saving rose from 13.6% to 37.2% as a percentage of total gross saving of private companies over the same period. Profitability in the manufacturing sector improved substantially, helped by a weak exchange rate. Saving in the commerce sector has remained fairly stable at 9%, whereas the contribution to saving by the financial services sector declined from 31% in the latter half of the 70's to 21% during the 90's.

## **5.4. Econometric estimates for Corporate Saving**

Aron and Muellbauer (2000) constructed an equation to estimate corporate saving from 1960 to 1997. Using net corporate saving as a ratio of net corporate profits, (estimated separately as explained in 5.3.2) as the dependent variable, they found the explanatory variables impacted on the ratio of corporate saving to net corporate profits as follows:

1. Long-term capital inflows have a positive impact from 1980 to 1994 under financial sanctions.
2. A rise in personal tax on dividends raises corporate saving.

3. Higher inflation results in corporations retaining more earnings.
4. Financial liberalisation of consumer credit markets has had a positive impact on corporate saving. The change in consumer credit from 1983 to 1997 caused corporate saving to rise by four percentage points.
5. Growth in real PDNI per capita has a significant influence, reflecting higher demand for goods and services. More investment and more retained earnings are required.

From the two models on (1) gross corporate profits to GNDI and (2) corporate saving relative to net corporate profits, a final model was derived for corporate saving from national income. This showed that the gold price boom had a major impact on corporate saving in 1980. Commodity cycles will thus be important for South Africa, as mining still equals 7% of GDP.

### **5.5. Policy and Economic Implications of Corporate Saving**

Corporate saving now represent 81% of total gross saving, almost double the ratio in 1975. Despite the rising trend over the last 40 years from 1960 to 2000, it has not been sufficient to offset the decline in household and government saving.

Both Prinsloo (2000) and Aron and Muellbauer (2000) concur that high inflation and tax policies were the key elements in creating a structural shift towards corporate saving away from household saving. This provides evidence of individuals “piercing the corporate veil”.

Policy implications for tax structures, investment incentives and real interest rates should be directed towards encouraging growth (and profits), within a stable inflationary framework.

## VI.

### **Impact of Financial Liberalisation on Household Saving Behaviour**

#### **6.1. Introduction**

Most of the OECD economies experienced some form of financial development during the 80's before emerging market economies followed. Falling household saving rates in most of the OECD economies have occurred at the same time as household wealth and access to financial markets have improved. (See Hiebert, 2006). These changes in equity values and the value of residential real estate have created a renewed interest in the potential influence of greater net wealth on consumer spending and saving.

Initially there were expectations that once financial liberalisation started in earnest in the mid-80's the impact on saving would be positive. Bandiera, Caprio, Honohan and Schiantarelli, (1999) however state that it is far from clear that financial liberalisation does increase saving. They stressed the difference between the short and the long term effects of financial reforms. Theoretically long term effects on private saving will be channelled through changes in rates of return and in the degree of credit restrictions. In addition, if scarce resources are allocated more efficiently, greater increases in income will in turn increase savings.

Economists have been arguing for centuries about the causality of the relationship between finance and the economy. Many Nobel Prize winners and Nobel Laureate, Robert Lucas, were empathic in their views that finance follows economic development. Joseph Schumpeter (1912) said "...the banker, therefore, is not so much primarily a middleman...He authorizes people in the name of society....(to innovate)."

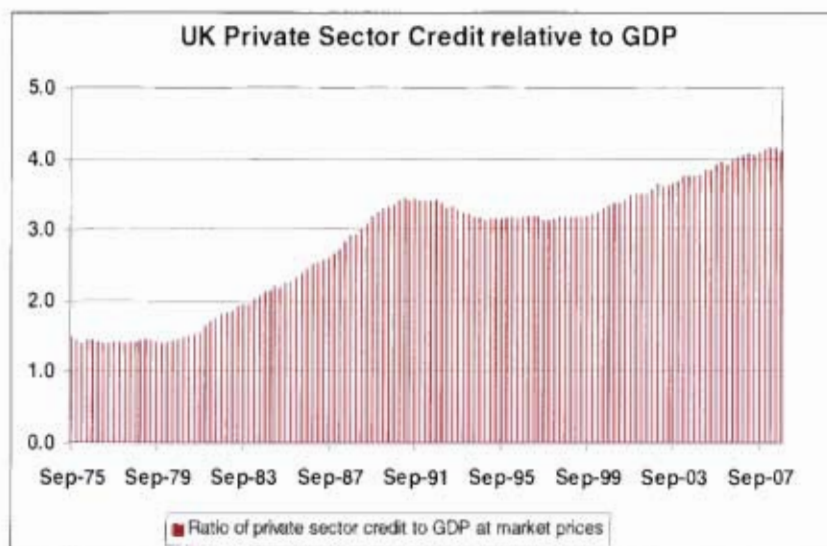
Levine (2004) undertook research into the various ways in which financial systems ameliorate market frictions by influencing the allocation of resources across space and time. He researches different types of financial systems with the potential impact on saving rates, investment decisions, technological innovation and hence long-run growth rates. Financial development, given that it is not a finite process, is defined by Levine

(2004) by looking at functions which financial intermediaries have to fulfil such as reducing the large fixed cost of pooling and mobilization of savings of multiple investors.

This reform process takes place over several years with setbacks and reversals of policy. (Bandiera, Caprio, Honohan and Schiantarelli, 1999) In itself there is no clear conclusion as to the impact on savings, although it can be concluded that the allocation of saving should be more efficient with a well-developed financial system.

Financial deepening can be measured in various ways. The most commonly used are (a) domestic credit provided by the banking sector relative to GDP, and (b) Liquid liabilities as a % of GDP, using either M2 or M3 as a % of GDP. (See Theron, 2003). This latter method is preferred as there are too many other influences on domestic credit extension which makes the series volatile, such as interest rate changes.

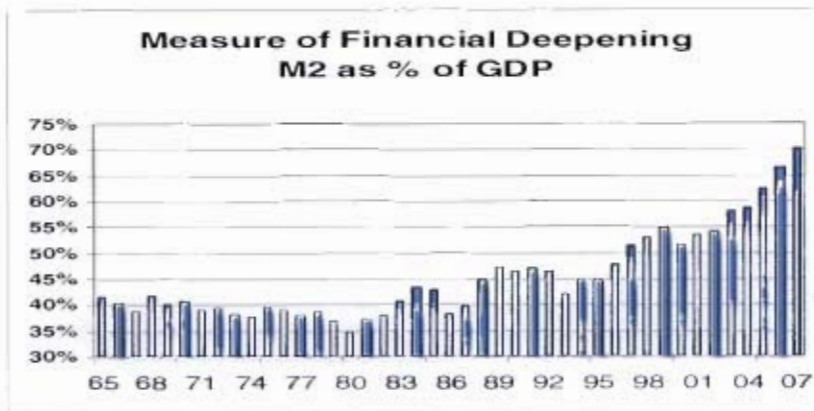
**Graph 19 UK Financial Deepening – Private sector credit**



Source: Bank of England and UK Office for Statistics

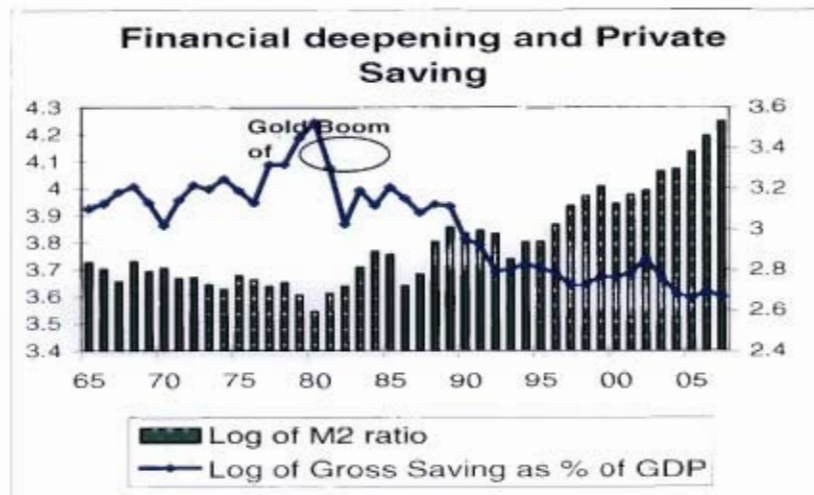
Quarterly amounts outstanding of monetary financial institutions' sterling net lending to private non-financial corporations and households (in sterling millions) seasonally adjusted and Gross Domestic Product at market prices.

**Graph 20 SA Financial Deepening – M2 as % of GDP**



Source: SARB

**Graph 21 SA Financial Deepening and Private Saving**



Source: SARB Statistical Database

Negative correlation coefficient of 89%

## 6.2. Financial Market Liberalisation and Economic Growth

The impact of financial arrangements on economic growth and the concomitant impact on savings remain ambiguous. Higher returns have an ambiguous impact through income and substitution effects. Lower returns on the other hand are often associated with lower risk and the latter may be the result of improved financial intermediation. This in turn may lower savings. What is clear is that physical capital *per se* cannot explain much of long term economic growth. It is the process of resource allocation that accounts for the advance in productivity improvement.

The impact on income distribution and poverty of financial development has also been conflicting. However Levine (2004) argues that it leads to increased access to finance for entrepreneurs and improve the allocation of capital. Easing liquidity constraints for households raises the targeted level of consumption. (See Boone et al, 2001).

This may be an oversimplification of a very complex situation. As Bandiera et al (1999) states in their World Bank Paper: “the multifaceted nature of financial reform – involving deregulation, liberalization, globalization and privatization – complicates the measurement effects”. Levine (2004) cites numerous studies such as cross-country studies, panel studies and pure time-series investigations to ascertain the causal relationship between finance and growth. In a cross-country study of 77 countries, King and Levine (KL hereafter,) found in their econometric results that if financial depth increases in a country, per capita growth also increased.

Levine (2004) concludes that although cross-country growth regressions show that finance predicts growth, the causality issue is not formally dealt with. In another study by Levine and Zervos a measure of stock market development was included. They used 42 countries over the period 1976 to 1993 and included the turnover ratio of stock markets. Their conclusion was that the initial levels of stock market and banking development are positively and significantly correlated with the growth indicators through productivity growth.

