

# **International Financial Architecture, Macroeconomic Volatility and Institutions: South Africa Experience**

Melvin Ayogu<sup>1</sup> and Hashem Dezhbakhsh<sup>2</sup>

**Policy Paper Number 8**

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International Financial Architecture,  
Macroeconomic Volatility and Institutions:  
South Africa Experience

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## Introduction

Through 43 years of history, this study identifies proximate causes of aggregate volatility in South Africa, the obstacles to managing those volatility risks, and suggests how the country can harness globalization to strengthen financial institutions in order to manage risks better.

Macroeconomic volatility is said to influence growth in many ways including its more obvious effect on investment, through affecting the level of uncertainty. Nonetheless, one can argue that not all types of macroeconomic volatility are on balance inimical. In fact, macroeconomic volatility can "manufacture a crisis" that leads to fruitful reforms. However, this aspect of volatility would be viewed as an exception because in general, *volatility dislocates existing policies and impairs institutions*, thereby rendering an economy more fragile.

The question of what causes volatility (sources of fluctuations) is just as important as the study of its effects. These questions illuminate our understanding of shocks and how they propagate. Thus, they strengthen our search for ways to mitigate its adverse consequences. For instance, one of the ways in which shocks can dislocate policy is by changing the payoffs from policy objectives or conversely by altering the costs and benefits of continuing a course of conduct. Thus, in certain circumstances, depending on the size of the shock, it may pay policymakers to implement a contingent rule and abandon a policy. Such an optimal regime switch may nonetheless have adverse consequences on certain parts of an economy's institutional structure. In turn, weak institutions can induce or amplify volatility. Therefore, volatility and institutions plausibly embody bidirectional causality.

Case studies can offer a new body of evidence on the exogenous sources of volatility in developing countries, and hence allow us to examine several competing hypotheses about volatility and institutions. South Africa is an important case country because the regime switch in 1994 demarcates the previous years of isolation due to Apartheid from the present democratic regime in which the country has “inserted” itself into the global community? During the Apartheid era, macroeconomic volatility was rooted in both political and economic forces of which the financial markets alone could not completely immunize. However, post-Apartheid, one could at least downplay the political factors and begin to attribute more of the effects of volatility to deficiencies in the risk-bearing capacity of the financial system. The South Africa experience thus presents a natural control for political factors even though the robust correlation of politics with economics makes such a control feeble.

The rest of the paper is organized in five sections. Section 1 analyzes aggregate volatility, particularly shocks to output, consumption, and investment and addresses the hypothesis that aggregate volatility in developing countries is substantially higher than in developed countries. In Section 2, we identify the main sources of shocks, both domestic and external, but with emphasis on external sources, with a view to examining the hypothesis that certain structural features typical of developing countries contribute to generating excess aggregate volatility. Section 3 characterizes South Africa’s domestic financial architecture and assesses the effect of volatility (crises) on the functioning of financial institutions. Section 4 examines the main problems of risk management in the economy, and probes whether these flaws follow from volatility-induced weaknesses on the system. The idea is to identify those institutional flaws that impede optimal management of aggregate risks, and to evaluate what changes should

be introduced to “complete” markets. Given that the changes must be managed in a globalizing market-context, an additional concern is to ensure that the process is consistent with existing international financial architecture. Section 5 concludes by offering lessons from the South Africa experience, for designing the international financial architecture.

## *Section I: Excess volatility and crises*

### **I. Analysis of shocks and volatility**

The main goal of this section is to analyze shocks to output, consumption and investment; test for the presence of excess volatility and identify episodes of crises or extreme volatilities. We begin by presenting a brief background on the unique history of the country. South Africa became a republic and dissociated from the British Commonwealth in 1961. The new government inherited an entrenched regime of extreme racial segregation called *Apartheid*.

The making of Apartheid and the formation of resistance to it trace back to the end of the “war between the whites” in 1902 and the publication in 1905 of the post-war program for segregation. In 1906, Britain handed a whites-only parliamentary government to a collection of former Dutch and English colonies-transformed into republics. These republics amalgamated in 1910 as the Union of South Africa. In 1912 the South African Natives National Congress, later the African National Congress [ANC] is founded, followed a year later by the beginning of a series of segregation laws and acts by the government.

The coming to power of the Afrikaner National Party in 1948 marked the formal application of the policy of Apartheid: Prohibition of Mixed

Marriages Act, Immorality Act that forbade relationship between black and white races, the Population Registration Act that classified people by race, and the Group Areas Act that forced people to reside in racially zoned areas. There were as well the Security Legislation that gave sweeping powers to the government, the Reservation of Separate Amenities Act and the Bantu Education Act to control the education of Africans. Countervailing events such as the advent of the resistance movement by ANC and its allies, and the launch of an alternative vision of desegregation and non-racial society, *the Freedom Charter*, were also in motion.

In 1959, the Pan-Africanist Congress [PAC] was founded; in 1960, the PAC organizes protest against Apartheid laws. Protesters are massacred (in Sharpeville), and African and Coloreds (collectively, Blacks) representation in parliament (by whites) rescinded. Thus is the historical background within which the political and economic crises of the last 43 years and the volatilities they engendered are studied.

In terms of the structure of production, output is classified into three major sectors: *primary* comprising agriculture (agriculture, forestry, fishing) and mining (mining and quarrying); *secondary* comprising manufacturing, electricity, construction, gas and water; *tertiary* comprising wholesale and retail trade, catering and accommodation, transport, storage and communication, financial intermediation, insurance, real estate and business services, community, social and personal services, and general government (Table A). Economic production and export is dominated by the primary sector (Table B). The official statistics defines agriculture in terms of commercial large-scale farming but this discounts the large proportion of the population that is dependent on subsistence farming for livelihood (Table C).



## **I.1 Aggregate volatility in South Africa: measures, methods and stylized facts**

### **Measures of Volatility**

Before examining factors that affect volatility, it is important to discuss what is meant by volatility and how volatility is measured. We make a distinction between variability and uncertainty. Variability refers to all variations in a series and can be roughly measured by statistical norms such as unconditional variance, coefficient of variation, mean absolute deviation, and inter-quartile range of the distribution of a variable. Uncertainty has a more profound connotation as it refers to unknown movements in a variable.<sup>1</sup>

Variability itself can be decomposed, at least conceptually, into anticipated (expected) and an unanticipated (unexpected) components. Expectation, as used here, is assessed with respect to an information set that is known at the time of measurement. In practice, economic fundamentals, identified by the equilibrium relationship between the variable of interest and its determinants, define the information set. Unexpected variations are then viewed as excess volatility. Extreme volatility, moreover, is synonymous with crisis.

Two issues are critical when making a distinction between total variability and excess volatility. First, the distinction presumes the existence of a correctly specified and appropriately estimated economic model characterizing the anticipated (expected) component of the movement in a variable. Specification of such model depends on availability of established economic theory—which might be a daunting task given that economic theory has not yet reached a

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<sup>1</sup> See, Wolf (2004) for a review of volatility related concepts.

consensus regarding the impacts of globalization and domestic institutions on volatility or volatility's potential transmission channels. Tenuous specification casts doubt on the statistical consistency of the estimated models on which the above distinction is predicated.

Second, the choice between total or unexpected variability as the relevant metric for the analysis of volatility depends on our research purpose. Although some authors (e.g., Serven, 1998) argue that using a measure of total variability such as standard deviation of a variable leads to an overestimation of volatility, most of the literature comparing macroeconomic fluctuations across countries, indeed, follow this practice and interpret volatility as total variability (see, e.g., Ramey and Ramey, 1995, Easterly *et al*, 2000, Prasad *et al*, 2003, among others). Such interpretation tacitly assumes that both expected and unexpected volatility impose costs on the economic agents, and a distinction does not serve a practically useful purpose. This assumption is not unrealistic given that financial market failures in many countries and the lack of perfect markets everywhere but more deficient in developing countries, make it impossible to hedge anticipated risks. Consequently, even anticipated economic fluctuations impose costs since their risk cannot be mitigated through using financial instruments (see Fanelli, 2004 for details).

One measure of total variability is sampling variance (or standard deviation), which can be easily obtained if the data is stationary—in other words, if the first two moments of the probability law that generates the series are defined and are time invariant. For a series  $\{Z_t\}$ , this measure is

$$\hat{\sigma}_Y^2 = \sum_{t=1}^T (Y_t - \bar{Y})^2 ,$$

where  $\bar{Y}$  is mean of the series;  $Y_t = Z_t$  if the series  $\{Z_t\}$  is stationary and  $Y_t = (Z_t - Z_{t-1})$  if the series has a unit root. To allow comparison with other country studies in this project as well as with studies in the growth literature which has used this measure extensively, we adopt standard deviation as our main measure of total variability rather than mean absolute deviation or interquartile range, which are more resilient to outliers.

We use both annual and quarterly data, seasonally adjusted as necessary.<sup>2</sup> The samples span 1960 through 2004, unless noted otherwise. Units of measurement are the local currency (Rand), except when making cross country comparisons when U.S. dollar is the unit of measurement. Although our main analysis is based on quarterly data to avoid aggregation smoothing and loss of variability information, some series are available over a long span only in annual frequency, leaving us no other choice but to use annual data in parts of our analysis. Since stationarity of a series is crucial for our analysis, we next apply unit root tests to series used here.

### **Testing for Unit Root**

To determine whether a series has a unit root, we use both the standard and the augmented Dickey-Fuller tests; see Dickey and Fuller (1979, 1981) and Said and Dickey (1984). For series that show trend, the with-drift version of the tests are applied. Test Results for key *annual* series for South Africa are reported in Table 1. Real GDP, household consumption, investment, export, and import are all nonstationary in level but stationary in growth rate and per capita growth rate. Terms of trade is nonstationary in level, but its growth rate as well as the trade deficit to GDP ratio are both stationary.

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<sup>2</sup> See Data Appendix for sources and descriptions.

Results not reported here, for brevity and available upon request, suggest a similar finding for other variables used in our study.

There is little material difference between the Dickey-fuller and Augmented Dickey Fuller results, suggesting robustness of the findings to autoregressive specification of the data generating process for these series. Consumption is the only series with an Augmented Dickey Fuller p-value that is slightly higher than the ten percent significance level. This suggests that consumption is more likely to have a nonstationary growth pattern than other series examined here, although such likelihood is still small given the low p-value and the well know small power of the unit root tests. We do not apply the above tests to quarterly data in order to avoid the statistical pitfalls of testing for unit root with seasonally adjusted quarterly data. These tests are very likely to suggest a unit root, which does not add much to our findings based on annual data anyways.<sup>3</sup>

The unit root test results reported here suggest that the South Africa's macroeconomic series considered here are difference stationary in level and stationary in growth rates (log difference), except for ratios of two variables that are stationary in the level. Therefore, using the growth rate series to estimate volatility is statistically justified.

### **Volatility Estimates**

The graph of the growth rates for some of the South Africa's key macroeconomic series are presented in Figures 1 (annual data) and

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<sup>3</sup> Ghysels (1993) reports that tests strongly suggest the presence of a unit root in the seasonally adjusted quarterly post war data for U.S. GNP and GNP per capita, but are far less conclusive when applied to similar but seasonally unadjusted data. More generally, Ghysels and Perron (1993) and Perron (1993) show that seasonal adjustment biases unit root tests toward a unit root finding in the adjusted data. The resulting loss of test power has prompted econometricians to suggest using annual data when testing for unit root (See, e.g., Maddala and Kim, 1998, chapter 12)

Figure 2 (quarterly data).<sup>4</sup> Several points are worth noting. First, growth rate of real GDP and growth rate of GDP per capita have remarkably similar patterns as illustrated by the top two graphs in Figure 1. This is not surprising given that population growth is quite stable in most countries including South Africa. So changing a series to per capita basis only shifts its mean and not its dispersion. Here the per capita graph seems to have been obtained by shifting the other graph down by about two percent.