These econometric studies done by Levine and his colleagues indicate a strong link between financial development and growth which is not due to simultaneity bias. These results were interpreted as proof that financial development boosts steady-state growth. This interpretation is challenged by Aghion, Howitt and Mayer-Foulkes (2005).

In an independent study, Rioja and Valev (2004) found that finance boosts growth in rich countries primarily by speeding up productivity growth. In poorer countries finance encourages growth through accelerated capital accumulation.

Efficient allocation of capital should reduce the need for a large buffer of capital stock. Beck, Demirguc-Kunt and Maksimovic (2004) show that Gini-coefficients fall more rapidly in countries with higher levels of financial intermediary development.

A developed mortgage market is but one aspect of financial market liberalisation. According to Catte, Girouard, Price and Anaré (2004), some of these OECD economies have been more resilient than others in weathering either cyclical downturns or common shocks. House price buoyancy in particular has played a role in boosting private consumer spending and residential construction, which have helped to offset weakness in other sectors. This in turn implies lower household saving rates. There are numerous ways to access capital gains in a buoyant housing market.

The rise in consumer spending relative to income in most OECD economies, as well as in South Africa, in conjunction with higher debt to income ratios cannot be entirely explained by changes in income, interest rates, income expectation or wealth. Aron and Muellbauer (2000) studied the role of financial liberalisation with particular emphasis on South Africa.

### **6.2.1. Financial Market Liberalisation and Developing Economies**

The World Bank Research Paper by Bandiera, Caprio, Honohan and Schiantarelli (1999) on eight developing economies highlight the various routes followed by authorities in the 1970's and 1980's to reform financial systems. For example in countries like Chile liberalisation happened very quickly in 1974, which was then reversed to some degree in the early 80's due to a severe banking crises. The impact on saving was negative with the initial implementation of reforms due to easing of credit constraints. Private savings recovered gradually with the implementation of a fully funded pension system.

Mexico has had a protracted decline in saving since financial reforms were implemented. In many ways the results were similar to South Africa. Countries such as Malaysia followed a more gradual approach in lifting controls and subsequently witnessed an increase in saving, where-after saving settled back at the original level.

In their study it was only Ghana and Turkey which experienced an increase in saving following on financial reforms. Saving ratios in these countries rose by 6% and 12% respectively. In Korea and Mexico the savings rate (as % of GDNI) was permanently lowered by 12% and 6% respectively.

By combining an index of financial liberalisation index and the impact of interest rates, it was found that on average private saving decreased by 5.5% of GDNI. The relaxation of borrowing constraints on consumers is the dominant factor.

Considering that government saving can also be adversely affected by financial reforms, it would be unwise according to Bandiera, Caprio et al, to rely on savings as the route through which financial reforms should boost growth.

### **6.2.2. Financial Market Liberalisation in OECD countries**

In an influential paper by Boone, Girouard and Wanner (2001), it was concluded that financial market liberalisation in OECD countries led to lower saving. The intention of most central banks was to improve the working of their financial systems, but the macro-economic implications were underestimated.

Most of the deregulation centred on market-related interest rates and direct controls of credit markets. European countries were somewhat slower to introduce reform, with the US on the other hand starting as early as 1971. By 1994 most of the OECD economies have completed reform programmes.

Improved access to credit markets, combined with market-related interest rates had a noteworthy impact on reducing liquidity constraints facing households. It was exactly the question of optimising consumer behaviour of the Permanent Income Hypothesis, given that households are often faced with liquidity-constraints, which prompted further research to enhance the PIH.

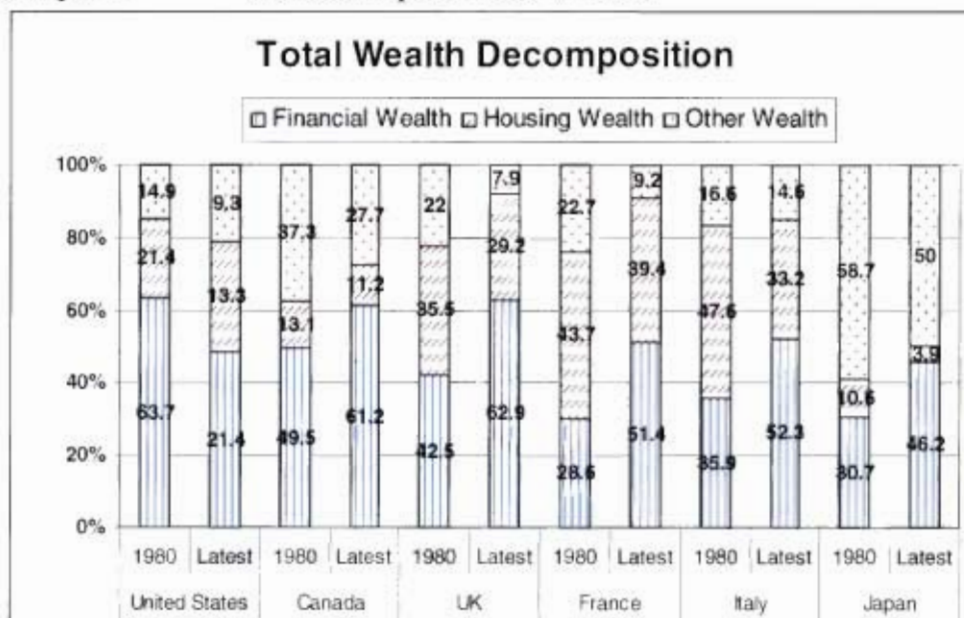
The impact of financial reforms on 'alternative non-financial assets' has been of great interest. Here Bandiera et al (1999) refer to the return on owner-occupied housing and other real-estate investment. For most of the developing economies which they analysed,

information on rates of return on real estate was not always available. In their study they refer to separate studies done for the UK and France, where it was found that post-liberalisation, private savings collapsed in the UK. Eighty percent of the total of home-equity withdrawal by UK home owners was consumed. In France the increase in volume of consumer credit and impact on interest rates resulted in lower saving.

South Africa did not experience a property boom during the period of financial deregulation, which has made it easier to assess the effects on other macro variables. (See Aron and Muellbauer, 2000).

In the graph below, reproduced from the research paper by Boone, Girouard and Wanner (2001), it is exactly this reduction in borrowing constraints which changed the composition of wealth. Prior to deregulation most households' balance sheets were made up of housing. Financial market reform was followed by an increase in *financial wealth*, defined as financial assets minus financial liabilities, but including mortgages. This is a far more liquid form of wealth compared to *housing wealth*, which consist of housing assets minus home mortgages. *Other wealth* is defined as net worth minus financial wealth and housing wealth.

**Graph 22 G-6 Decomposition of Wealth**



Source: OECD Economics Department Working Papers No. 308

Equity market gains outstripped housing wealth during the 90's, resulting in an overall increase in wealth as a % of GDP. The change in the composition of wealth following on reduced liquidity constraints, imply an increase in permanent income. According to the PIH this should lead to a progressive rise in consumption levels.

### **6.2.3. Financial Market Liberalisation in South Africa**

Following on recommendations by the De Kock Commission in 1978 and 1985, a more market-oriented monetary policy was implemented. Similar to other countries interest and credit controls were lifted initially from 1980 onwards. Between 1983 and 1985 the liquidity ratios required for banks were reduced. Unfortunately in 1985, South Africa faced an international debt crisis due to unfavourable political comments, indicating that the then State President had no intention of moving away from the apartheid doctrine. Some of the monetary reforms had to be reversed, following a massive outflow of capital and a debt standstill which had to be imposed.

Reforms in the housing market got underway in 1986 with the Building Societies Act and banks could compete freely from 1988 onwards in the mortgage market. Access bond accounts have provided financial flexibility to households from 1995 onwards by agreeing on a collateral home value with the bank, resulting in a specified balance available for consumption or refinancing of debt.

In the absence of a house price boom during the major implementation of financial reforms in the 80's, it is easier according to Aron and Muellbauer to distinguish between financial liberalisation effects and wealth effects on consumption. In their study (see Aron and Muellbauer, 2000), they estimated the impact of financial liberalisation on consumption and saving in South Africa. Their results show that financial liberalisation has played a major role in lowering personal saving rates in South Africa.

By adjusting their model for credit-constrained households, they estimated the direct effect of financial liberalisation on the personal saving ratio resulting in a decline of

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<sup>4</sup> From 1992 onwards the series on net new mortgage loans more than doubles in value from R13.9bln to R31.4bln., an increase of 126%. Over the same period ('91-'92), gross fixed investment in residential housing rose from R5.9bln to R6.6bln, only 12%

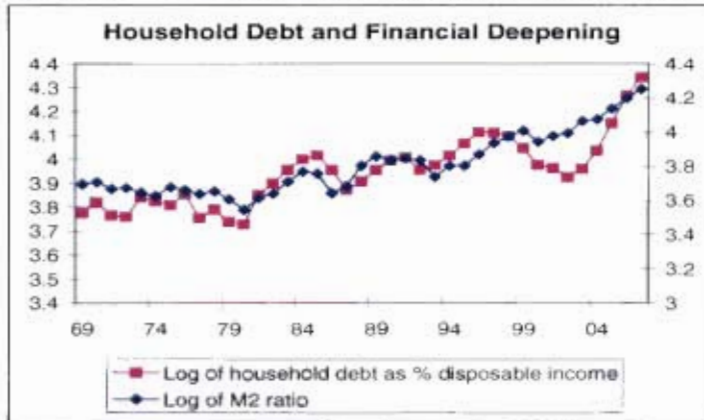
around 21% when comparing 1996/97 with 1983. The average ratio of PDI to gross national disposable income (GDNI) in these years was 0.62, which implies a fall in the personal savings ratio to GDNI of 12.5%. However there were numerous offsetting factors to cushion the fall in the savings rate, of which one of the most important was the rise in the PDI/PDNI ratio, where self-employment in the unincorporated business sector and property income rose relative to income from formal employment. This increased saving. Increased access to credit stimulated unincorporated business enterprises.

For the group of credit-unconstrained households the impact of wealth on consumption was large and statistically significant in the long run estimates. The marginal propensity to consume is 12 cents out of every one rand's liquid assets (minus debt), 6 cents out of illiquid assets and 6 cents out of housing wealth. (See Aron and Muellbauer, February 2006). Again the impact of financial reforms in making illiquid assets more liquid is significant.

### **6.3. Household Debt in South Africa**

The increase in debt in South Africa has been a source of concern for analysts and policy makers. (See Graph 23: Household debt). High debt levels have to be considered against a background of financial market liberalisation and most recently in the last decade political liberalisation. Access to financial markets and housing wealth have been a major force since the 1994 elections in South Africa, which can be argued to be of a similar magnitude to the 80's financial reforms on economic activity. Countries **without** sophisticated financial markets in general do not have robust consumer spending, all else being equal.

**Graph 23 Financial Liberalisation in South Africa**



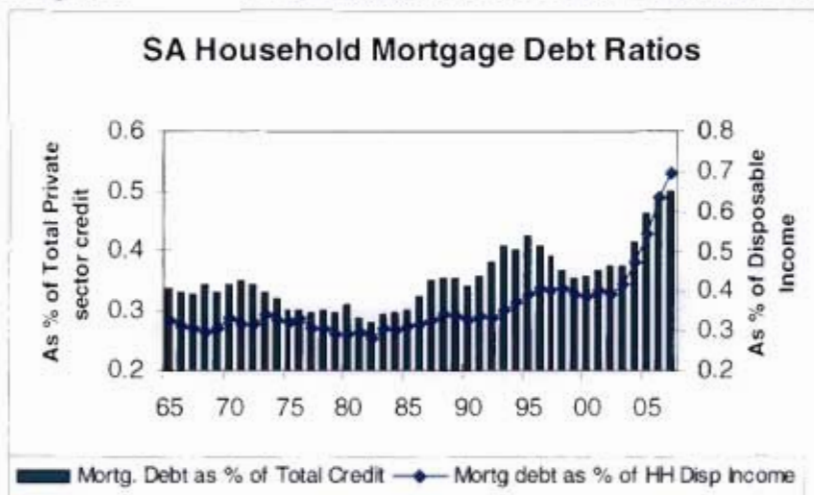
Source: SARB Statistical Database (Correlation coefficient of 84%)

Flipping the debt coin reveals lower household saving. In a comprehensive study by the Reserve Bank (Prinsloo, Quarterly Bulletin, December 2002) household debt is divided into two categories, namely household credit and mortgage advances.

### 6.3.1 Mortgage debt

An increase of 277% in mortgage advances undertaken by households from 2000 to 2007, accounts for the lion's share of the rapid rise in household debt. Mortgage debt stood at 54.5% as a percentage of total liabilities outstanding by households in 2000. It subsequently increased to 60.3% of total liabilities. According to Absa (1 Q 2007), other household credit declined as a % of total liabilities from 45.5% in 2000 to 39.7% in 2005.

**Graph 24 SA Mortgage debt to Total Credit and Disposable Income**



Source: SARB Statistical Database

Growth in mortgage advances are the result of mortgage products being flexible as well as the increase in house prices. Average house prices increased by 20.4% in real terms from 1999 to 2005. Considering that out of 12.4 million households in South Africa, 8 million earn up to R54 000, which is below the qualifying level for a bond to purchase a property, the market for new home owners is not that big. Only 33% of households in South Africa qualify for a housing bond. As can be seen from the graph above, a major portion of the growth took place since 1999, in line with the solid growth in disposable income. The following table illustrates the point:

**Table 7 House Prices and Qualifying households**

<b>80 m<sup>2</sup></b>	<b>140 m<sup>2</sup></b>	<b>220 m<sup>2</sup></b>
<b>(2004)</b>	<b><u>Nominal House prices</u></b>	
R358 644	R472 949	R639 879
	<b><u>Monthly repayments</u></b>	
R3 773	R4 975	R6 732
	<b><u>Qualifying gross monthly income</u></b>	
R12 576	R16 585	R22 438
	<b><u>Qualifying gross annual income</u></b>	
R 150 916	R199 014	R269 258
	<b><u>Households above qualifying gross</u></b>	
	<b><u>income</u></b>	
1 792 994	1 296 519	1 035 692
	<b><u>% of Households above qualifying</u></b>	
	<b><u>income</u></b>	
14.4%	10.4%	8.3%

Source: ABSA Property Research (1Q, 2006)

### 6.3.2 Other household debt

In most other OECD countries household debt ranges from 100% to 120% of disposable income. If mortgage debt is excluded from total credit extended to the private sector in South Africa, households are back at levels last seen in the early 80's.

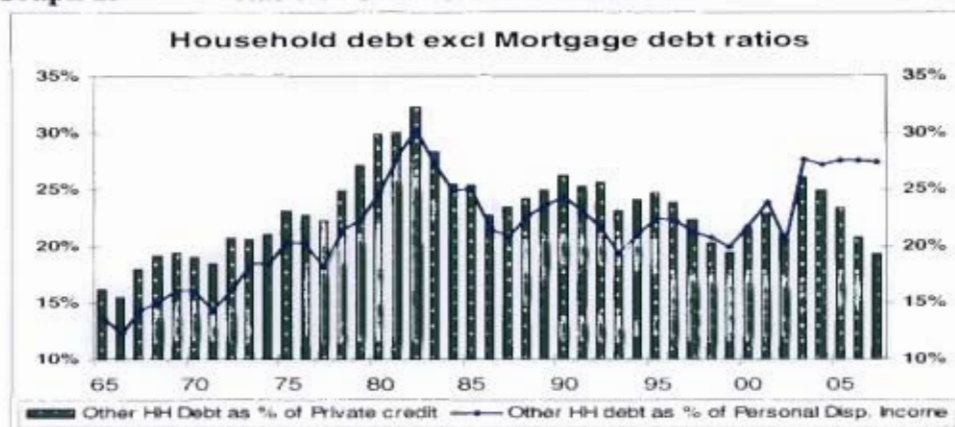
**Table 8 Household debt as % of Disposable Income**

Average	<u>1969 – 1979</u>	<u>1980 – 1989</u>	<u>1990 - 1999</u>	<u>2000 - 2007</u>
Total Household debt as % of Personal disposable income	44.5%	50.2%	56.8%	60.1%
Standard Deviation	2.2	4.4	3.2	9.7

Source: SARB Statistical Database

From the table above it can be seen that household debt has risen dramatically over the last 37 years, with an incremental rise over the last three years, currently up to 78% of disposable income. In the graph below household debt was constructed by excluding mortgage debt.

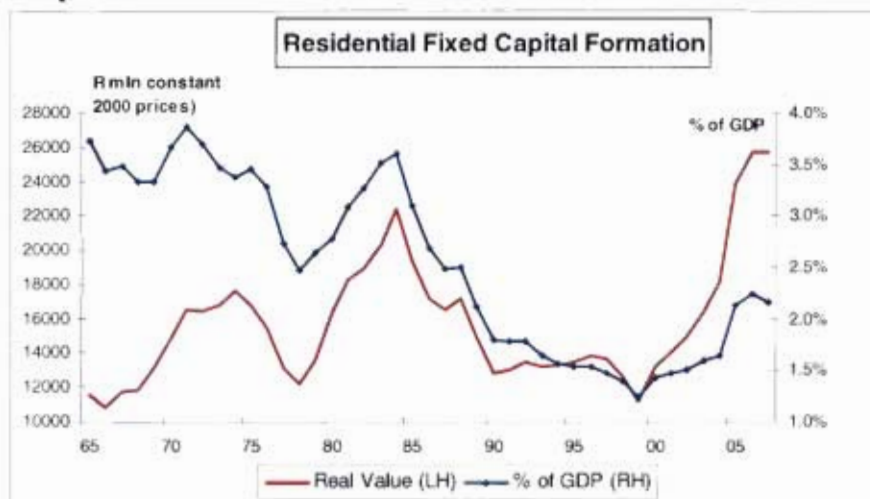
**Graph 25 Ratio of Other SA Household debt**



Source: SARB Statistical Database

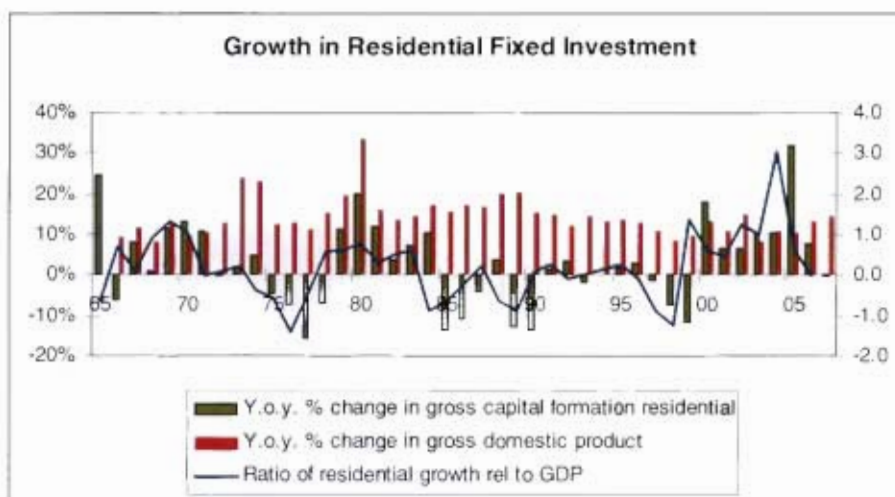
Household debt, when seen against the increase in household wealth, should lessen concerns. The real vulnerability for households lies in the rapid increase in mortgage debt against rising interest rates and falling house prices. The real value of gross capital formation of residential buildings is only now outstripping the high values last seen in 1984, whilst it is still at a historical low level as a % of GDP.

**Graph 26 SA Residential Fixed Investment**



Source: SARB Statistical Database

**Graph 27 Growth in Residential Capital Formation relative to GDP (Current prices)**



Source: SARB Statistical Database

### 6.3.3. Household Debt and Interest Payments

Measuring household debt against household assets (residential, total and net wealth) all reveal the same story of a substantial rise in debt.