This is not a key finding but it has an important implication for us. Population data are not generally available at quarterly frequency. To perform our analysis of quarterly growth series on a per capita basis, we have to linearly interpolate the population series. Such interpolation will contaminate the resulting per capita data series, altering their statistical properties.<sup>5</sup> We avoid the interpolation problem by using growth rate series rather than growth rate per capita. This choice does not have an adverse statistical ramification, given that our analysis is time series rather than cross section, as we analyze volatility in South Africa over time. Also, given that our focus is on growth volatility that is driven by dispersion, which is unaffected by per capita filter. We use the same metric for annual data to ensure comparability with our quarterly results, except when making comparisons with other countries where we use per capita data.<sup>6</sup>

Second, most growth series exhibit considerable fluctuations at both annual and quarterly frequencies thereby suggesting that in general growth series are highly volatile. Investment and imports seem to be

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<sup>4</sup> Note that the growth rates for quarterly data are quarterly growth (not annualized).

<sup>5</sup> For example, Dezhbakhsh and Levy (1994) show that linear interpolation performed to increase the frequency of a series makes a stationary series to appear nonstationary.

<sup>6</sup> Note that even the annual population data is often obtained through interpolation of decennial census data, so annual per capita data is subject to the same criticism as quarterly per capita data.

the most volatile among the annual growth series. Quarterly graphs show terms of trade growth to be quite volatile, but the annual graph for terms of trade smoothes out some of the quarterly fluctuations.<sup>7</sup> Third, most series show less volatility during the last ten sampled years corresponding to post-racial South Africa with less political and politically-induced economic upheavals as well as financial market reforms. This pattern is particularly pronounced at the quarterly frequency (Figure 2). Of course, output volatility in many countries has declined during the past fifty years, but the decline here seems to be confined to the last decade only. The statistics reported later confirm these visual findings.

Table 2 reports mean, standard deviation, and range for South Africa's key quarterly macroeconomic series. Note that among the eleven series examined, eight are in growth rate and the other three (inflation, discount rate, and money market rate) are not. Also, the growth rates reported for the variables in the top panel are all for one quarter (not annualized)<sup>8</sup>; the inflation and interest rates are per annum. Results are reported for the full sample that covers 1960 through 2004 as well as two sub-samples truncated at the political regime change date. The analysis of the two sub-samples is to shed some light on the volatility pattern in Figures 1 and 2 which overall exhibit an appreciable reduction in recent years.

First consider the pooled samples. Among the eight series, investment, terms of trade, export, import, and exchange rate have a relatively large standard deviation, exhibiting more volatility in their growth. For investment, export and import, the magnitude is in the order of five to six times larger than the associated mean growth whereas the

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<sup>7</sup> Note that terms of trade data is seasonally adjusted so the volatility observed here is not due to seasonality.

<sup>8</sup> Annualized mean and standard deviations are larger by a factor of 4.

ratio of standard deviation to mean is less than two for GDP and consumption, and less than one for M2, one of the least volatile series considered here.<sup>9</sup> The range of the growth rates as reported in Table 2 illustrates further the magnitude of quarterly fluctuations in these key macroeconomic variables.

The results for the two sub-samples suggest a clear drop in volatility post-Apartheid period. This is true for all but the exchange rate growth series. The exchange rate was pegged to dollar at a fixed rate until 1972. If we exclude this period that shows no change in Rand/Dollar rate then the corresponding mean (standard deviation) of exchange rate growth for the 1972-1993 is 1.95 (6.20). The increase in volatility of the rand post-1994 may be attributed partially to steps in the liberalization of the capital account (gradual dismantling of exchange control measures) and regime switch to inflation-targeting. A successful inflation-targeting framework requires the monetary authorities to abandon any pre-commitment with regard to following some form of exchange rate parity. Being the monetary policy instrument in use, the influence of changes in interest rate on exchange rate movements grew with the increasing openness of the capital account. There are other complicating factors as well. For instance, massive open forward contracts of the Reserve Bank and the externalities of adverse political developments in Zimbabwe, South Africa's largest regional trading partner. Zimbabwe had implemented a highly controversial land redistribution policy among other political intrigues that altogether generated concerns about the future evolution of equity and redistribution efforts in South Africa.

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<sup>9</sup> We note however that M2 being less volatile does not imply absence of an expansionary monetary policy.

The overall higher volatility of key macroeconomic variables during the Apartheid years reflect tumultuous political environment, changes in the global environment and in South Africa's international relations, all of which we elaborate subsequently under our analysis of crisis and institutions. Social unrests, economic and political embargoes, and military incursion into neighboring but hostile states all contributed to an uncertain environment with large economic upheavals.<sup>10</sup> These adverse effects of political instability on growth volatility are well documented in the growth literature; for example Ramey and Ramey (1995), Easterly *et al.* (2000), and Turnovsky and Chattopadhyay (2003), among others.

Inflation rate, discount rate, money market rate and growth of M2 all show reduced volatility for the post-Apartheid period, but there is a difference in how their means have changed. While M2 growth and inflation rate seem to have declined post-1994, interest rates have increased considerably. The reason can be found in the affect of inflation targeting which has been successful but initially at a cost of high interest rates that have subsequently declined gradually in response to favorable realizations of inflation targeting.

## **I.2 Comparison with Trading Partners**

We compare the volatility of key macroeconomic growth series for South Africa with those of her major trading partners, namely U.S., U.K., Japan, and Zimbabwe.<sup>11</sup> This exercise is important because the finding of excess volatility in key macroeconomic variables does not of itself say much about the relative magnitude of the disturbances. Furthermore, our working hypothesis H1 is that *aggregate volatility in*

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<sup>10</sup> The mining industry exploited migrant labor. When some of the source countries gained political independence, they imposed restrictions on migratory labor.

<sup>11</sup> See, the Data Appendix for sources. Also, note that we could have included Germany, but we would like to have representation from all four continents, while keeping the list short for presentation convenience.



*developing countries substantially exceeds those in developed countries.* Therefore, a comparison is required.

The selected four major partners represent four different continents. Moreover, three of these countries are among economic superpowers with developed economies and relatively low volatility. Therefore, they can be used as a benchmark. We compare growth rates of inflation adjusted GDP, consumption and investment. Given that we compare countries with different population growth rates, all measures are per capita but this normalization raises an even more serious comparability problem in the case of South Africa.

In 1976, the government declared Transkei the first “independent” Bantustan (black homeland), followed by Bophuthatswana in 1977, Venda in 1979, Ciskei in 1981 and KwaNdebele in 1984. These acts effectively alienated over seventy percent of the population from South Africa, at least until 1994 (see Table C). The story does not end with population adjustment. Even during periods in which blacks were part of South Africa, their per capita consumption was essentially below poverty level. Therefore, measures using mean grossly understate the true consumption level typical of those privileged under the apartheid.<sup>12</sup> Readers must therefore be mindful of these complications as possible sources of error in the metrics.<sup>13</sup>

Results are reported in Table 5.<sup>14</sup> South Africa has the second lowest mean GDP per capita growth rate after Zimbabwe. The volatility of

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<sup>12</sup> Simkins (1976) estimates income per employee from Bantustan agriculture in 1970 to be R98 per annum and R217 for employment outside the Bantustans. The current rand-dollar exchange rate is R6.50. Assuming one to one Rand exchange to the US dollar, the income translates to \$98 per annum. Therefore, it does not matter how one works the arithmetic, the amount involved is dismal.

<sup>13</sup> All-inclusive census figures between 1971 and 1991 may not be reliable.

<sup>14</sup> We use annual data here, because long quarterly data needed for this analysis are not available.

this rate is less than Zimbabwe as well as Japan, which has the highest GDP growth rate. South Africa's per capita consumption during this period grew on average at a rate higher than its GDP but with less volatility, as suggested by a smaller standard deviation. Nonetheless, South Africa has the lowest rate of consumption growth among these five countries. All five countries have experienced more volatility in their gross domestic investment than in their consumption or income. With the exception of Zimbabwe on both counts, South Africa's average growth rate is the lowest and its volatility the highest.

Overall, South Africa's key macroeconomic variables are considerably more volatile than those of the United Kingdom and the US, less volatile than those of Zimbabwe, and almost at par with Japan.<sup>15</sup> Japan's notably high volatility, in comparison with its two industrialized counterparts, is due to its susceptibility to oil prices and the impact of the two oil price shocks within 1973-1980. This of course raises the question of what is a reasonable expectation of developing economies when a wealthy industrial giant and the second largest economy in the world is unable to cope with commodity price shocks.

Our results suggest that South African's macroeconomic series exhibit considerable volatility in comparison to its major trading partners with more developed financial markets. Because South Africa does not have the level of sophisticated domestic institutions and access to international capital markets that are assumed in the complete-market model, volatility whether anticipated or unanticipated can be expected to impose costs on the economy. Therefore, total variability of the macroeconomics series should be considered the relevant metric for policy decisions. A detailed analysis of the sources of such variability

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<sup>15</sup> Major differences are reported among the developed and developing countries in terms of the short run, business cycle, and long run components of macroeconomic volatility; see, e.g., Cogley (1990) and Levy and Dezhbakhsh (2003).

and its implications for financial architecture at the domestic and international levels are explored.

### **I.3 Crises as episodes of extreme volatility in South Africa**

Despite the prevalence of crisis episodes, there is no agreed upon and sound theoretical definition of crises. So we seek an empirical definition instead. Wolf (2004) and Fanelli (2004) suggest basing such definition on empirical distribution of volatility for an economic variable, because extreme volatility is crisis. We follow their suggestion and identify episodes of crisis for a variable as those corresponding to the largest quantiles of the empirical distribution of volatility measure for that variable. Continuing our practice in this study, we use standard deviation as the measure of volatility.

To identify volatility distribution for a series, we have to obtain a number of volatility estimates for the series over various sub-samples (sub-periods). We obtain bi-annual estimates by dividing a quarterly series into many eight-quarter segments, spanning non-overlapping two year periods. The standard deviation of the series over each sub-period is the estimate of its volatility during those two years. The starting sample point is 1964-65 to ensure that data is available for all examined series and the last sub-sample is 2002-03.<sup>16</sup> Overall, twenty volatility estimates are obtained for each series. Note that these estimates are different than the rolling standard deviations estimated earlier, as they are based on non-overlapping sample periods, and, therefore, obtained only on a bi-annual, and not quarterly, basis. These estimates for some of the key variables used in this study are reported in Table 8. The extreme values are identified by the largest quartile of the distribution of the resulting estimates and marked with boldface.

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<sup>16</sup> Quarterly data for some of the series is available only after 1963.

Before discussing the estimates in Table 8, we present an alternative method for identifying periods of extreme volatility for the variables of interest. These estimates are based on rolling standard deviations. As discussed earlier, rolling standard deviations produce quarterly estimates of volatility where each estimate is based on the preceding eight quarters. They include many more volatility observations for each series than the bi-annual estimates based on non-overlapping samples.

However, successive estimates are based on common observations that are not independent, so they do not generate an empirical probability distribution to be used for identifying extreme values. To overcome this problem, we analyze these rolling standard errors in a regression context. Accordingly, we run each series of rolling standard errors on a set of binary variables, each denoting two consecutive years—assuming a value of one for quarters during these two years, and zero otherwise. These binary variables span 1966 to 2003. To correct for the serial correlation that rolling samples create, we use the method of maximum likelihood estimation with regression errors that follow a high order moving average scheme.

The estimated coefficient for each binary variable measures the difference between the volatility estimate for the two years corresponding to that variable and the smallest volatility measure for all other sub-samples. The largest coefficient estimate belongs to binary variables for the most volatile two year periods. These regression results are reported in Table 9. Again the largest 25% of the estimates are marked with boldface, indicating the most volatile periods. Note that the starting point is 1966 due to data unavailability for some series. The table also reports the moving average coefficient

estimates, indicating the number of MA lags used to correct for serial correlation in these regression equations.

Although the crisis periods for each macroeconomic series reported in Tables 8 and 9 are not identical, due perhaps to differences in methods used and sampling variations, there are many overlaps. The estimated crisis episodes reported in the two tables mark 1978-79 and 1980-81 as periods of unusually high volatility in key macroeconomic indicators in South Africa; similarly for 1974-75 and 1975-76. These periods coincide with the two oil price shocks. Given the dependency of South Africa on oil imports, it is not surprising that such shocks have profound effects that can reverberate through the economy. That it can have such profound effects may implicate the capacity of the economy, via its financial system, to manage risks. There has been no period of broad volatility (involving several macroeconomic variables) in recent years, except for 1994-95. The volatility here is perhaps induced by the political transition.