**Table 9 Household Gearing**

	<b>1975</b>	<b>1980</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>	<b>2005</b>
Household Debt (R billion)	7.59	14.93	42.28	98.59	186.71	286.83	606.78
As % of Residential Assets	41	42.9	57.9	72.1	88.3	79	60.4
As % of Total Assets	11.8	10.7	14.7	16.2	15.2	14.9	15.3
As % of Net Wealth	13.5	12.2	17.4	19.7	18.5	18	18.3

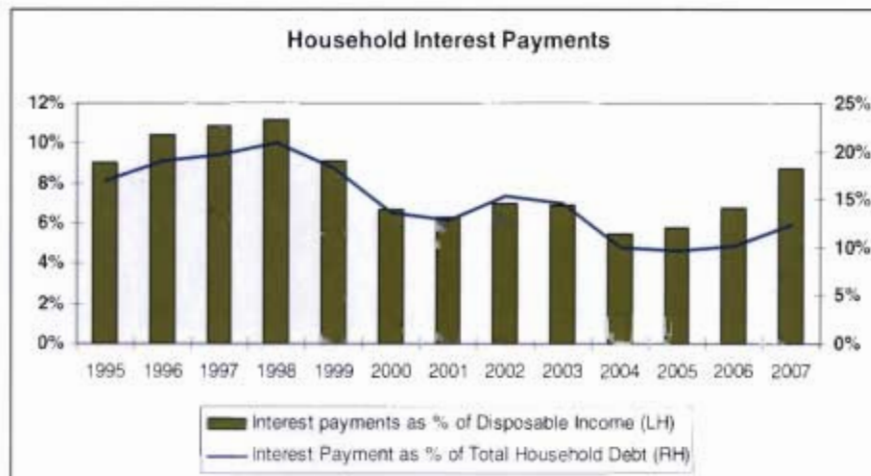
*Source: SARB Statistical Database*

As noted by Kantor (see Investec Strategy, May 2006), the theory behind consumer spending decisions has moved away from ‘spending equals take-home pay’, to incorporate net wealth and the willingness of consumers to take on more debt in the spending equation. The rationale behind this are sophisticated financial markets, low inflation and a stable interest rate environment. In countries such as the UK, USA and Australia for example, this has changed consumer behaviour more than a decade ago. The ability to service debt will restrain households in their borrowing.

Globally low inflation meant low interest rates, whilst economic growth was robust in most countries. In this so-called ‘goldilocks’ environment consumers and businesses world-wide became complacent with regard to typical economic cycles and as a result risk-taking behaviour changed, with risk-profiles rising during this extended period of low interest rates. The current banking crisis is the result of a multitude of complex and interacting factors, but the common thread is the complacency of consumers, businesses, policy makers and governing institutions with regard to risk.

Graph 28 below depicts the dilemma facing South African households in a rising interest rate environment, which worsened during 2008. The National Credit Act came into being in June 2007 in South Africa and initial indications are that both the behaviour of lenders and borrowers is changing towards less risk-taking and a more conservative approach to managing household finances.

**Graph 28 South African Household Interest Burden**



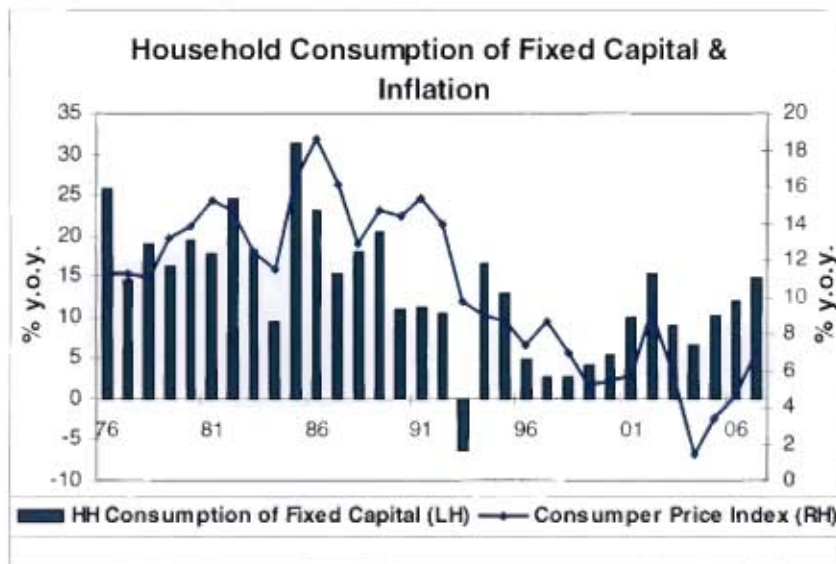
Source: SARB (Allocation of Primary Income Account, interest paid by households)

Kantor forecasts that household debt as a % of disposable income will comfortably exceed the 70% level in the next few years, from current levels of 63%. (See Investec Strategy, May2006). And in fact in both 2006 and 2007 debt levels were 71% and 77% respectively. As a result household sector saving will remain subdued, especially at the net saving level. Net household saving turned negative in 2006/07. This is not uncommon and similar trends have been witnessed in Australia and the USA. (See Hiebert, 2006).

#### **6.3.4 Consumption of Fixed Capital and Net Saving**

Nominal growth in the consumption of fixed capital by households, which consists mainly of depreciation of fixed assets, such as property, has risen by 62.2% from R16.4 billion in 2000, to R26.6 billion in 2005, with a further rise of 28% to R34.1 billion in 2007. (See ABSA Residential Property Perspective, 1Q 2007) This has been the result of a nominal growth rate of 20% per annum since 2000 in house prices. As a consequence of the rapid increase in consumption of fixed capital, gross saving is being reduced by a larger number than ever before in history. Gross saving, albeit at low levels, is also a symptom of the increase in real estate values.

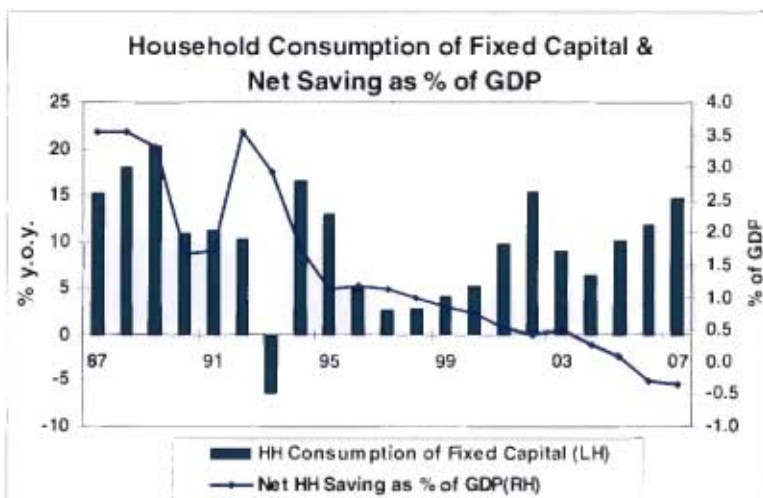
**Graph 29 Depreciation in the value of Fixed Assets of households**



Source: SARB Statistical Database

Higher housing inflation results in fixed assets being written off at an accelerated rate. (See Graph 29 above). This shows up in reduced net saving. During the 80's and early 90'S inflation was in the double-digit territory, clearly having an impact on depreciation of fixed assets. The decline in inflation since 1993 should have had a positive impact on consumption of fixed assets and concomitantly on net saving. But with the onset of 1994, a renewed wave of financial liberalisation and inflation in the housing sector in excess of consumer prices led to a deterioration in net saving. (See Graph 30)

**Graph 30 Depreciation of Fixed Assets and Net HH Saving**



Source: SARB Statistical Database

### **6.3.5 Conclusion**

Household debt rose to new highs as a percentage of disposable income after 1994 in South Africa. Excluding growth in mortgage debt, growth in other household debt has accelerated from 20% in 1994 to 28% as a percentage of disposable income. Although high, this has not been exponential and viewed against residential assets, net wealth and total assets for which the data currently is only available up to 2005, debt should be manageable.

Rising interest rates can put severe pressure on new home-owners, who did not take full cognisance of the risk that economic cycles are not always benign. A substantial proportion of households, (3.1 million out of 12 million), qualify for housing in the 80 m<sup>2</sup> and 140 m<sup>2</sup> categories. This number is growing and is positive for South Africa's economy.

## VII.

### Estimating SA Household Sector Wealth.

#### 7.1 Introduction

Various OECD studies (see Boone, Girouard and Wanner, 2001 and Catte, Girouard et al. 2004), have linked the rising propensity to consume and incur debt by households to the theory of life-cycle income and consumption-smoothing. In the 2001-study by Boone et al., the econometric results for total wealth effects on consumer spending were significant for all OECD countries reviewed. Long run propensities to consume out of financial wealth, which is more liquid than housing wealth, are presented in the table below for a selection of countries. The first equation was estimated without home-equity withdrawal (HEW) and the second equation included home-equity withdrawal, which is a cash flow concept. In most countries, except Canada, the coefficient for housing wealth fell away once HEW was included.

**Table 10 Long term propensity to consume household wealth**

	Financial Wealth		Housing Wealth		Home-equity withdrawal
UK	0.04 <sup>1)</sup>	(0.08) <sup>2)</sup>	0.07 <sup>1)</sup>	(--) <sup>2)</sup>	(0.89) <sup>2)</sup>
USA	0.03 <sup>1)</sup>	(0.03) <sup>2)</sup>	0.05 <sup>1)</sup>	(--) <sup>2)</sup>	(0.20) <sup>2)</sup>
Canada	0.04 <sup>1)</sup>	(0.06) <sup>2)</sup>	0.06 <sup>1)</sup>	(0.05) <sup>2)</sup>	(0.63) <sup>2)</sup>
Australia	0.03 <sup>1)</sup>	(0.03) <sup>2)</sup>	0.07 <sup>1)</sup>	(--) <sup>2)</sup>	(0.63) <sup>2)</sup>
South Africa*	0.15 <sup>1)</sup>	(n.a.)	0.07 <sup>1)</sup>	n.a.) <sup>2)</sup>	(n.a.)

Source OECD

\* *Liquid & Illiquid assets of credit-unconstrained households (Aron & Muellbauer, 2006)*

Wealth effects and especially housing wealth can buffer an economy against cyclical up- and downturns, (unless these cycles are induced by excessive exuberance in these same financial markets themselves). As a result volatility of these balance sheets and risk profiles of households have transpired to be crucial to consumer behaviour and saving patterns.

In Chapter 3 of the Global Financial Stability Report (GFSR) by the IMF (2006), the authors comment on the changing financial landscape and note that "...in certain respects households may not appreciate or be adequately prepared for such changes." Financial liberalisation policies and standards aim to improve risk management in the financial sector but have resulted in redirecting risks to the household sector.

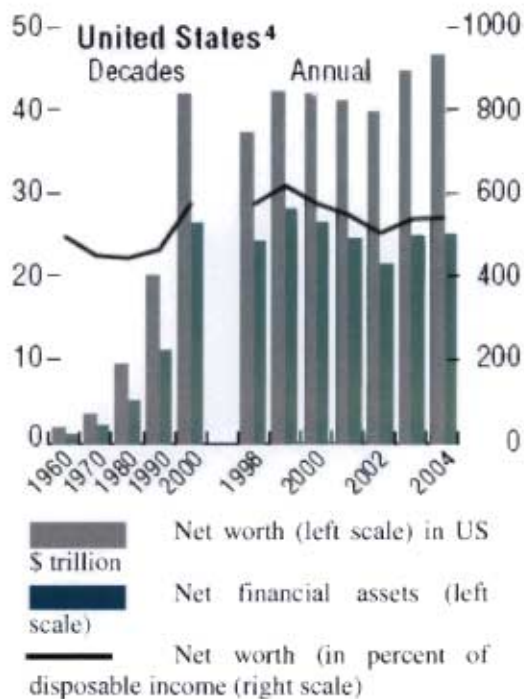
The channels through which these risks have been embedded in households' balance sheets are numerous, including mortgage loans equal to a 100% or more of home values, unit-linked insurance products with historically high exposure to equity markets and defined contribution and other self-directed pension plans. Household wealth has become crucial to individuals' retirement planning as governments and corporate sectors dilute their responsibility. Therefore the financial stability debate should take full cognisance of the household sector. Failing to do so will place a burden on the public sector to finance shortfalls in long term saving and investment. Such shortfalls can be the result of changing household consumption and saving patterns related to shouldering more direct risk without being prepared for the consequences.

The focus of this chapter is to assess the impact on saving following this increase in wealth, with specific emphasis on the increased risk profile of households.

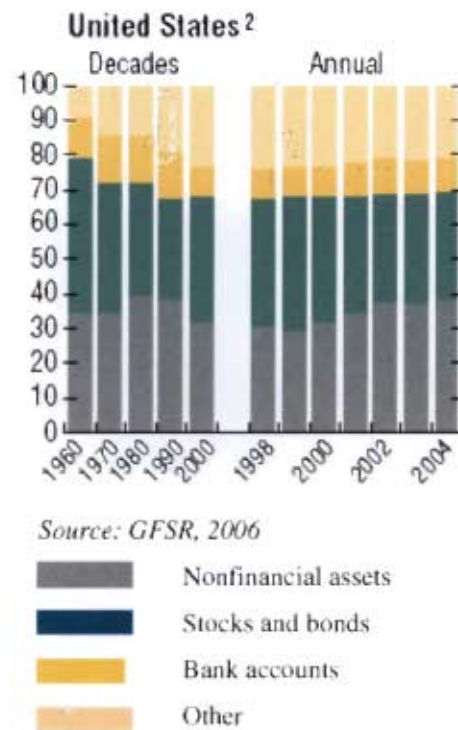
## **7.2. Household Balance Sheets for G-6 countries**

Balance sheets of G-6 countries have changed little over five decades. The composition of household balance sheets in these various countries differs markedly. Graph 31 and 32 portray US household balance sheets. The other countries are included in Appendix IV. A more diversified balance sheet has also meant less volatility.

**Graph 31 US Household Sector:  
Net Worth and Net Financial Assets**



**Graph 32 US Household Sector:  
Total Asset Composition (in percent of total assets)**



### 7.3. Importance of Household sector property.

The transmission mechanism of monetary policy is scrutinized by Catte et al. (2004). In their empirical research on 18 countries within the OECD group it the speed and strength of house price movements was found to differ widely across countries in reaction to interest rate changes.

In summary they found that:

- Residential property reacts more gradually to cyclical up-and downswings than equity markets.
- The **volume** of residential investment precedes any change in house prices.
- House prices lag any change in output.
- House prices affect the cycle through a change in housing wealth, consumer behaviour and savings.

As the South African housing sector has similar characteristics to both the UK and Australia, most of these findings are applicable here. The main difference lies in the spread of home-ownership, which is still relatively low but rising in South Africa at 33% ( see ABSA Property Review 1q, 2006), compared to 70% of households owning property in Australia, the UK and the USA. (See Catte, Girouard et al., 2004).

Catte, Girouard , Price and André (2004), constructed an index to quantify the “completeness” of a country’s mortgage market. The more complete the mortgage market, the stronger housing wealth effects on consumption. This “completeness” index is measured according to a weighted average of several criteria such as floating vs. fixed rates, cost of refinancing, loan-to-value ratios etc. It was found to be statistically significant in estimating the impact of house prices on consumption and on home-equity withdrawal (HEW).

Long term implications of increased home ownership for consumption and saving are twofold:

- 1) Consumption permanently moves to a higher level and saving to lower levels, given stable real estate markets.
- 2) Cyclical consumption behaviour should become less pronounced.

South African households react in a robust fashion to a change in home-equity-wealth, given sophisticated financial markets and relatively low transaction cost.

In attempting to estimate a value for HEW for South Africa,<sup>4</sup> the following series was used from the SARB database:

Total net new mortgage loans and re-advances  
**Less**  
Gross Capital formation of Residential Buildings.

If the average for the period 1987 to 1991 is taken, HEW as a % of household disposable income average 2.9 times. This number should be higher following on the

1995 financial reforms. It compares well with levels in the US of 3 times, UK (6 times) and Australia (4 times).

Households have come to rely on housing investment as a form of saving for retirement as well as utilising home-equity to finance consumption.

#### 7.4. Estimating South African household balance sheets

In the absence of official data on household balance sheets in SA, research done by Aron and Muellbauer (2006) was published by the Reserve Bank in June 2006. The focus was on estimating market values for household assets, both tangible and financial assets.

**Table 11 SA Household sector balance sheet<sup>7</sup>**

(Rand billion as at 31 December 2005)

	1975	1980	1985	1990	1995	2000	2005
Tangible assets	35.8	65.3	123.6	219.4	315.6	504.2	1225.1
% of Total assets	55.6	46.8	43.1	36.1	25.7	26.2	30.9
Residential buildings	18.5	34.8	73.0	136.8	211.4	363.2	1005.3
% of total assets	28.7	24.9	25.4	22.5	17.2	18.9	25.3
Other tangible assets	17.3	30.5	50.6	82.6	104.2	141.0	219.8
% of total assets	26.9	21.9	17.6	13.6	8.5	7.3	5.5
Financial assets	28.6	74.2	163.4	388.3	911.0	1416.8	2744.1
% of total assets	44.4	53.2	56.9	63.9	74.3	73.8	69.1
<b>Total assets</b>	<b>64.4</b>	<b>139.5</b>	<b>287.0</b>	<b>607.7</b>	<b>1226.6</b>	<b>1921.0</b>	<b>3969.2</b>
	1975	1980	1985	1990	1995	2000	2005
Mortgage advances	4.5	8.9	19.0	50.6	119.4	176.9	398.3
% of total liabilities	55.6	53.3	43.5	46.9	54.8	54.5	60.3

*Note: 1) Published flow of funds data and Households' holding of local authority and public enterprise bonds, unit trusts, pension and long term insurance funds and household debt was used. Adjustments were made to calculate market values for all these categories from book values.*

*2) Their estimates of household sector assets exclude foreign assets. When amnesty was declared in the 2003/04 budget, 43 000 applications were received by South African individuals to the value of R65 billion. This may still be an under-estimation of the actual number.*

*3) South Africa also has a large farming sector and as these estimates of household wealth excluded unincorporated businesses, there is likely to be an underestimation of household sector net wealth.*

	1975	1980	1985	1990	1995	2000	2005
Other credit	3.6	7.8	24.7	57.4	98.5	147.4	262.4
% of total liabilities	44.4	46.7	56.5	53.1	45.2	45.5	39.7
<b>Total liabilities</b>	<b>8.1</b>	<b>16.7</b>	<b>43.7</b>	<b>108.0</b>	<b>217.9</b>	<b>324.3</b>	<b>660.7</b>
<b>Net worth (total assets minus liabilities)</b>	<b>56.3</b>	<b>122.8</b>	<b>243.3</b>	<b>499.7</b>	<b>1008.7</b>	<b>1596.7</b>	<b>3308.5</b>
Total liabilities and net worth	64.4	139.5	287.0	607.7	1226.6	1921.0	3969.2

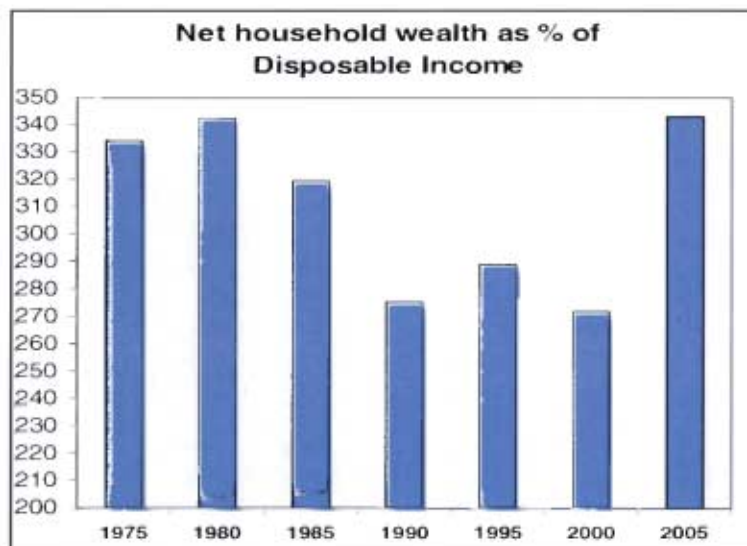
Source: SARB, June 2006

Some stylized facts emerge:

- Change in net wealth to disposable income outpaced growth in both debt and disposable income. (See Graph 33)
- The composition of wealth has changed. The ratio of financial assets total assets have risen by a factor of almost 2 relative to the ratio of residential assets.