## *Section II: Structural factors, shocks and excess volatility*

### **II.1 Main sources of aggregate volatility**

In this section, we develop time series measures of volatility and use them to identify sources of macroeconomic volatility and then seek to identify structural features of the economy that induce excess volatility (hypothesis H2). It would not have been difficult to identifying factors that affect volatility of a variable like GDP growth if we had a panel data set consisting of  $n$  time series for different countries. In such case, we could use each of the  $n$  GDP growth series to obtain one volatility estimate (for example, standard deviation of the GDP growth of a sampled country). These  $n$  estimates could then be used in a

regression analysis with  $n$  data points to identify country specific characteristics that affect volatility.

When only one country is analyzed, however, the task is more challenging because there is only one times series for a given variable such as GDP growth resulting in only one volatility estimate. No correlation or regression analysis is possible with only one data point. To overcome this challenge, we need to obtain many volatility estimates for each variable, each estimate pertaining to a sub-sample, rather than just a single estimate for the entire sampling period. These temporal measures of volatility for each key South Africa's macroeconomic variables are obtained using rolling standard deviation of quarterly series suggested by Blanchard and Simon (2001). The resulting volatility series will assist us in identifying factors that affect such volatility as well as episodes of extreme volatility (crises).

### **Rolling standard deviation and volatility series**

Temporal estimates of volatility for a given variable are a series of volatility estimates obtained at different point in time using a sampling window. The sampling windows overlap to allow many estimates, similar to calculating moving averages. We use a moving window of eight quarters, where the volatility estimate of a variable at each point (a given quarter) is the standard deviation of the current as well as seven preceding quarterly observations on that variable. Thus, the first observation in the resulting volatility series corresponds to the fourth quarter of 1961, because the starting sample point is the first quarter of 1960.

The overlap of the moving windows allows us to capture the dynamic characteristics of the volatility propagation mechanism, or to infer how

volatility is affected by various events over time.<sup>17</sup> Obtaining multiple estimates of volatility for a country, rather than just one estimate for the entire sampling period, has the added advantage of reducing the temporal aggregation bias that affects panel data studies.

Figures 4 to 6 present the resulting series of rolling standard deviations for several variables. Figure 4 includes graphs of the rolling standard deviation of growth rate of real GDP, consumption, investment and government expenditures. Figure 5 includes graphs of the rolling standard deviation of growth rate of real exports, real imports, and terms of trade. Figure 6 includes similar graphs for the monetary sector, including inflation rate, discount rate, money market rate, and growth rate of Rand/Dollar exchange rate.

Comparing Figures 4 and 6, we note a remarkable difference in progression of volatility pattern for the key real macroeconomics variables on one hand and monetary variables on the other hand. Volatility of GDP, consumption, investment, and government expenditures appears to be on the decline, particularly during the post Apartheid period. This is consistent with the estimates presented earlier. It is interesting to note that the variations in growth of real exports and imports are similar, as indicated by similar patterns in rolling standard deviation of growth rates of exports and imports. Interestingly, the four major sources of imports were the same as the four major export markets during 1961–1990, mindful that details of petroleum trade were not published (Jones and Müller, 1992a). The foreign sector volatility portrayed in Figure 5 also suggests a decline in volatility in recent years with one exception. The terms of trade

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<sup>17</sup> Note that we can use a wider windows, but that reduces the number of the volatility estimates and also makes the series too smooth—in the limit the window is the size of the entire sample and only one volatility estimate is obtained. Also, a few quarter increase or decrease in the size of the moving window does not materially affect our general findings.

changes appears to have acquired considerable volatility in the mid 1990s; see the graph in lower panel of Figure 5. This coincides with the period of political transition.

Even controlling for the political regime change, the movements in the terms of trade have become quite volatile since the 1970s. First, it must be noted that South Africa's export is dominated by primary export, particularly gold and other minerals (see Table B). The metals index which gives an indication of the price of the major mineral exports is also dominated by gold despite the importance of platinum, vanadium, chrome, manganese ore and diamonds. As at 1980, South Africa ranked number one in world production of these minerals except diamonds where it ranked third even though in the Western world, it ranked second (Jones and Müller, 1992a). Understanding movements in gold prices and exchange rate (see Figures 12–16) is therefore vital to understanding terms of trade shocks and the volatility it induces on macroeconomic variables.

Before 1970, the price of gold was fixed and the exchange rate was stable—linked to gold with a fixed price. Post-Bretton Woods both gold and exchange rate became variable, reacting to both political uncertainty (flight to quality) and to economic shocks (inflation hedge). Examples include the Yom-Kippur war coincident with Post-Bretton Woods and the first oil shock (1973); Soviet invasion of Afghanistan in 1979, hostage crisis in Iran 1979 and oil shock in 1980, revaluation of gold in 1980; "Operation Desert Storm" (Kuwait invasion) 1991, and Iraqi crisis 2004 (see also Figures 13 and 14). The exogenous (i.e., internationally-determined) dollar price of gold in conjunction with Government's economic policy of exchange control completed the ascendancy of gold price in the economy:



Each \$50 change in the gold price ... altered the value of annual gold production by about \$1 billion ... not only caused fluctuations in the revenue and profitability of mines, in their dividends, and in their contribution to national income, but also in their contribution to the balance of payments and to the state's tax revenues ... also a greater volatility in the money supply (Jones and Müller, 1992b, p.265)

In sharp contrast to the real sector, the volatility of the monetary sector appears to have been increasing during the past ten years as can be seen from Figure 6. This can be attributed partly to an inherited high inflationary financing in the eighties and the change in monetary policy regime to inflation targeting, as well as the influence of exchange rate volatility and gold prices already noted above. The switch to inflation targeting in an environment of ongoing domestic financial reforms, increasing international financial liberalization but still inadequate domestic financial architecture comprise additional sources of disturbances.

Not all higher volatility periods for various series coincide, but there are common periods when most series experienced greater volatility. For example output, consumption, investment, terms of trade, import, export, and interest rates all show substantial volatility in the early to mid 1980s. Furthermore, we can distinctly identify the eighties as an era of notoriety by looking to the secondary and the tertiary sectors as exhibited in Figures 7–11. We already know why the primary sector was insulated. Stabilization policies favored mining and financial sectors but not commercial and manufacturing (Black, 1991, p. 173). External shocks favored mining while favorable economic structures and “aid liberally provided” cushioned shocks to agriculture.<sup>18</sup>

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<sup>18</sup> According to Jones and Müller (1992c), over 86 percent by value of all agricultural products were sold under producer-dominated marketing boards, while rich South Africans frequently bought farms in order to reduce their tax liabilities (ibid, p.251).

Therefore, setting aside the impact of the oil shock in the beginning of the eighties (Figures 14–16) which in any case was initially more than partially offset by a stratospheric increase in the price of gold, we can understand these macroeconomic volatilities in terms of the domestic and political upheavals of the time—the ANC guerillas were sabotaging South African cities (1981-88), military incursions into neighboring states by the government, international sanctions, South Africa approaches IMF for a standby loan of \$1.1 billion (1982), state of emergency, changing exchange rate regimes, and political business cycles (elections, formation of right-wing Conservative Party, Botha becomes President 1984).<sup>19</sup>

## II.2 Determinants of Volatility – domestic and external

Regression analysis is an appropriate tool for identifying factors that affect growth volatility for any of the key macroeconomic variables examined here. Since our temporal measures of volatility are based on overlapping windows, any regression that uses these volatility measures as the dependent variable is likely to exhibit significant serial correlation. Estimating such regressions without correcting for serial correlation in regression errors leads to biased standard errors and invalid inference. To deal with this problem, we use the following regression model in the analysis presented in this section:

$$Y_t = f(\beta, X_t) + u_t, \text{ and}$$

$$u_t = \varepsilon_t + \theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2} + \dots + \theta_q \varepsilon_{t-q},$$

where  $f(\cdot)$  is a linear function with vector of coefficients  $\beta$  and regressors  $X_t$ ; regression errors  $u_t$  follow a  $q$ th order moving average (MA) process with parameters  $\theta$ s that satisfy invertibility condition, and  $\varepsilon_t$ s are white noise normally distributed errors with mean zero and

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<sup>19</sup> For details, see Clark and Worger (2004), Bienart (2001), and Thompson (2000).

variance  $\sigma^2$ . The two equations are jointly estimated using nonlinear maximum likelihood method. The moving windows used to obtain volatility series make the MA process an appropriate choice here. We set  $q$  high enough so that additional MA coefficients are zero and the resulting regression residuals do not exhibit serial correlation as measured by Durbin-Watson statistics.

First, we examine the volatility of the components of GDP to identify the contribution of each to volatility in GDP growth. In particular, we estimate a regression equation with the GDP growth volatility as the dependent variable, and rate of changes in the volatility of consumption, investment, government expenditures, export and imports as explanatory variables, with regression error terms that follow an MA process as described earlier. We use both the full sample and the post Apartheid samples in our estimation. Results are reported in the middle column of Table 6.<sup>20</sup>

For the full sample covering 1961:IV through 2004, import volatility seems to be the only factor that contributes significantly to GDP volatility.<sup>21</sup> Consumption volatility has a significant effect but only at the ten percent level.<sup>22</sup> For the post Apartheid sample, the volatilities in consumption, investment, government expenditures, and exports all seem to contribute to GDP volatility, although consumption coefficient again is only significant at the ten percent level. Among these, government expenditure seems to have the most significant impact on GDP volatility. Government expenditure and its influence can be understood in terms of poverty alleviation and transfer payments.

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<sup>20</sup> As correctly anticipated, the regression errors are serially correlated, but a 4<sup>th</sup> order MA adequately captures this correlation and the estimation method corrects for it, as evidenced by insignificant Durbin-Watson statistics.

<sup>21</sup> See notes to Table 6 for related explanations.

<sup>22</sup> Note that this regression does not produce a significant coefficient estimate for a variable that makes only a short-run contribution to GDP volatility; significance suggests a relatively persistent relationship.

These are components of equity and redistribution programs, housing and urban integration, and responses to the challenges of HIV-AIDS.

It is not uncommon to find that volatility of GDP components contribute to GDP volatility. For example, Blanchard and Simon (2001) have identified consumption and investment volatilities to be important factors affecting GDP volatility in the U.S. Again, our findings are not unrelated to the economic and political environments. Volatility of imports can be understood in the context of adjustment to balance of payments problems that surfaced acutely in the eighties when current account deficits became increasingly difficult to finance externally. The problem had to be addressed through a combination of factors that included reduction in domestic absorption and imports (see Khan, 1991). The disinvestment that followed the international campaign against Apartheid is another possibly major contributor. Overall, the significant variability of investment and imports can be better appreciated by noting that “machinery and mechanical appliances, vehicles and transport equipment, and chemical products” constituted no less than forty percent of the imports and in some cases surpassed fifty percent (Jones and Muller, 1992a, p. 349).

To examine the extent to which GDP volatility affects consumption volatility, we use an estimation method similar to the one used above. Results are reported in the right column of Table 6. The estimates suggest that while historically GDP volatility has contributed to consumption volatility in South Africa, as suggested by the significant coefficient of GDP volatility in this regression equation, the pattern has changed since the transition. GDP volatility no longer seems to drive the volatility of consumption although both exhibit a high co-movement. This result is relevant as we try to assess South Africa’s

domestic financial architecture to identify those institutional flaws that impede the optimal management of aggregate risks.

### **Other volatility factors**

To identify other factors that contribute to the volatility of income and consumption growths in South Africa, we estimate GDP and consumption volatility equations with an expanded set of explanatory variables. We cannot rely on established theory in selecting these variables, because such theory is not yet available (Fanelli, 2004). Instead, we rely on stylized facts, anecdotal evidence, and theories in the growth literature to identify plausible explanatory variables for the income and consumption volatility equations.

For example, among factors whose link to output or consumption volatility has been examined are terms of trade volatility (Acemoglu *et al.*, 2003), inflation volatility (Blanchard and Simon, 2001), interest rate volatility (Easterly, *et al.*, 2000), volatility of capital flows (Gavin and Hausmann, 1998; Prasad *et al.*, 2003), globalization, financial integration, and outward orientation of trade (Kose *et al.*, 2003; Buch *et al.*, 2005), monetary and fiscal policy shocks (Ramey and Ramey, 1995; Caballero, 2000; Buch *et al.*, 2005), exchange rate regime and shocks (Denizer *et al.*, 2000), social and ethnic fragmentation and political instability (Ramey and Ramey (1995), Easterly, *et al.*, 2000, and Acemoglu *et al.*, 2003), strong dependency on export revenues (Caballero, 2003), government deficit (Caballero, 2000), and financial deepening (Easterly, *et al.*, 2000; Denizer *et al.*, 2002; Acemoglu *et al.*, 2003; Prasad *et al.*, 2003).

Based on the above literature, our regressors include a binary variable that marks the transition from Apartheid, the terms of trade, capital

inflow and outflow, Rand/Dollar exchange rate, money market interest rate, money supply (M2), inflation rate, and three ratios that include M3/GDP, exports/GDP, and government deficit/GDP. The M3-GDP ratio measures financial deepening as reflected by the extent of financial intermediation. Exports-GDP ratio is a proxy for the domestic economy's dependency on export earnings. The deficit-GDP ratio measures potential for crowding out effect caused by deficit financing.<sup>23</sup> Except for ratios, interest rate, and inflation rate, all series are in terms of growth volatility of the corresponding variable (Model I). To examine the robustness of the results to the measures used here, we repeat the estimation replacing standard deviation of growth with mean of growth for variables where such substitution makes sense (Model II). Coefficient estimates for Models I and II are reported in Table 7. There are several interesting results.

First, the coefficient estimates for regime change is strongly significant in all four specifications, suggesting that the post-Apartheid era is marked by lower volatility in output and consumption *even after controlling for other contributing factors*. Second, the estimated coefficient of the financial deepening variable is also strongly significant in all four specifications. An implication of this result is that domestic financial architecture matter for income and consumption volatility.

It is noteworthy that the financial deepening variable is the inverse of velocity of circulation; conversely the proxy for the monetary transmission mechanism in the economy. Therefore, its variability argues for a switch to interest rate-targeting as opposed to the targeting of reserves in the management of money supply. In fact, the Reserve Bank of South Africa in February 2001 adopted an inflation-targeting

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<sup>23</sup> This assumes that the marginal social benefits from government spending are below that of private investment.

regime using interest rate as instrument. Third, volatility of inflation rate adds to consumption volatility, as indicated by a positive and significant coefficient estimate for inflation. This result is not surprising given the absence, until recently, of indexed financial instruments and the lingering exchange control restrictions that constrain consumer's diversification horizon. Besides, the high comovement of income and consumption predicts high variability in consumption when income is buffeted by inflation.

Fourth, fiscal policy appears to affect consumption volatility presumably through changes in appropriations with regard to transfer payments and other social spending as well as payroll. To summarize, inflation (representing monetary policy stance), broad money supply, fiscal policy, terms of trade and the regime dummy seem to have picked up much of the volatility in this model.

These results identify proximate causes of volatility in output and consumption growth in South Africa. The South Africa data tend to reject H2 because the periods of crises identified in Tables 8 and 9 as well as the proximate causes noted above do not follow from structural features typical of developing countries. In particular, the oil crises that were identified as defining South Africa's crises impacted on Japan and the United States as well. These powerful economies were not immune to these shocks, a fact which we noted in I.2 where we compared South Africa to trading partners inclusive of industrialized countries.

### *Section III: Effects of crises and volatility on the DFA*

#### **III.1 Assessing domestic financial architecture: characterization and functioning**

This section addresses the basic hypothesis that excess aggregate volatility, particularly crises episodes deteriorate the quality of institutions (maintained hypothesis H3). This direct effect is one of the principal motivations for the entire studies in this volume on macroeconomic volatility and institutions. Interestingly, in the case of South Africa as with Chile, the identified episodes do not appear to have impaired the functioning of the financial institutions in any appreciable way, certainly not of the order experienced elsewhere as described in the papers in this volume on Argentina, Brazil, Thailand, and Soviet Union. Therefore, we present South Africa as a case of domestic financial institutions robust to severe macroeconomic shocks and later, speculate about factors that could account for this relative stability. But, first we assess the domestic financial environment with regard to its functioning (or intermediation services). Then we speculate as to why, if we are so smart, how come with are not so rich? Why would a solid financial environment fail to provide adequate risk-mitigation services? The answer is examined in Section IV under problems of risk management whereas possible solutions and consequences for the design of IFA are given in the conclusion in Section V.

#### *Reforms in the 1980s*

Two eras can be distinguished; the pre and the post-1994 regimes. It would be fair to say that the early development of financial intermediation goes back to the late 16th century but that its preeminence was not until the advent of reforms in the eighties. Of



relevance is the parallel evolution of depository and contractual savings institutions.

Contractual savings institutions are still very significant players in South Africa's highly concentrated financial sector. Until recently when Sanlam sold its controlling shares in Absa Bank to Barclays Bank, the four largest banks were all owned by life assurance companies; Old Mutual controls Nedbank, Liberty Life controls Standard Bank, and Southern Life controls First National Bank. Together with a fringe competitor, Investec Bank, these five banks account for over 80 percent of the asset base in the South Africa banking industry.

### **Financial services in the 1980s**

During this period in which South Africa remained isolated by the rest of the world, there was little international coordination in terms of regulatory practice. Domestically, there was as well little coordination or contact among the regulatory agencies that were responsible for oversight of the financial services sector. With regard to the conduct of financial intermediaries, explicit competition in interest rates begun in 1983 with the abolishment of the Register of Cooperation (that hitherto suppressed competition in deposit rates and induced disintermediation to contractual savings institutions already favored by differential tax breaks). In other respects though, the "playing field" can be described as uneven.

### **Domestic banks and their competitors**

Competition from foreign banks was limited in part due to political isolation and in part to protect locals from competition. However, foreign banks were active in corporate banking, often catering to their multinational clientele. Banks were at a competitive disadvantage with the insurance companies. Competition among the life insurers then

(and now) was limited in what is clearly an oligopoly market. Disclosure requirements by industry regulators were very minimal, and were even lower than the already weak disclosure requirements for banks.

### **Capital markets**

South Africa had one organized trading floor, the Johannesburg Stock Exchange [JSE]. The introduction of trading on index futures in 1989 allowed for some price competition in the equities markets than was hitherto possible. Trading in bonds had its origins outside an organized exchange but in 1989, the formal and informal bond markets were combined into the Bond Market Association, later transformed into the Bond Exchange of South Africa.

### *Post-Apartheid reforms*

#### **Bank regulation and competition**

The reestablishment of relations with the rest of the world enabled South Africa's financial regulators to cooperate with foreign regulatory agencies in order to begin streamlining regulatory practices. As well, domestic financial institutions began to increase their presence in major international financial centers and enter into other African countries.

To attract international players, domestic regulators sought to balance the domestic playing fields for local and foreign financial institutions. Nonetheless, foreign banks remain excluded from retail banking. Forces of competition unleashed by the opening up (even if partially) of the financial market stimulated yet other innovations in the product lines to better serve customers' needs. One such event despite initial

opposition from the banks is the introduction of money market funds in 1997, as a substitute for bank deposits.

### **Micro finance and non-bank banks**

In view of the history of South Africa and its highly unequal income distribution, much work is needed in micro-credit in order to improve the risk coping strategies of the majority of economic agents and hence achieve a real reduction in the volatility of per capita consumption. Recognizing this need, the financial services industry has confronted the challenges of access to finance and banking facilities by small, medium and micro enterprises as well as the “unbanked and under-banked” communities.

Concrete steps include the introduction in 1998 by the JSE, of a virtual service called the Emerging Enterprise Zone [EEZ] to match seekers and providers of capital for small and medium enterprises. In addition, the industry has developed a Financial Sector Black Economic Empowerment Charter to improve access to financial services and promote increased ownership of a piece of the financial services pie by historically disadvantaged people. The Charter made public on 17 October 2003 sets out targets that will be pursued through to December 2014.

By a recent account, approximately half the population of South Africans does not use financial services. Furthermore, thirty five percent of the population has never “banked” (Falkena et al., 2004). The main impediment is the cost of financial services.<sup>24</sup> Possible

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<sup>24</sup> The annual effective return on a savings account at the largest bank in South Africa is a whopping negative 19.49 percent, based on an initial lump sum deposit of R500 (less than \$100), 11 monthly deposits of R100 each, 3 withdrawals of R250 each and a final withdrawal of the balance on the account (see Falkena, et al. for details across 8 banks surveyed). No bank returned a nonnegative yield.

remedies now being suggested by way of proposed amendments to banking legislation include the introduction of hybrid banks to be designated second and third-tier banks. Their advantages will lie principally in low cost diversification benefits through denomination intermediation and transaction economies.

According to Falkena et al (2004), “narrow banks” are second-tier banks that would accept retail deposits but can invest only in pre-authorized instruments. This arrangement would transform them into de facto mutual funds. Third-tier banks would be limited geographically. Essentially, they would take deposits and make loans to the same community of customers; would become insufficiently diversified, could not grow in any meaningful way as their economic fortunes would be inextricably linked to their locality. There would be little scope for economies of scale and scope, and thus they would be condemned to small-time.

Such ordination is because regulators reason that delimiting third-tier banks in this manner avoids systemic risk. Even if this were to be the case, it represents a very inefficient way to safeguard the banking system. Since institution building is a key objective of this study, we seek an understanding of this potential legislation but offer a feasible alternative (i.e., one that is politically acceptable, given the endogeneity of institutions).

### *Globalization and domestic architecture for micro-finance*

We draw from the literature on economics of organization, particularly insights from *multitask agency theory* to boldly suggest a feasible organization form to service low income clientele. According to this theory, how a regulator or bureaucrat allocates her effort among multiple goals is determined by the relative benefits to be derived from

the various goals and by the complementarity or substitutability of the tasks.

Therefore, incentives must be balanced across tasks in order to avoid effort substitution (Holmström and Milgrom, 1991). Using this insight, it is easy to see how, depending on the structure of incentives that confront regulators in South Africa, the Financial Stability Unit can advocate third-tier banks as it seeks to reduce financial fragility at the expense of the quality of intermediation.<sup>25</sup>

Dewatripont, Jewitt, and Tirole (1999) make a distinction between objectives that are not *per se* incompatible and those that are at odds, and emphasize that because important tasks can be neglected even when they are not incompatible, tasks could be separated (for example through the creation of “advocates”). However, Dewatripont et al. (2000) note that while such models of effort substitution can handle problems of balanced incentives and exclusivity (the latter referring to situation where agents are forced to select one Caesar in the presence many masters), it is not suitable for analyzing the separation of tasks. Nonetheless, it can motivate the creation of multiple agencies as a solution to incentive design problems when such incentives cannot be otherwise balanced across compatible tasks.

Applying multitask agency theory to the question of third-tier banks, recommends that the compatible tasks of achieving safety and efficiency/service quality be separated by reason of incentives. The Financial Stability Unit (local regulator) continues to monitor soundness whilst the international financial institutions supply loan

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<sup>25</sup> Wilson (1989) emphasizes the incentive cost of focusing on multiple goals and hence why it may be useful for an agency to sacrifice other important tasks for the benefit of achieving focus.

guarantees to tier three banks (a quasi-deposit insurance) to enable these banks raise long term capital from the global capital market, retain their major retail base within the under-banked (niche market) but remain free to diversify its loan portfolio and deposit base. In addition to the guarantee, IFI will provide technical assistance by way of training lending and loan monitoring officers (advances review and advances control executives). By lowering the cost function of these banks such technological transfers can in the long-run deliver benefits that exceed the other direct handouts. At the least, it is a welcome departure from the classic aid-in-cash solution to African's development challenges—globalization would be teaching us how to fish.

Subsidized financing can be justified on the basis that third-tier banks are unable to appropriate completely the benefits from nurturing low quality customers into creditworthy borrowers. To the extent that these banks compete with big time full service banks for “upgraded” customers, third tier banks face adverse selection challenges.

### **Non bank financial intermediaries**

Although not pinpointed in our empirical analyses, one of the biggest shocks to private consumption (through its impact on current income and thus wealth) is health problems pertaining to debilitating illnesses, catastrophic health care and geriatrics. In addition, shocks to income from death has become pretty much predicable in recent times as have the consequences of retirement.<sup>26</sup> In the latter case, the co-movement of income and consumption is amplified because the fall in income around retirement generates a necessary fall in consumption. We can

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<sup>26</sup> A recent estimate ranks South Africa as having the largest concentration of HIV-AIDS infection in the world. At about 5 million people infected, it is the leading cause of death in the country and accounts for 75 percent of all new orphans (Ntuli et al, 2004).

gain some understanding of why such predictable changes are not fully hedged by looking to the non bank financial intermediaries.