The ratio of pension assets to income has been rising since 1975. The share of equities in particular has risen from 20% in the early 70's to over 50% by the 1990's.

➤ **Graph 33 Net South African Household Wealth**



Source: SARB, Quarterly Bulletin, June 2006

The volatility measure calculated in Table 12 must be interpreted with care as it is based on only seven observations and not on an uninterrupted time-series over 30 years. As can be expected the volatility of net worth is far less if all the assets are considered at 10.1% and compares favourably to that of France and the United States.

Financial assets excluding real estate are more volatile as this consists mainly of bonds and equities.

**Table 12: Volatility of South Africa Household Balance Sheet**

Volatility 1975-2005 (at 5 year intervals)	<u>Market-sensitive assets as % of disposable income</u>		
	<u>Net Worth as % of disposable income</u>	<u>Without real estate</u>	<u>Including real estate</u>
	10.1%	29.7%	16.6%

*Source: SARB Household Balance sheet information at 5 year intervals.*

*Volatilities of the ratios calculated as standard deviation divided by the mean. This may not be totally accurate due to lack of time-series data.*

## 7.5. Conclusion

Retirement planning and funds available is an important part of household balance sheets. The most significant feature of pension plans has been the move away from defined benefit to defined contribution plans. This is widely regarded as beneficial for the development of a country's capital markets as well as for labour market mobility. South Africa has also moved in a similar direction as the industrialised countries. Formal employment in South Africa is still low relative to industrialised countries and even many emerging market economies. As a result a substantial part of the lower income group retirement planning is overly dependant on government pension pay-outs. Even for the higher income groups, retirement planning falls hopelessly short.

What has to be recognised is that the move towards defined-benefit plans has as a consequence an increase in market risk exposure for households. This may be underestimated in addition to taking on inflation and longevity risk. Demographic factors and fiscal issues play an important role for governments, the corporate sector and households. Policy makers will have to increasingly assess the many obligations which households are accumulating, from retirement planning to health care and education costs.

This assessment will most likely underscore the low level of saving in most countries, even the wealthy industrialised countries. The key concept is to look at the estimated retirement replacement rates. Most countries are already expecting a shortfall in the replacement of income rate for retiring employees. The GFSR (2006) mention a 'financial margin' analysis which provide a projected cash-flow or income analysis for households reflecting the vulnerability to changes in benefit plans of households by income and age group.

More and more the concept of having a reasonable 'financial cushion' is being touted. Financial liberalisation had the effect that households did not need to save up for deposits on houses or other durable goods. As a result these 'cushions' were regarded as unnecessary. Even without the current financial crisis this 'cushion' would have become important.

## VIII.

### Summary and Conclusions

Do consumers save out of current income or do they behave according to Friedman's Permanent Income Hypothesis? Campbell and Mankiw estimated that it is a combination of both. Ricardian Equivalence also enters into the saving debate as an important theoretical foundation in governments' fiscal policy decisions. Households do save to offset government deficits, although the magnitude of offsetting is difficult to estimate.

Private sector saving in South Africa is at low levels compared to the 60's and the 70's. Historically in the 80's and the 90's such low savings had a negative impact on investment. The political situation also dictated that it was impossible to run a deficit on the current account of the balance of payments to finance the difference between saving and investment.

Changes in the political environment have resulted in a reversal of this binding constraint on the balance of payments and foreign capital, although mostly portfolio inflows have returned over the last decade. Most recently there have been various announcements of inflows of a more direct nature, which is encouraging.

Compared to most other developing countries the gross saving in South Africa is low. A benign credit policy and the role of the financial intermediaries are important facilitators in a low saving environment.

Changing household balance sheets have contributed to higher consumer spending and lower saving. The role of financial intermediaries is again highlighted in facilitating access to wealth. The need for precautionary saving has diminished with the onset of more sophisticated financial markets and South Africa is no exception.

Long term studies indicate that growth in GDP per capita is an important determinant for saving. For emerging market economies government saving and growth in credit

are both significant determinants on gross saving. Demographic factors, especially relevant for South Africa given the AIDS epidemic, have a strong influence on saving.

Corporate saving was a major force in supporting gross national saving. Especially during the 80's and 90's when government saving turned sharply down. Since 1994 government saving has turned around and prudent fiscal policy should encourage a recovery in saving from this sector. This makes a huge difference to overall saving levels. This trend has been evident in most of the successful developing economies.

Corporate saving started to decline from 1995 onwards. This has a lot to do with more aggressive expansion plans and bode well for future economic growth. Higher GDP growth translates into higher income per capita and this trend has supported consumer spending. It has also allowed households, which were previously deprived of wide-spread access to financial markets, the opportunity to incur debt, whether for home-ownership or consumer durables.

This has resulted in low personal saving and rising debt levels. The debt levels are still significantly below international levels in countries such as Australia. This study shows that an upward trend in debt can be expected for a number of years as the portion of households who own houses is still very low in South Africa.

Long term implications of higher debt levels indicate higher consumption levels and lower saving as measured traditionally. South Africa has in a peculiar way undergone a second "wave" of financial liberalisation following on democratic elections in 1994, with the concomitant impact on debt and spending levels.

For sustained growth the saving rate in South Africa needs to be higher. It is unlikely to be generated by the private sector and government saving should play an increasingly important role.

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## APPENDIX I

1. Definition of Gross Saving
2. Definition of household Saving
3. Definition of Corporate Saving
4. Definition of General Government Saving

## APPENDIX II

1. List of Tables
2. List of Graphs
3. List of Abbreviations

## APPENDIX III

Derivation of Euler Equation with the Ramsey-Koopmans-Cass Model.

## APPENDIX I

### 1. National Accounts Definition

- “Gross Saving represents that portion of total income generated during a certain period which is not consumed during that period”
- It is measured as a balancing item in the current income and outlay accounts of the domestic institutional sectors, i.e. private households, companies and general government.
- Capital gains and losses made by revaluing financial or fixed assets are excluded from saving.
- Net saving is equal to gross saving less provision for the consumption of fixed capital.

### 2. Personal Saving

- Household Saving: is that part of current income, after payment of direct taxes, which is not consumed or transferred as part of household current consumption.
- Household (HH) saving includes current disbursements made in reduction of HH liabilities such as capital portion of loan repayments on housing and consumer durables.
- Using credit to finance current expenditure is viewed as an increase in liabilities and thus negative saving.
- HH saving includes regular and recurring employee and employer contributions to pension and insurance funds and the interest earned on these funds.
- Includes retained income of unincorporated business enterprises and retained income of non-profit institutions serving households.
- Excludes capital gains or losses.

Contractual and Discretionary saving: National account estimates of personal saving do not distinguish between the two types of saving.

**Contractual saving** comprises of premiums on insurance policies contributions to pension funds and capital repayment on HH mortgage loans.

### **Discretionary Saving**

There is no fixed payment commitment, which is typical of this form of saving. Most contractual saving stems from discretionary saving except for legal obligations to contribute to a pension fund by an employee.

### 3. Corporate Saving

Definition: Balancing item after all the current receipts (income) and current payments (expenditure) have been taken into consideration. It is thus also retained income of both private and public incorporated financial and non-financial corporation.

In the national accounts it is estimated by using the sum of:

	gross operation surpluses of companies
less:	Net dividend, interest, rent and royalties payable by companies to other sectors and the rest of the world.
less:	direct taxes on income and wealth and
less:	other transfer payments to general government, HH sector and rest of world.
=	Gross corporate saving

Net corporate saving = Gross less provision for consumption of fixed capital and inventory valuation adjustment.

Inventory valuation adjustment =

Change in book value less change in physical quantities of inventories valued at average prices during period of measurement.

- Essentially measures net gains / losses realised on inventories by businesses as a result of price changes.
- Gains / losses on inventory holdings form part of corporate profits before taxes. This must be excluded in order to measure current production and actual saving by the corporate sector.

#### 4. Definition of general government saving

Government income is constituted of the following items:

- + retained profits by public enterprises
- + retained taxes
- + current receipts (not disbursed on current outlays by government)

less: current government expenditure ( these are all current outlays for goods and services, including an imputed expense for the capital consumption of fixed assets by general government.

less:

- + interest payments on public debt,
- + including the discount on issues of government stock
- + subsidies and other transfers to house holds and the rest of the world.

Tax revenue = taxes on income and wealth (direct)

= taxes on production and imports (indirect)

### Note on the provision for consumption of fixed capital

Gross domestic saving includes provision for depreciation. This element of consumption of fixed capital (CFC) is that part of the gross value of production, which is required to replace fixed capital consumed in the process of production.

The expected economic life of each individual asset is estimated and the loss in value due to normal wear and tear is calculated.

In the national accounts system the estimation of CFC allowances are calculated from “capital – formation totals at constant prices”. This number is converted to replacement values in order to assess the usage of capital asset at replacement cost in the year in which these assets are being “consumed”.