More than any other industry in the financial services sub-sector, the contractual savings institutions are core to income-consumption risk management in the economy. Their centrality is only matched by their remarkable financial strength. Using a conservative estimate that excludes short-term insurers from the classification of institutional investors, Vittas (2003) notes only four countries in the world as having institutional investors with an asset-GDP ratio greater than South Africa's.<sup>27</sup> Contrasting the world ranking of South Africa's institutional investors with its world ranking in terms of income or consumption volatility reveals a divergence that suggests a serious wedge between South Africa's risk management potentials and its performance. According to one estimate (Ntuli et al., 2004) approximately 8.5 percent of GDP was spent on healthcare at least in fiscal 2003/4; all taxpayers contribute to the National Health Insurance; the private sector consumes in excess of sixty percent of the healthcare budget, employs over seventy percent of the healthcare professionals but represents access to just twenty percent of the population.

The non bank financial intermediaries are dominated by life companies although retirement schemes are the most popular products. Industry concentration is high in the pension industry, in the life industry and relative to global trends, in the casualty business as well (Vittas, 2003). Specifically, ten out of a total of fifteen thousand schemes account for about half the industry assets of which life companies administer approximately ninety percent of these schemes. The two largest companies control sixty percent of the market.

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<sup>27</sup> Eliminating double counting, total assets of institutional investors including unit trusts in 2001 were 164 percent of GDP or R1.56 trillion (Vittas, 2003).

Total annual premiums (group life, individual life, and annuity) as a proportion of national income are rated the highest in the world, followed by a distant UK (15.2% vs. 10.7%) with US and Canada at 4.4 percent and 3 percent respectively (ibid, p.26). By contrast, total annual premiums from casualty business estimated to be 2.8 percent of national income compare favorably with many OECD countries. The concentration ratio is lower than in life and pension, and competition fiercer, particularly from captive companies. Recent rulings by industry adjudicator have urged for more transparency around the practice (of funneling business to captives) to avoid being in violation of the Financial Advisory and Intermediary Services Act (see below, and Clayton, 2005).

Although South Africa is said to have become riskier from increases in road accidents, auto theft, and other criminal activities yet its casualty premiums are globally competitive in comparison to the outrageous costs of providing contributory and defined benefits. Evidently competition matters.

As with micro financing, access to insurance (generically defined) is limited by the seemingly prohibitive costs of coverage. Focusing on the specific issue of healthcare even though similar concerns abound with regard to annuities and other investments (see footnote references), estimates show that insurance costs between 1980-96 have increased from 7 percent to 17 percent of annual employment compensation.<sup>28</sup> Costs of coverage now account for about ten percent of aggregate costs

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<sup>28</sup> Regarding access to credit by the poor, see [www.financialdiaries.com](http://www.financialdiaries.com); on the high cost of banking in South Africa, see Fisher-French (2005); on sharp practices by life insurers, see Cameron (2005), Clayton (2005), and Rose (2005); on unit trusts and investments generally, see Business Times Money (2005).



of employment with the result that annually, over twenty percent of those insured are forced to lower their coverage (Connelly, 2002).

If low quality services and consumer skepticism are part of the reported costs of accessing financial services in this regulated sub sector, it may be beneficial to consider modalities for international transfer of regulatory technology to improve capabilities locally unless there are political issues at work also. *De novo* entry into the sub sector by foreign firms should be welcome to consumers and the regulatory agencies. How to successfully create such a foreign investor-friendly environment requires a study of the political influence of financial services industries in South Africa. Nascent study of political campaign financing has just been initiated in South Africa (see [www.whofundswho.org.za](http://www.whofundswho.org.za)). We consider this initiative a major step in institution building.

## **Capital markets**

### ***Stock and bonds***

Several institutional changes occurred; the establishment of a modern electronic trading system; and the introduction of capital adequacy requirements for market participants. Other complementary changes, principally in the incentive structure include the introduction of competition in fees and commissions, abolishing of the South Africa citizenship requirement for membership, admission of corporate membership and extension of trading rules to allow dual-capacity trading. Positive signs of the reform can be measured in terms of growth in the annual value of shares traded which has jumped from R62 billion in 1994 to over R1 trillion in 2004 ([www.jse.co.za](http://www.jse.co.za)).<sup>29</sup>

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<sup>29</sup> These figures have not been adjusted for inflation.

Following the licensing of the bond exchange, the shift in bond trading in 1996 from the JSE to the BESA led to a substantial rise in the annual turnover in the secondary bond market from approximately R2 trillion to over R11 trillion in 2002.<sup>30</sup> BESA prides itself in being the first exchange in South Africa to achieve compliance with international best practices with regard to clearing operations.

Government is the dominant issuer of debts with the national government accounting for over 60 percent of the primary debt market. Local government and state-owned enterprises are the other significant players, principally the utilities. The first non-government bonds (collateralized mortgage obligations) were listed in 2001, followed in 2002 by credit swap synthetic securitizations and index-linked contracts. As at 2003, a total of 272 bonds were issued by 43 borrowers, of which six were corporations. Corporate bonds account for a mere three percent of the nominal issues in 2003 (Table 7).

The slow pace of development of the bond market has been attributed to regulatory impediments and weak demand from both investors and issuers. The “selling” of debt financing (popularization of the bond market) is something that requires further attention as part of institution-building.

### *Derivatives: Futures and Options*

In 1990, the enabling legislation is passed and South Africa Futures Exchange [SAFEX] is licensed as a derivatives exchange. Options on futures are launched in 1992 followed by the introduction of commodities futures (Safex Agricultural Derivatives Division) in 1995 and individual equity options 1997. Options are available on all listed futures contracts.

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<sup>30</sup> “Profiling the Bond Exchange of South Africa 2003,” [www.besa.za.com](http://www.besa.za.com), p. 12.

**Public finance**

The asset and liability management of the Government changed considerably over the past ten years. In the domestic financial market, the government sought to reduce the cost of borrowing, manage the maturity profiles of its liabilities, diversify funding instruments, become more transparent and thus build its reputation. The marketing of government debt through primary dealers was introduced in 1998 and the funding instruments diversified from fixed income bonds and treasury bills to inflation-linked bonds, variable rate bonds and retail bonds. Moreover, considerable progress has been made in improving cash management through investments in interest-bearing deposits.

According to our findings, stability in government expenditure can mitigate consumption volatility. Therefore, Government spending is not only a significant component of the autonomous consumption of many poor residents, but also forms part of the available risk insurance products (unemployment benefits and other social expenditures).

**Monetary policy and exchange control**

In February 2000, South Africa formally adopted an inflation-targeting regime. Under this framework, the Reserve Bank announced that there would be no intervention to stabilize the value of the Rand in the foreign exchange market and that exchange rate volatility was inevitable under an increasingly open economy.

With regard to capital control, the Authorities have followed gradualism in what it clearly an outbound bias in the potential net flows. Whereas a huge amount of demand for capital outflow is ostensibly being held up by fiat, the prerequisites for an offsetting free

inflow is far from established. Still, the investment opportunity set of institutional investors have widened through the slackening of exchange restrictions but limits are still binding with regard to the amounts that residents may invest abroad or that emigrants may repatriate. Institutional investors also face limits on the amount of funds they can invest abroad; currently 15 percent of their assets.

### **III.2 Effects of volatility and crises on DFA**

During the high inflationary periods in the eighties—a time of considerable macroeconomic volatility—certain holders of monetary assets such as building societies, contractual savings institutions, and generally financial intermediaries witnessed erosion in the value of their wealth whilst real returns declined. On the other hand, holders of monetary liabilities and physical assets such as real estate gained. In order to manage this and other shocks in the last three decades (which shocks have already been exhaustively reviewed here), domestic financial institutions had to reconfigure, beginning first with adjustment in ownership structure and control. Control changes enabled institutions to subsequently institute innovations that ensured economic viability.

Building societies merged into banks that managed shocks better through both structural changes and product innovations (for details, see Jones and Müller, 1992d). This and the earliest wave of divestment in reaction to Apartheid completed the vesting of the ownership of the major banks on the locals. The four largest banks then and now which constitute an oligopoly transformed themselves into bank holding companies. This corporate structure allowed them to expand product lines. In their innovation, they copied developments elsewhere notably the United States, to exploit economies of scope driven by technological opportunities. Each of the bank holding companies

owned a bank, a merchant bank, a leasing company and acquired sufficient latitude to bridge the divide between banking and commerce (without at the time, a corresponding regulatory burden).<sup>31</sup> Re-inventing themselves did not eliminate all the risks however and banks continued to pursue aggressive market strategy. Two of the large banks later developed financial crisis but were rescued in each instance through buyouts by the two largest life assurance companies.

Life insurance companies as contractual savings institutions were beneficiaries of enormous cash flows induced by several enabling factors. Close ties to mining concerns whose employees labored under hazardous conditions; industrializing and commercializing economy with affluent middle class, and as already noted generous fiscal incentives. Unable to efficiently diversify their holdings outside the region due to stringent exchange control, they went on a binge, buying up literally all assets on the local stock exchanges in South Africa and Zimbabwe.

The web of ownership linking the mining, financial and industrial sub sectors may have to some extent solved the asymmetric information problem (between borrowers and lenders) for the major firms in these industries thereby eliminating the usually pro-cyclical nature of credit and hence mitigating shocks. Two of the large mining houses are controlled by the two largest insurance companies, one of which also owns the largest industrial corporation. There has been substantive unbundling in recent times as part of reintegration into the global

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<sup>31</sup> Note that South Africa does not have a deposit insurance scheme.

economy.<sup>32</sup> Nonetheless, the legacy of the concentrated market power continues to be a source of concern to regulators and consumers.<sup>33</sup>

Costs and quality of financial services across the spectrum of providers have been a major factor in risk management. Consumers are not fully utilizing all potentially available instruments because of the high cost of services, criticized even by regulators (Financial Services Board, Banking Adjudicator, and Insurance Ombudsman) in some instances as sharp practices and in others as contraventions. Some of the inefficiencies are legacies from previously closed shops that are gradually dismantling (see for example Barrow, 2002).

#### *Section IV: The DFA, financial market failures, and aggregate fluctuations*

##### **IV.1 Effect of DFA weaknesses and volatility on financial intermediation**

This section examines two hypotheses (H6 and H8). The first is that weak financial institutions and volatility induce adaptive responses by economic agents. These responses create imperfections in the financial systems that then exacerbate financial fragility. The other is that inefficient risk management by the financial system is an additional source of excess volatility and crises but that removing the impediments to improving risk management is often hampered by institutional inertia (endogeneity of institutions), commitments to existing international financial arrangements, and domestic politics.

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<sup>32</sup> In 1987, Anglo-American Corporation, the mining giant that owns Southern Life controlled sixty one percent of the listed firms in South Africa. In 1991, the top five shareholders controlled 85 percent of the wealth. For more details, see Ayogu (2002), p.60.

<sup>33</sup> For instance, Vitas (2003) raises serious concern about the excessive exposure of institutional investors to country risk. This exposure is amplified by the high concentration of assets in equities. Should the stock market crash or the commercial and/or industrial sub sector suffer a serious shock, this can dangerously erode asset value and therefore cast doubts about ability to meet contractual obligations.

Therefore, how reforms proceed in the presence of these constraints is an exercise in institution building.

South Africa is an interesting case because although the institutions are not weakened by extreme volatility, the very factors that may be responsible for protecting these institutions also militate against efficient risk management. The market is very concentrated and protected as noted in the previous section which ensures a healthy profit; the pattern of ownership ensures a solid capital base which keeps the institutions healthy; exchange controls protect the institutions from capital surges but leave them with portfolio that is insufficiently diversified. The lack of competitiveness has also excluded a large proportion of economic agents from accessing risk management services and thus created a dual economy (segmentation/rationing) with a large proportion of the agents outside the formal financial system but yet employing innovative informal financial instruments. We examine the second hypothesis using the “complete market” model.

#### **IV.2 Effect of market imperfections (un-hedged risks)**

The *complete market* approach to assessing excess volatility asserts two joint propositions: Access to credit and the correct specification of the behavior or response of economic agents to consumption risk (i.e., when presented with opportunities, agents will exploit such opportunities to mitigate consumption risk). The model asserts that *volatility imposes costs on economic agents only when it is unanticipated*. Anticipated fluctuations can be hedged and the associated risks diversified using both domestic and international financial markets and institutions. A key assumption of the model is *availability of market structures and institutions that facilitate hedging* (otherwise called developed financial markets which, includes being integrated with

international financial markets). Accordingly, consumption is smoothed, making domestic consumption more concordant with world consumption (which by assumption is closer to the ideal).

The complete market approach can be modeled as an ideal against which a country's excess volatility, resulting from imperfections in market structures and institutions, can be assessed. Its testable implications are that (i) domestic consumption volatility is uncorrelated with domestic output volatility and (ii) domestic consumption volatility is similar to world consumption.

### *Empirical results*

We examine the testable implications of the complete market model as a prelude to exploring the link between aggregate volatility and institutions in South Africa. Accordingly, volatility estimates for GDP, consumption for South Africa and the world for 1960-2004 as well as non-overlapping nine year intervals are reported in the upper panel of Table 3.<sup>34</sup> All estimates are from per capita series to allow meaningful comparisons. Estimates suggest that South Africa's per capita consumption growth is less volatile than its GDP per capita. This is true for the full sample as well as every sub-sample. A similar pattern is also observed for world GDP and consumption volatilities although with a much smaller discrepancy. Moreover, consumption volatility is lower in South Africa than in the world when we estimate volatility over the entire sampling period and the first two sub-periods. But starting from 1978 (the third sub-period) South Africa's consumption volatility exceeds the world consumption volatility, the latter of which has continued to decline during the past 25 years. Several important

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<sup>34</sup> The window for these non-overlapping sub-samples is selected such that we increase the comparisons points without wasting recent data points or reducing the size of the sub-samples to the point that estimates become statistically meaningless. Findings are robust to alternative window lengths such as ten years and eight years, but data points for 2000-2004 are left out when these two windows are used.



political developments and economic consequences with international dimensions and thus impacting on the balance of payments contributed to the rise in consumption volatility evident from 1978. On the political side, we can look to events connected with the apartheid regime.

### *Economic factors*

On the economic side, international business and banks begin divesting from South Africa. In 1985, Chase Manhattan Bank, at the time the second largest US lender to South Africa, cut off credit to South Africa. Other US banks followed suit and refused to roll over maturing debt obligations, mostly short term but accounting for seventy two percent of the foreign debt (Kahn, 1991). By end 1987, forty percent of foreign firms divested while between 1985 and 1993 net capital outflow amounted to about R45 billion or approximately 11 percent of gross domestic fixed investment (Padayachee, 1991). Presumably such a massive disintermediation when viewed in conjunction with other contemporaneous events induced a severe reduction in consumption.

Part of the increased variability in the growth of aggregate consumption could be reflective of the state of the domestic financial architecture as a risk-coping mechanism. There has been also a switch in the trend in the volatility of consumption growth since 1995 coinciding with a similar increase in the variability of exchange rate changes (see, Figures 4 and 6). In our view, this close conjunction of events on the financial side and the real side is important in the present context in which we seek to link excess volatility to the quality of risk management mechanisms in the economy.

Furthermore, the drop in GDP and consumption volatilities reported for many industrialized countries during the last few decades seem to be reflected also in the volatility estimates for world GDP and consumption. However, South Africa does not seem to have enjoyed such volatility reduction until the post Apartheid period. For example, its consumption volatility is estimated to be 2.30 during 1960-68 and 2.32 during 1978-95, showing no systematic decline. The estimate drops to 1.20 for 1995-2004 coincident with when access to international capital market was re-established, specifically in 1995.

The lower panel of Table 3 reports correlation coefficient estimates for three pairs of per capita growth series: South Africa's consumption and GDP, South Africa's consumption and world GDP and South Africa's consumption and world consumption. Similar to the upper panel the estimates are reported for the entire sampling period as well as five non-overlapping sub-periods. These estimates suggest a high contemporaneous co-movement between South Africa's consumption and income growths which is not surprising within the "complete-market" paradigm, namely, that missing markets typically of developing countries induce high contemporaneous correlation between present consumption and even predictable income. In conclusion, our limited evidence suggests that complete-market model is not descriptive of South Africa's financial system.

To make a finer point of the matter, the growth rate of per capita consumption for South Africa is regressed on growth rate of per capita GDP for South Africa and growth rate of world per capita consumption. If the residents of South Africa had access to international capital markets and if domestic institutions in South Africa were sufficiently developed to allow diversification of idiosyncratic risk then the estimated coefficient corresponding to

domestic GDP should be insignificant while the estimated coefficient corresponding to world consumption should be positive and significant (which world consumption is by assumption “smoothed”). We estimate the equation using the full sample (1960-2003)<sup>35</sup> as well as two sub-samples corresponding to the Apartheid period (1966-1993) and post Apartheid period (1995-2003), with transition year omitted as before.<sup>36</sup>

Table 4 presents the regression results. Heteroskedasticity and autocorrelation consistent covariance estimates proposed by West and Newey (1987) are used to obtain robust standard errors. In all three samples, the coefficient estimate for South Africa GDP is positive and significant, rather than insignificant, and the coefficient estimate for world consumption is insignificant (negative in one case), rather than positive and significant. Coefficient estimates substantiate the correlation results that complete-market model is not descriptive of the financial system.

### *Inferences*

These results lead to a rejection of the complete-market model for South Africa. The rejection has important implications. First, South Africa appears to not possess either suitable domestic financial architecture or command adequate access to international capital markets to enable agents eliminate the cost of anticipated macroeconomic shocks through a comprehensive risk management. Second, excess volatility seems to be present in key macroeconomic variables. This implication is further supported by volatility estimates reported earlier in this section. But South Africa’s domestic financial institutions are stable. When banks had gotten into trouble, insurance

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<sup>35</sup> World data for 2004 was unavailable when we conducted this analysis.

<sup>36</sup> These regressions are statistically valid given that the growth rate series used are all stationary.

companies have been there to stabilize the turf. Non bank financial intermediaries are solid, yet risks are not sufficiently hedged. This financial markets failure, according to our analysis feeds back into aggregate volatility but the volatility does not impair financial institutions. Hence, we do not observe the volatility circle that exists in the case of some of the country case studies in this volume.

## *Section V: Conclusions*

### **V.1 Summary**

This study began by analyzing aggregate volatility of key macroeconomic variables in South Africa in order to examine the hypothesis (H1) that aggregate volatility in developing countries is substantially higher than in developed countries. We found a mixed result in that initially South Africa was within the industrialized country band but later deteriorated but without a corresponding impairment of DFA.

Then we identify and analyze the main sources of shocks, domestic and external, but with emphasis on external shocks in order again to examine the hypothesis that certain structural features typical of developing countries exacerbate aggregate volatility. Although the structure of production is quite diversified, the value added to GDP by sector contribution is still dominated by primary commodity exports, typical of developing countries. Furthermore, the manufactures and intermediate processing activities depend very much on imported raw materials and semi-processed components. This is reflected in the

terms of trade which represents a significantly external source of volatility. It is not clear however that this is a problem that the financial system can solve or is indicative of a dysfunctional DFA but it supports the hypothesis that certain aspects of macroeconomic volatility are structural.

Sections III and IV are the core hypotheses, namely that volatility weakens DFA which in turn impairs its ability to mitigate risks. Consequently, aggregate volatility increases further weakening institutions in a vicious cycle. In the present case, we find no compelling historical evidence or evidence based on our assessment to suggest that past crises impaired DFA. In fact, if DFA in South Africa is to be judged by outcomes in terms of consumption volatility, it seems that the system did better under apartheid when it had no linkages to the IFA than the current reforms beginning in the 1980s that sought to align practices with international norms. Certainly, the volatilities of recent times have not impaired domestic financial institutions. Therefore, hypothesis H3 is not supported by the evidence. Equally, the bidirectional causality between excess volatility and institutions has not been observed here.

Nonetheless, the inability of the DFA to mitigate risks adequately has caused financial mutations by segmenting the market and causing inefficient risk management and insufficiently hedged portfolios. The main problems to risk management are two fold. One lied in the structure of the financial sector which is basically a “closed shop,” and the other in the pattern of exchange control regulations that do not allow institutions to diversify their portfolio optimally.

## V.2 Recommendations

In terms of hypothesis H5, we find that there are no frequent changes in regulations, that property rights are secure, and that nominal anchor is predictable (inflation targeting has been very successful); furthermore, DFA institutions are not deficient; yet in terms of hypothesis H6, there are financial mutations and risk management is inefficient thereby feeding excess volatility and crises (without impairing institutions). *The question to be answered is why do high quality DFA institutions generate deficient risk management?*

Apparently, more reforms (exercise in institution-building) are required and admittedly there are constraints to accomplishing the sort of reforms envisaged. Much of the markets in South Africa may not be missing due to under-development but more importantly due to the high cost of accessing financial services (for instance, why does it take ten days to clear checks?) This is an area in which globalization of capital markets and expanded trade (in financial services) could prove useful. More competition is required in the domestic financial services sector but incumbents are firmly entrenched. Some unbundling may be necessary, reminiscent of the type imposed on the stock exchange when it sought to insert itself into the global market place by attracting foreign players. Prudent dismantling of exchange controls and removal of restrictions on cross-border services are correlates as this would allow institutions to diversify their portfolio.

One connection between domestic and international financial architecture lies in the regulatory arena. Domestic institutions can emulate international best practices and assent to international protocols with regard to codes and ethics, regulatory standards, corporate structure and governance as well as service quality. Jurisdictional boundaries can of course interfere with the application of

international regulations locally but such hazards can be mitigated through the benefits to domestic firms of accessing international markets. However, such pressures to conform are blunted by exchange controls that prevent domestic institutions from exploiting those potential benefits of conforming to international standards.

Dismantling impediments to greater financial integration boils down ultimately to the calculus of the net benefits to policymakers from following either of several policy choices. As noted above, the authorities can either continue the restrictions to protect the domestic economy from the disturbances of capital surges or accept the costs of excess volatility (from insufficiently diversified portfolio). The balance can be tipped in favor of further dismantling of controls if international financial architecture can address the dangers of cross-border capital surges and the potential moral hazard from increased competitive pressures.<sup>37</sup> This is an area where a global solution trumps national remedies, forged country by country.

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<sup>37</sup> This abiding concern over financial volatility and its consequences for financial fragility is evident in the reasoning behind the restriction on negotiable certificates of deposits [NCDs]. South African Reserve Bank considers NCDs to be highly volatile funding instruments held by large institutional investors (see Reserve Bank DI 300 Question 2; [www.reservebank.co.za/internet/publication.nsf](http://www.reservebank.co.za/internet/publication.nsf))

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## Data Appendix

### *Annual Data:*

The real GDP, export, and import data for South Africa were obtained from Main Economic Indicators, Organization for Economic Cooperation and Development. Terms of trade, real consumption and its components, as well as real gross domestic investment, and M2 data for South Africa were obtained from the South African Reserve Bank. World real GDP, real consumption, and real per capita GDP data as well as South Africa's real per capita GDP and population data were taken from the World Bank's World Development Indicators.

Real GDP, consumption, and investment data for South Africa's main trading partners (U.S., U.K., Japan, and Zimbabwe) were obtained from World Bank World Development Indicators. Population data for these countries were obtained from International Financial Statistics. South Africa's main trading partners were identified based on export and import data from Cassim, R., D. Onyango, and D.E. Van Seventer, *The State of Trade Policy in South Africa, Trade and Industrial Policy Strategies*, January 2004 and [http://www.southafrica.info/doing\\_business/sa\\_trade](http://www.southafrica.info/doing_business/sa_trade).

### *Quarterly and Higher Frequency Data*

Nominal GDP, consumption, investment, government expenditures and deficit, export and import, GDP deflator, consumer price index, real GDP, money market rate, discount rate, M2, M3, capital inflow and outflow, and Rand exchange rate data for South Africa were all obtained from International Financial Statistics. Terms of trade, export price index and import price index data were obtained from the South African Reserve Bank. Inflation rate (CPI based) for South Africa is obtained from the South African Reserve Bank, Quarterly Bulletin. When appropriate the data are seasonally adjusted.