## Appendix II

### LIST OF GRAPHS

1. South Africa Fixed Investment and Saving	Pg 6
2. South Africa Prime Overdraft Rate	Pg 7
3. South Africa Household Saving ratio	Pg 9
4. South Africa Corporate Saving ratio	Pg 9
5. South Africa Government Saving ratio	Pg 9
6. (a) Investment and Saving as a % of GDP: Advanced Economies	Pg 14-15
(b) Investment and Saving as a % of GDP: Newly Industrialised Asian Economies	
(c) Investment and Saving as a % of GDP: Emerging and Developing Economies	
(d) Investment and Saving as a % of GDP: Developing Asian Economies, incl. China	
(e) Investment and Saving as a % of GDP: Africa – Sub-Saharan Economies	
7. (a) Sector Breakdown of Gross Saving in South Africa (1975)	Pg 39
(b) Sector Breakdown of Gross Saving in SA (2005)	Pg 39
8. (a) Economic Downswings and Upswings from 1975 to 1989	Pg 40
(b) Economic cycles and Household Saving	Pg 41
9. (a) SA Real Per Capita GDP Real Per Capita Disposable Income	Pg 45
(b).SA Gross HH Saving and Real Per Capita Disposable Income	Pg 45
10. Real Prime Overdraft Rate and Gross HH Saving as a % of GDP	Pg 46
11. Total Credit to the Private Sector as % of GDP	Pg 47
12. Growth in Total Credit and Saving (1966-2007)	Pg 48
13. Growth in Mortgage Advances in South Africa	Pg 48
14. Growth in Mortgage Advances in South Africa and Saving	Pg 49
15. Terms of Trade and Gross Saving	Pg 52
16. Corporate Saving and GDP in South Africa	Pg 56
17. SA Real Interest Rates and Real GDP	Pg 57
18. (a).Gross Domestic Private Saving as a ratio of Net Operating Surplus of the Corporate Sector	Pg 60

18	(b) Corporate Profits and Corporate Saving	Pg 60
19.	UK Financial Deepening – Private Sector Credit	Pg 64
20.	SA Financial Deepening – M2 as % of GDP	Pg 65
21.	SA Financial Deepening and Private Saving	Pg 65
22.	G-6 Decomposition of Wealth	Pg 69
23.	Financial Liberalisation in South Africa	Pg 72
24.	SA Mortgage Debt to Total Credit and Disposable Income	Pg 72
25.	Ratio of Other SA Household Debt	Pg 74
26.	SA Residential Fixed Investment	Pg 74
27.	Growth in Residential Capital Formation relative to GDP	Pg 75
28.	SA Household Interest Burden	Pg 77
29.	Depreciation in the Value of Fixed Assets of Households	Pg 78
30.	Depreciation of Fixed Assets and Net Household Saving	Pg 78
31.	US Household Sector: Net Worth and Net Financial Assets	Pg 82
32.	US Household Sector: Total Asset Composition	Pg 82
33.	Net South African Household Wealth	Pg 85

### LIST OF TABLES

1.	International comparisons of gross saving as percentage of GDP: OECD countries and South Africa	Pg 10
2.	International comparisons of gross saving as percentage of GDP, Regional Breakdown	Pg 13
3.	Average Correlations of Saving and Investment Ratios	Pg 17
4.	Household Saving during up – and downswings since 1975	Pg 40
5.	Global Saving: Panel Regression	Pg 43
6.	SA Corporate Saving as % of GDP	Pg 57
7.	House Prices and Qualifying Households	Pg 73
8..	Household Debt as a % of Disposable Income	Pg 73
9.	Household Gearing	Pg 75
10.	Long Term Propensity to Consumer Households Wealth	Pg 80
11.	G-6 Household Balance Sheet Volatility Measures	Pg 84
12.	SA Household Sector Balance Sheet	Pg 84
13	SA Volatility of Household Balance Sheet	Pg 86

## APPENDIX III

### Ramsey – Cass – Koopmans Model and Euler Equation

*The Ramsey-Cass-Koopmans Model resembles the Solow model, but the dynamics of economic aggregates are determined at the micro-economic level. Growth rates of labour and knowledge are exogenous as in the Solow Model, but the evolution of capital stock is derived from the interaction of maximising households and firms in competitive markets. Thus the saving rate is no longer exogenous and it need not be constant.)*

Start off with the utility function:

$$1. U = \int_{t=0}^{\infty} e^{-\rho t} u(C(t)) \frac{L(t)}{H} dt$$

$C(t)$  is consumption of each member of HH at time  $t$ .

$u(\cdot)$  = instantaneous utility function.

$L(t)$ : total population

$H$ : number of households.

$\rho$ : discount rate, the greater  $\rho$ , the less HH value future consumption relative to current.

2. Instantaneous utility function (fn):

$$u(C(t)) = \frac{C(t)^{1-\theta}}{1-\theta} \quad \begin{array}{l} \theta > 0 \\ \rho - n - (1-\theta)g > 0 \end{array}$$

$n$  = population growth rate ( exogenous)

$\rho$  = discount factor

$g$  = growth rate of technology / knowledge (exogenous) and capital per worker

$\theta$  = coefficient of relative risk aversion.

According to the Solow Model, regardless of an economy's starting point, the economy averages to a balanced growth path. Each variable of the model grows at a constant rate.

### The HH's budget constraint

The households budget constraint in the Ramsey–Cass–Koopmans model is similar to the PIH. The present value of HH lifetime consumption cannot exceed its initial wealth plus the present value of its lifetime labour income.

In the RCK Model, households take  $r$  (real rate of return) and  $w$  (wage per effective labour) as given. But  $r$  can vary over time thus to formally write the budget constraint,

$$R(t) \text{ as } \int_{t=0}^t r(T) dt$$

This states that one unit of the output good invested at time zero yields  $e^{R(t)}$  units of the good at  $t$ . Or the value of one unit of output at time  $t$ , in terms of output at time zero is  $e^{-R(t)}$ . Thus  $e^{R(t)}$  shows the effect of continuously compounding interest  $[0, t]$

Formally the budget constraint is written as

$$B1. \int_{t=0}^{\infty} e^{-r(t)} C(t) \frac{L(t)}{H} dt \leq \frac{K(0)}{H} + \int_{t=0}^{\infty} e^{-R(t)} W(t) \frac{L(t)}{H} dt$$

PV of lifetime consumption cannot exceed initial wealth + PV of lifetime labour income.

Simplifying and combining the two integrals:

$$B2. \frac{K(0)}{H} + \int_{t=0}^{\infty} e^{-R(t)} [W(t) - C(t) \frac{L(t)}{H}] dt \geq 0$$

B3. Integral from  $t = 0$  to  $t = \infty$  as a limit

$$\lim_{S \rightarrow \infty} \left[ \frac{K(0)}{H} + \int_{t=0}^S e^{-R(t)} [W(t) - C(t)] \frac{L(t)}{H} dt \right] \geq 0$$

B4. Capital holdings at time S are:

$$\frac{K(s)}{H} = e^{R(s)} \cdot \frac{K(0)}{H} + \int_{t=0}^S e^{R(s)-R(t)} [W(t) - C(t)] \frac{L(t)}{H} dt$$

1.  $e^{r(s)} \cdot \frac{K(0)}{H}$  = contribution of the HH's initial wealth to wealth at S.
2. HH Saving at t is  $[w(t) - C(t)] \frac{L(t)}{H}$

This saving may be negative, and  $e^{r(s) - R(t)}$  shows how the value of that saving changes from s to t.

B4. =  $e^{r(s)}$  x (times) expression B3 in brackets.

B5. Rewrite budget constraints as  $\lim_{S \rightarrow \infty} e^{-R(s)} \cdot \frac{K(s)}{H} \geq 0$

No – Ponzi game condition = PV of HH asset holdings cannot be negative in the limit.

Maximising HH utility subject to a budget constraint: Normalise variables by the equality of effective labour.

Objective for:  $c(t)$  = consumption per unit of effective labour.

$$C(t) = A(t) c(t)$$

Instantaneous utility is:

$$O1. \frac{C(t)^{1-\theta}}{1-\theta} = \frac{[A(t) c(t)]^{1-\theta}}{1-\theta}$$

$$\begin{aligned}
&= [A(0) e^{gt}]^{1-\theta} c(t)^{1-\theta} \\
&= \frac{A(0)^{1-\theta} \cdot e^{(1-\theta)gt} \cdot C(t)^{1-\theta}}{1-\theta}
\end{aligned}$$

Remember  $L(t) = L(0)e^{nt}$ . Using this and O1., and substituting into the HH objective fn,

$$U = \int_{t=0}^{\infty} e^{-\rho t} u(C(t)) \frac{L(t)}{H} dt$$

$$\text{We get: } U = \int_{t=0}^{\infty} e^{-\rho t} \cdot \frac{C(t)^{1-\theta}}{1-\theta} \cdot \frac{L(t)}{H} dt$$

$$= \int_{t=0}^{\infty} e^{-\rho t} \left[ A(0)^{1-\theta} \cdot e^{(1-\theta)gt} \cdot \frac{c(t)^{1-\theta}}{1-\theta} \right] \frac{L(0)}{H} e^{nt} dt$$

$$= A(0)^{1-\theta} \frac{L(0)}{H} \int_{t=0}^{\infty} e^{-\rho t} \cdot e^{(1-\theta)gt} \cdot e^{nt} \cdot \frac{c(t)^{1-\theta}}{1-\theta} dt$$

Let  $B = A(0)^{1-\theta} \cdot \frac{L(0)}{H}$  and  $\beta = \rho - n - (1-\theta)g$

$\text{O2. } \therefore \beta \cdot \int_{t=0}^{\infty} e^{-\beta t} \cdot \frac{c(t)^{1-\theta}}{1-\theta} dt$
---

Taking the budget constraint and normalizing it:

$$w(t) = A(t) \cdot \frac{L(t)}{H} \quad \text{and} \quad K(0) = \frac{A(0) \cdot L(0)}{H}$$

$w(t)$  = wage per unit of effective labour

$K(0)$  = Capital per unit of effective labour at time 0.

Rewrite B1 as:

$$B6. \int_{t=0}^{\infty} e^{-R(t)} c(t) \cdot \frac{A(t)L(t)}{H} dt \leq K(0) \frac{A(0)L(0)}{H} + \int_{t=0}^{\infty} e^{-R(t)} w(t) \cdot \frac{A(t)L(t)}{H} dt$$

$A(t)L(t) = A(0)L(0) e^{(n+g)t}$ . Substitute into B6 and divide both sides by  $\frac{A(0)L(0)}{H}$  yields.

$$B7. \int_{t=0}^{\infty} e^{-R(t)} \cdot c(t) e^{(n+g)t} dt \leq K(0) + \int_{t=0}^{\infty} e^{-R(t)} \cdot e^{(n+g)t} \cdot w(t) dt$$

$K(s)$  is proportional to  $K(s) \cdot e^{(n+g)s}$ , rewriting the no-Ponzi game version of the budget constraint as:  $\lim_{s \rightarrow \infty} e^{-R(s)} \cdot e^{(n+g)s} \cdot K(s) \geq 0$

Set up a Lagrangian:

$$B8. \mathcal{L} = \beta \int_{t=0}^{\infty} e^{-\beta t} \frac{c(t)^{1-\theta}}{1-\theta} dt +$$

$$\lambda [K(0) + \int_{t=0}^{\infty} e^{-R(t)} \cdot e^{(n+g)t} \cdot w(t) dt - \int_{t=0}^{\infty} e^{-R(t)} \cdot C(t) \cdot e^{(n+g)t} dt]$$

First order condition for an individual  $c(t)$  is:

$$B9. B e^{-\beta t} \cdot c(t)^{-\theta} = \lambda e^{-R(t)} \cdot e^{(n+g)t}$$

Households behaviour is characterized by B9. The budget constraint is B7.