**Table A: Percent value added by type of economic activity  
(2000 prices)**

<i>Year</i>	<i>Primary sector</i>	<i>Secondary Sector</i>	<i>Tertiary Sector</i>	<i>Community, social and personal Services</i>
1960	24	18	52	6
1961	24	18	52	6
1971	19	25	52	5
1981	14	29	55	4
1991	13	25	62	6
2001	10	24	65	6
2004	10	23	67	6

Source: SARB Quarterly Bulletin

**Table B: Distribution of export (percent) by sector**

<i>Year</i>	<i>Primary</i>	<i>secondary</i>
1989	45	55
1994	68	32
1999	59	41
2004	67	33
2005	67	33

Source: SARB Quarterly Bulletin

**Table C: Population distribution by South Africa's racial  
classification**

<i>Year</i>	<i>Population</i>	<i>Africans</i>	<i>Asians &amp; Indians</i>	<i>Coloureds</i>	<i>Whites</i>
1991	30.98	21.60	0.98	3.20	5.06
1996	40.58	31.10	1.04	3.60	4.43
2001	44.08	35.41	1.10	3.99	4.20

Notes: Population is in millions. Source is Statistics SA Census 2001, 1996, 1991. The data source uses the term Blacks to refer to Africans but here and throughout our paper, 'Blacks' refers to Africans, Asians & Indians, and Coloureds.

**Table 1: Unit root test results- South Africa's annual macroeconomic data**

Time Series	Dickey-Fuller Test	ADF Test Two AR Terms
Real GDP	-0.468 (0.887)	-0.495 (0.882)
Real GDP Growth	-2.508** (0.013)	-1.957** (0.049)
Real GDP Per Capita Growth	-3.761*** (0.000)	-2.869*** (0.005)
Real Consumption	0.793 (0.992)	1.159 (0.997)
Real Consumption Growth	-1.886* (0.057)	-1.555 (0.111)
Real Consumption Per Capita Growth	-3.323*** (0.001)	-2.660*** (0.009)
Real Investment	-1.274 (0.632)	-1.225 (0.654)
Real Investment Growth	-3.875*** (0.000)	-3.186*** (0.002)
Real Investment Per Capita Growth	-4.583*** (0.000)	-3.703*** (0.001)
Real Export	0.843 (0.993)	1.170 (0.997)
Real Export Growth	-3.295*** (0.001)	-2.505** (0.013)
Real Export Per Capita Growth	-4.247*** (0.000)	-3.197*** (0.002)
Real Import	0.212 (0.970)	0.484 (0.984)
Real Import Growth	-4.540*** (0.000)	-3.394*** (0.001)
Real Import Per Capita Growth	-5.354*** (0.000)	-4.145*** (0.000)
Terms of Trade	-0.710 (0.402)	-0.817 (0.355)
Growth in Terms of Trade	-6.743*** (0.000)	-5.206*** (0.000)
Trade Deficit as Percent of GDP	-3.202*** (0.002)	-3.272*** (0.001)

Notes: The numbers in parentheses are MacKinnon's (1996) p-values corresponding to Dickey Fuller (or Augmented Dickey Fuller) Test Statistics. "\*\*", "\*\*\*" and "\*\*\*\*" indicate significance at the 10%, 5%, and 1%, respectively. See Data Appendix for source of data. Henceforth, when not specified, data source is listed in the Data Appendix.

**Table 2: Statistics for South Africa's Key Macroeconomics Time Series**

Series	1960-2004 Sample			1960-1993 Sample			1995-2004 Sample		
	Mean	St. Dev.	Range	Mean	St. Dev.	Range	Mean	St. Dev.	Range
<b>In Growth Rate</b>									
GDP	0.78	1.12	(-2.11, 5.02)	0.79	1.26	(-2.1, 5.0)	0.67	0.49	(-0.2, 1.8)
Consumption	1.07	1.51	(-4.03, 5.65)	1.04	1.65	(-4.0, 5.6)	1.07	0.93	(-1.6, 2.5)
Investment	0.73	4.17	(-11.7, 16.7)	0.62	4.66	(-11.7, 16.7)	0.59	2.40	(-7.3, 4.1)
Terms of Trade	0.15	5.00	(-17.9, 13.4)	0.18	5.12	(-13.2, 13.4)	-0.11	3.36	(-7.6, 6.6)
Export	1.24	6.48	(-21.7, 22.2)	1.27	6.83	(-21.7, 22.2)	1.49	6.21	(-9.6, 14.3)
Import	1.19	6.91	(-26.0, 20.4)	1.06	7.68	(-26.0, 20.4)	1.02	3.84	(-9.3, 9.0)
M2	3.63	2.74	(-3.0, 10.6)	3.69	2.86	(-3.0, 10.6)	3.25	2.52	(-1.7, 7.0)
R/\$ Exch. Rate	1.35	5.59	(-18.4, 23.4)	1.28	5.08	(-18.4, 23.4)	3.36	5.45	(-6.9, 20.0)
<b>In Level</b>									
Inflation Rate	8.43	5.46	(-4.7, 24.5)	9.12	5.64	(-0.4, 24.5)	6.59	3.57	(1.1, 16.4)
Discount Rate	10.10	5.02	(2.35, 21.8)	9.06	5.04	(2.35, 21.7)	15.39	2.70	(11.7, 21.8)
Money Market Rate	9.56	5.33	(1.7, 22.5)	8.76	5.62	(1.7, 22.5)	13.98	2.93	(9.5, 20.5)

*Notes:* All series are Quarterly and seasonally adjusted when appropriate. GDP, consumption, investment (gross private), export, and import series are all real (inflation adjusted); the growth rates reported for these series are for one quarter and not annualized. When splitting the sample to Apartheid and post-Apartheid sub- periods, 1994 which is the transition year is excluded.



Table 3: Inter temporal Volatility-Comparisons

	Full Sample (1960-2004)		1960-1968		1969-1977		1978-1986		1987-1995		1998-2004	
	St. Dev. Of GDP	Cons	St. Dev. of GDP	Cons	St. Dev. of GDP	Cons	St. Dev. of GDP	Cons	St. Dev. of GDP	Cons	St. Dev. of GDP	Cons
South Africa	3.56	2.56	3.30	2.30	4.11	2.61	4.74	3.58	2.06	2.32	1.36	1.20
World	3.43	3.25	4.96	4.83	5.27	4.93	1.72	1.52	0.89	0.64	0.85	0.51

	Full Sample Correlation	1960-1968 Correlation	1969-1977 Correlation	1978-1986 Correlation	1987-1995 Correlation	1998-2004 Correlation
South Africa Consumption & Its GDP	0.799	0.566	0.824	0.830	0.879	0.894
South Africa Consumption & World GDP	0.019	-0.177	-0.137	-0.251	0.701	0.032
South Africa Consumption & World Consumption	-0.036	0.186	0.171	0.469	0.580	-0.173

*Notes:* All series are annual due to unavailability of some of the series at quarterly frequency. GDP and Consumption are real (inflation adjusted) and per capita. Correlation estimates are based on real (inflation adjusted) per capita growth series.

Table 4: Consumption Output Relationship

Dependent Variable: South Africa Consumption	1960-2003 Sample Coef. Estimates	1960-1993 Sample Coef. Estimates	1995-2003 Sample Coef. Estimates
South Africa GDP	0.579*** (0.071)	0.577*** (0.073)	0.746** (0.242)
World Consumption	0.035 (0.063)	0.041 (0.065)	-1.145 (0.895)
Constant	0.706** (0.063)	0.641 (0.396)	2.637 (1.704)
Adjusted R <sup>2</sup>	0.623	0.633	0.453

*Notes:* All variables are per capita real (inflation adjusted) growth rates. The transition year 1994 is dropped from the post-Apartheid samples. Sampling period ends in 2003 rather than 2004 due to world data unavailability. Robust (heteroskedastic and autocorrelation-consistent) standard errors are in parentheses. “\*”, “\*\*” and “\*\*\*” indicate significance at the 10%, 5%, and 1%, respectively.

**Table 5: Growth and Growth-Volatility Comparisons  
(1960-2003)**

Countries	GDP		Consumption		Investment	
	Per Capita Growth		Per Capita Growth		Per Capita Growth	
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
South Africa	0.92	3.56	1.32	2.56	1.43	8.01
Japan	4.05	3.65	4.00	3.25	4.88	7.33
U.K.	2.11	1.80	2.54	2.41	2.41	5.06
U.S.	2.23	1.97	2.58	1.80	2.99	5.60
Zimbabwe	0.45	5.81	1.43	12.42	-1.20	14.86

*Notes:* All series are annual due to unavailability of some of the series at quarterly frequency. GDP, Consumption and Investment are all real (inflation adjusted). Series for U.K. consumption and investment and Zimbabwe consumption and investment have a few missing observations in the early sample years. Sampling period ends in 2003 rather than 2004 due to data unavailability for some countries.

Table 6: GDP Volatility Components and Consumption Volatility

Dependent Variable →	GDP Volatility		Consumption Volatility	
	Full Sample	Post-1994 Sample	Full Sample	Post -1994 Sample
<b>Regressors ↓</b>				
<b>Volatility</b>				
Consumption	0.094* (0.050)	0.076* (0.041)		
Investment	0.016 (0.019)	0.042** (0.019)		
Government Expenditures	0.006 (0.010)	0.144*** (0.019)		
Exports	-0.016 (0.012)	0.029*** (0.008)		
Imports	0.037*** (0.012)	-0.014 (0.010)		
Constant	0.558*** (0.132)	-0.066 (0.061)	1.085*** (0.121)	0.728*** (0.176)
GDP	----	----	0.311*** (0.104)	0.342 (0.249)
<b>Diagnostics</b>				
Adjusted R2	0.89	0.89	0.80	0.77
Durbin-Watson	1.73	2.01	1.94	1.87
Order of MA Errors	4	4	4	4

Notes: All series are quarterly. Volatility series are the rolling standard deviation of growth rates for the corresponding variables. All variables are based on real (inflation adjusted) measures. Sampling period starts with fourth quarter of 1961 as this is the first year where rolling standard deviations with an eight quarter window can be estimated. When making a pre-post Apartheid distinction, the transition year 1994 is dropped. Standard errors are in parentheses. “\*”, “\*\*” and “\*\*\*” indicate significance at the 10%, 5%, and 1%, respectively.

Table 7: Components of GDP Volatility and Consumption Volatility

Dependent Variable →	GDP Volatility		Consumption Volatility	
	Model I	Model II	Model I	Model II
<b>Regressors ↓</b>				
Constant	-1.5644 (1.0710)	-0.2146 (1.2760)	-2.4544* (1.3959)	-4.6758*** (1.5966)
Regime Switch	-0.3176*** (0.1104)	-0.3330*** (0.1057)	-0.5354*** (0.1367)	-0.4600*** (0.1317)
<b>Volatility (Shocks)</b>				
Terms of Trade (growth)	0.0280* (0.0169)	0.0233 (1.2760)	0.0259 (0.0223)	0.0226 (0.0223)
Capital Inflow (growth)	0.0005 (0.0016)	----	-0.0029 (0.0026)	----
Capital Outflow (growth)	-0.0004 (0.0005)	----	-0.0001 (0.0008)	----
Rand/Dollar Exchange Rate (growth)	0.0041 (0.0112)	----	0.0120 (0.0175)	----
Money Market Rate	-0.0249 (0.0416)	----	0.0040 (0.0598)	----
M2 (growth)	-0.0105 (0.0367)	-0.0042 (0.0360)	-0.0185 (0.0594)	-0.0464 (0.0538)
Inflation Rate	0.0247 (0.0248)	0.0275 (0.0241)	0.1246*** (0.0431)	0.1460*** (0.0321)
<b>Mean</b>				
M3/GDP (Financial Deepening)	6.8951*** (1.6567)	5.2367*** (1.8088)	5.4512*** (2.0500)	7.0250*** (2.2096)
Export/GDP	-5.1677*** (1.8393)	-5.7265*** (1.7341)	1.2179 (2.4765)	4.2099* (2.1614)
Government Deficit/GDP	-3.7405 (11.6374)	0.3034 (11.3176)	-24.6474* (15.0913)	-46.887*** (15.5274)
Capital Inflow (growth)	----	-0.0022 (0.0020)	----	0.0042 (0.0027)
Capital Outflow (growth)	----	0.0004 (0.0011)	----	0.0003 (0.0018)
Rand/Dollar Exchange Rate (growth)	----	0.0182 (0.0129)	----	0.0058 (0.0183)
Money Market Rate	----	-0.0309** (0.0142)	----	0.0260 (0.0171)

<b>Diagnostics</b>				
Adjusted R2	0.90	0.91	0.71	0.84
Durbin-Watson	1.81	1.84	2.16	1.92
Order of MA Errors	4	4	4	4
Effective Sample Size	158	158	158	158

*Notes:* All series are quarterly. Volatility series are the rolling standard deviation of growth rates for the corresponding variables. When appropriate, variables are based on real (inflation adjusted) measures. Sampling period starts with fourth quarter of 1961 as this is the first year where rolling standard deviations with an eight quarter window can be estimated. Due to data unavailability some series are shorter, reducing the effective sample size. Standard errors are in parentheses. *\*\*\**, *\*\** and *\*\*\*\** indicate significance at the 10%, 5%, and 1%, respectively.