Implications for behaviour of consumption, take logs of both sides:

$$\ln \beta - \beta t - \theta \ln c(t) = \ln \lambda - R(t) + (n+g)t$$

$$\text{but } R(t) = \int_{\tau=0}^t r(\tau) d\tau \quad \therefore = \ln \lambda - \int_{\tau=0}^t r(\tau) d\tau + (n+g)t$$

The two sides are equal for every  $t$ , thus derivatives w.r.t.  $t$  must be equal:

$$B10. \quad -\beta - \theta \frac{\dot{c}(t)}{c(t)} = -r(t) + (n+g)$$

$$\text{Solving for } \frac{\dot{c}(t)}{c(t)} \text{ yields: } -\theta \frac{\dot{c}(t)}{c(t)} = -r(t) + (n+g) + \beta$$

$$\frac{\dot{c}(t)}{c(t)} = \frac{+r(t) - n - g - \beta}{\theta}$$

$$B11. \text{ Remember } \quad \beta = \rho - n - (1 - \theta)g$$

$$\frac{\dot{c}(t)}{c(t)} = \frac{r(t) - \rho - \theta g}{\theta}$$

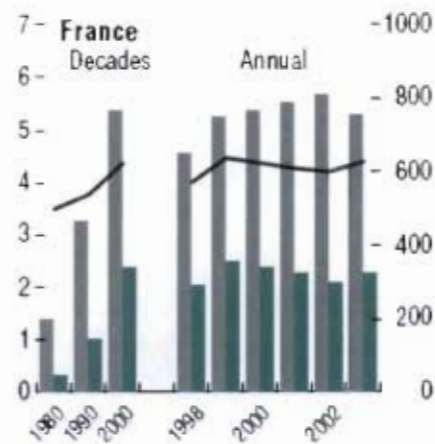
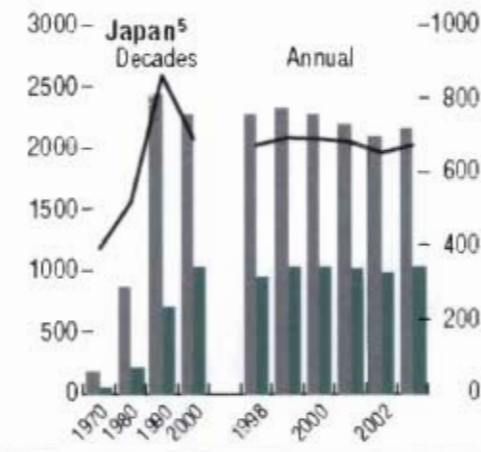
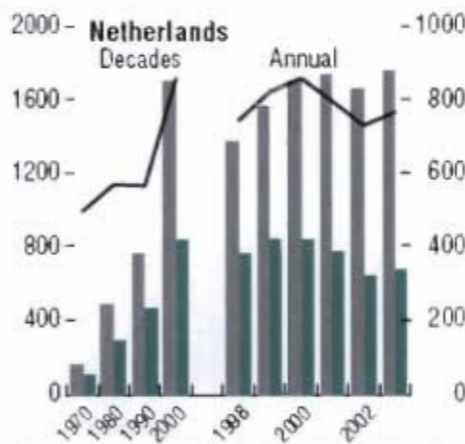
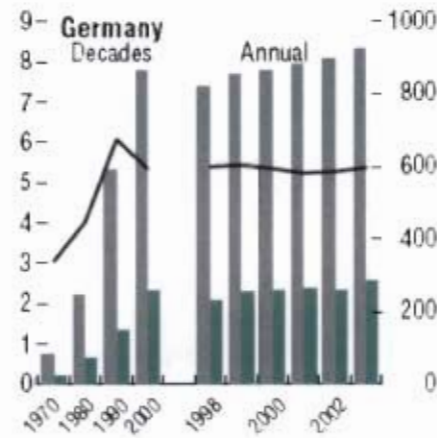
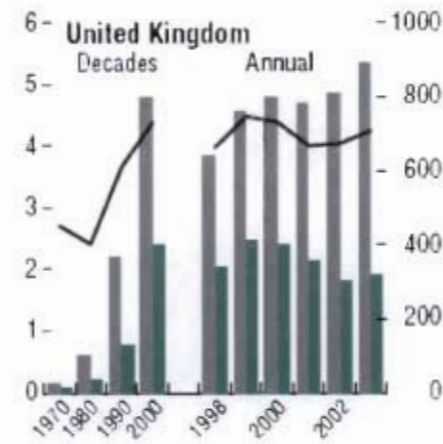
**This is the Euler equation**

APPENDIX IV

**G-6 Household balance sheets**

**Household Sector: Net worth and Net Financial Assets in Domestic Currencies**

■ Net worth (left scale)<sup>2</sup>  
 ■ Net financial assets (left scale)<sup>3</sup>  
 — Net worth (in percent of disposable income, right scale)



Sources: U.S. Board of Governors of the Federal Reserve System; Bank of England, U.K. Office; National Statistics, National Institute of Economic and Social Research; Bank of Japan, Economic Social Research Institute; De Nederlandsche Bank; Banque de France, INSEE; Bundesbank, OECD and IMF staff estimates.

<sup>1</sup>Net worth is calculated as sum of nonfinancial assets and financial assets minus financial liabilities. Net financial assets are financial assets minus financial liabilities.

<sup>2</sup>Net worth for United States, in trillions of U.S. dollars; for United Kingdom, in trillions of pounds sterling; for Japan, in trillions of yen; for Netherlands, in billions of euros, and for France and Germany, in trillions of euros.

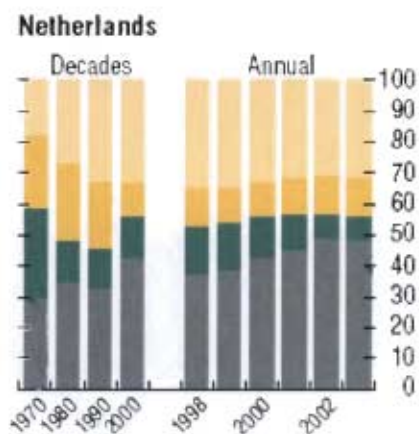
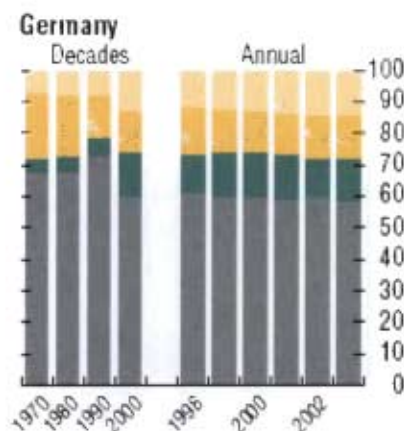
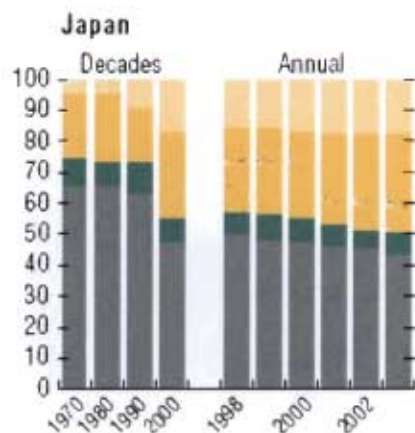
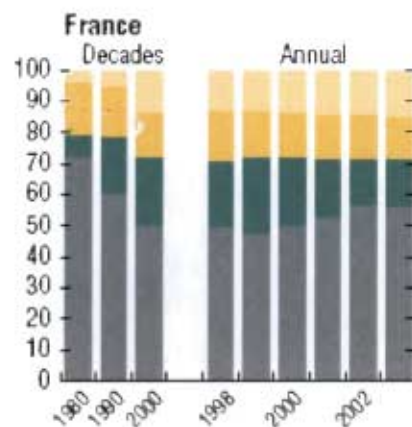
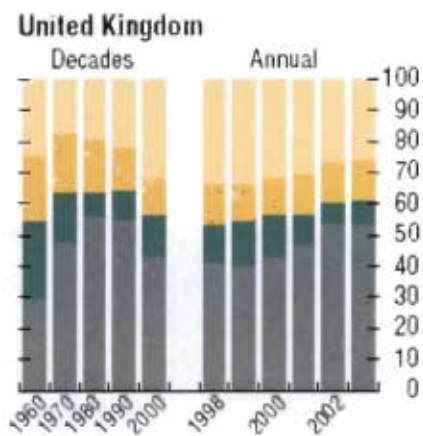
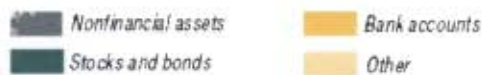
<sup>3</sup>Net financial assets for United States, in trillions of U.S. dollars; for United Kingdom, in trillions of pounds sterling; for Japan, in trillions of yen; for Netherlands, in billions of euros, and for France and Germany, in trillions of euros.

<sup>4</sup>Data for 2004 are only available through the third quarter.

<sup>5</sup>Figures for financial assets and liabilities are for the fiscal year beginning April 1.

## Household Sector: Total Asset

### Composition (as % of Total Assets)



Sources: U.S. Board of Governors of the Federal Reserve System; Bank of England, U.K. Office of National Statistics, National Institute of Economic and Social Research; Bank of Japan, Economic and Social Research Institute; De Nederlandsche Bank; Banque de France, INSEE; Bundesbank; and IMF staff estimates.

<sup>1</sup>Total assets are the sum of financial assets and nonfinancial assets. Nonfinancial assets consist of mainly real estate. Other assets consist of mainly insurance and pension fund reserves.

<sup>2</sup>Data for 2004 are only available through the third quarter.