Table 8: Periods of crises measured by key macroeconomic variables- South Africa

Years ↓	<i>Bi-annual Volatility Measures</i>									
	GDP	Consum	Invest	Govern Expend	Terms of Trade	<u>M3</u> GDP	<u>Export</u> GDP	<u>Deficit</u> GDP	Inflation	MMR
1964-65	0.95	0.79	3.27	<b>12.63</b>	4.07	0.005	0.013	0.0054	0.83	0.67
1966-67	<b>2.11</b>	<b>2.00</b>	<b>4.17</b>	<b>16.21</b>	3.14	<b>0.016</b>	0.006	0.0042	1.90	0.41
1968-69	<b>1.72</b>	0.97	2.94	2.13	5.07	0.012	0.015	0.0061	1.19	0.23
1970-71	<b>1.55</b>	1.65	3.70	4.45	4.97	0.009	0.007	0.0052	2.14	0.61
1972-73	1.23	1.38	2.01	4.33	5.79	0.012	0.011	0.0080	2.65	0.92
1974-75	0.99	<b>2.14</b>	<b>6.55</b>	5.53	4.40	<b>0.021</b>	0.009	<b>0.0091</b>	2.80	0.47
1976-77	<b>1.32</b>	1.35	3.93	4.48	<b>6.73</b>	0.010	0.013	<b>0.0124</b>	3.12	0.45
1978-79	1.02	<b>2.23</b>	<b>8.73</b>	3.94	4.22	<b>0.016</b>	<b>0.024</b>	0.0088	<b>5.99</b>	1.63
1980-81	0.69	<b>1.93</b>	<b>5.50</b>	<b>6.82</b>	<b>9.12</b>	<b>0.018</b>	<b>0.045</b>	<b>0.0116</b>	<b>5.13</b>	<b>3.42</b>
1982-83	<b>1.51</b>	1.49	<b>4.80</b>	3.77	<b>6.80</b>	0.012	0.016	<b>0.0090</b>	2.62	<b>2.46</b>
1984-85	1.29	<b>2.31</b>	2.34	<b>5.76</b>	6.04	0.007	<b>0.036</b>	0.0089	3.65	<b>3.10</b>
1986-87	0.69	1.32	3.52	<b>8.06</b>	<b>7.09</b>	0.014	<b>0.021</b>	0.0086	3.44	1.01
1988-89	0.68	1.21	2.66	3.22	3.92	0.015	0.012	0.0090	2.02	<b>3.15</b>
1990-91	0.28	1.73	1.62	3.78	2.91	0.010	0.015	0.0080	1.67	1.57
1992-93	1.03	0.78	1.94	1.32	1.94	<b>0.025</b>	0.008	0.0071	<b>4.02</b>	2.01
1994-95	0.57	0.77	2.01	2.07	<b>9.51</b>	0.006	0.010	<b>0.0117</b>	3.48	1.73
1996-97	0.62	0.58	1.56	2.30	4.21	0.013	0.013	0.0053	2.41	0.78
1998-99	0.52	1.42	3.64	0.99	2.92	0.008	0.011	0.0079	<b>5.05</b>	<b>3.34</b>
2000-01	0.27	0.66	1.00	0.87	0.76	0.014	0.016	0.0076	2.89	0.47
2002-03	0.27	1.36	1.19	1.06	2.90	0.017	<b>0.029</b>	0.0080	<b>6.83</b>	1.67

Notes: All series are quarterly. Volatility series are the standard deviation of growth rates for (or the ratio of) the corresponding variables, obtained using an eight quarter window. When appropriate, variables are based on real (inflation adjusted) measures. Sampling period is adjusted to make all samples equal to the smallest available sample. Extreme volatility estimates (corresponding to the highest quartiles) for each variable are in boldface.

**Table 9: Periods of crises measured by key macroeconomic variables – South Africa  
(Regression Based)**

Years ↓	<i>t-Statistic Capturing Size of Volatility in a Given Year for Each Volatility Series</i>									
	GDP	Consum	Invest	Govern Expend	Terms of Trade	M3 GDP	Export GDP	Deficit GDP	Inflation	MMR
1966-67	9.03	6.83	6.80	<b>21.18</b>	5.31	4.46	3.59	9.72	3.43	1.77
1968-69	<b>11.00</b>	9.13	7.50	8.38	5.89	7.19	5.33	13.02	4.00	2.95
1970-71	<b>16.86</b>	7.36	7.52	8.46	5.93	6.99	5.91	10.89	4.76	2.79
1972-73	<b>14.86</b>	10.55	7.89	<b>9.63</b>	<b>9.46</b>	8.82	6.86	13.90	6.85	1.88
1974-75	9.36	<b>11.38</b>	<b>8.32</b>	9.34	8.49	<b>10.64</b>	5.51	17.32	7.46	1.09
1976-77	10.09	<b>11.89</b>	<b>11.39</b>	<b>10.33</b>	<b>10.06</b>	8.58	6.24	<b>23.02</b>	8.71	2.04
1978-79	9.73	<b>12.42</b>	<b>12.80</b>	<b>10.67</b>	<b>8.84</b>	8.14	8.80	<b>21.51</b>	<b>11.51</b>	3.01
1980-81	7.59	<b>13.62</b>	<b>11.61</b>	<b>10.08</b>	<b>8.74</b>	<b>14.26</b>	<b>14.34</b>	<b>21.70</b>	<b>13.95</b>	3.19
1982-83	<b>10.91</b>	10.18	<b>9.62</b>	8.96	7.79	9.45	<b>10.61</b>	<b>22.03</b>	<b>10.74</b>	14.62
1984-85	<b>10.54</b>	<b>14.00</b>	7.17	6.10	8.26	<b>9.64</b>	<b>11.06</b>	18.17	9.25	<b>18.62</b>
1986-87	10.40	9.95	8.09	7.39	7.30	9.38	<b>9.26</b>	17.68	10.43	<b>17.28</b>
1988-89	7.87	8.98	7.74	7.22	<b>8.58</b>	7.38	8.47	17.87	6.30	<b>17.81</b>
1990-91	5.21	6.48	4.66	4.89	7.02	7.12	6.87	19.36	5.25	<b>16.54</b>
1992-93	5.36	6.18	4.65	4.89	6.44	8.87	5.32	16.11	8.29	<b>16.76</b>
1994-95	4.50	5.89	4.00	4.49	6.97	<b>10.48</b>	4.76	<b>21.52</b>	9.41	<b>15.44</b>
1996-97	4.15	7.13	3.88	4.07	6.88	<b>9.97</b>	5.94	12.23	8.71	11.21
1998-99	4.60	8.01	4.71	3.44	4.39	7.91	5.91	13.76	10.57	14.90
2000-01	2.47	5.80	4.52	3.33	4.22	5.88	7.35	15.75	<b>10.58</b>	15.02
2002-03	1.64	3.82	2.58	3.06	3.97	7.59	<b>9.30</b>	15.85	<b>13.55</b>	12.67
MA(1)	16.61	12.99	12.38	14.73	15.39	18.57	10.89	6.21	8.65	27.29
MA(1)	8.29	5.46	7.71	8.62	10.82	10.43	5.73	3.97	3.85	15.18
MA(3)	5.19	1.93	5.12	8.43	7.31	5.86	3.54	----	1.80	19.07
MA(4)	7.17	5.83	----	2.87	6.48	7.76	----	----	----	44.95

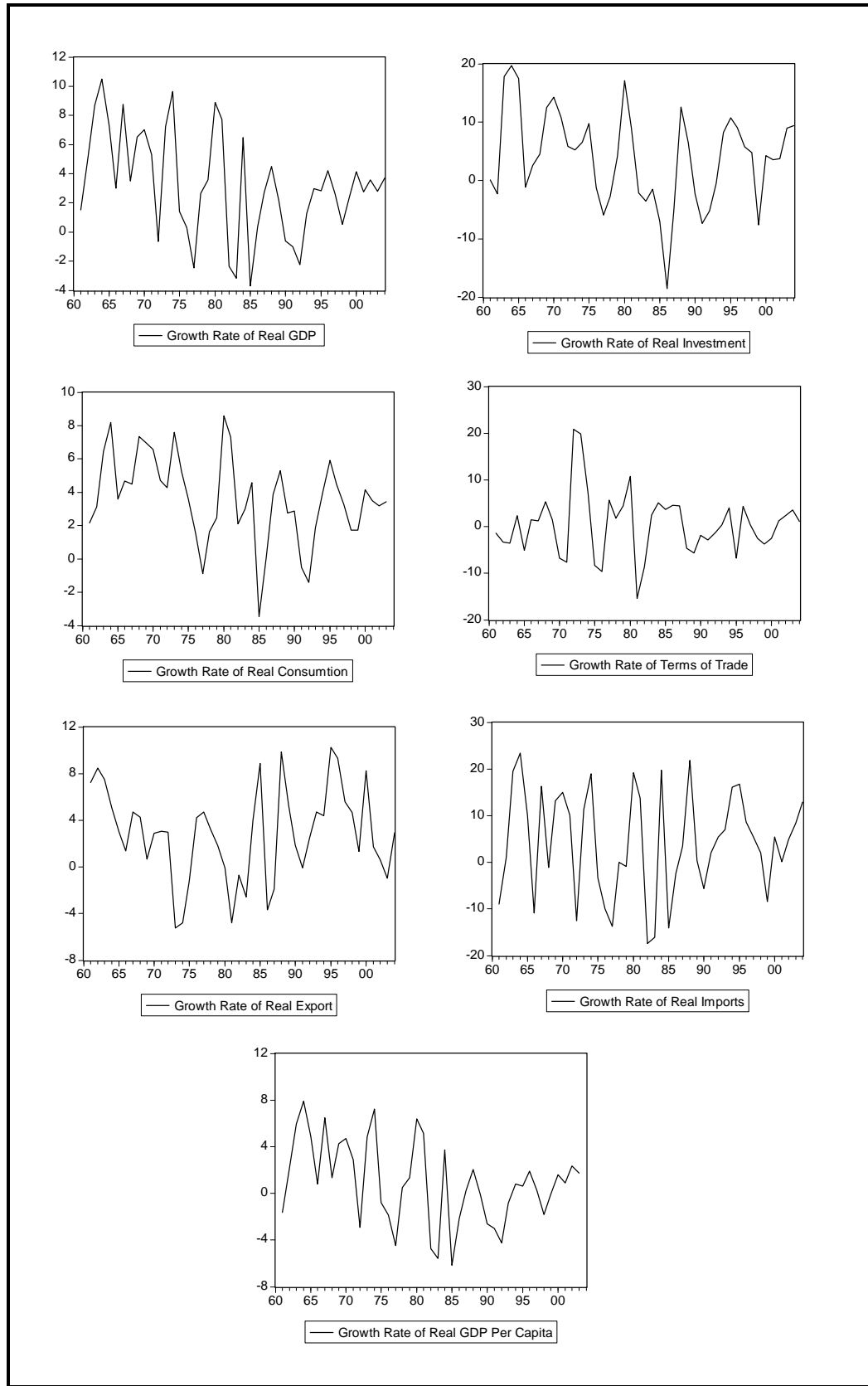
Notes: All series are quarterly. Volatility series are the rolling standard deviation of growth rates for (or the ratio of) the corresponding variables. When appropriate, variables are based on real (inflation adjusted) measures. Sampling period is adjusted to make all samples equal to the smallest available sample. Extreme t-values (corresponding to the highest quartiles) for each variable are in boldface. The statistics corresponding to MA(i) are the t-statistics for the corresponding moving average regression error terms, where the order is determined through testing of added terms.



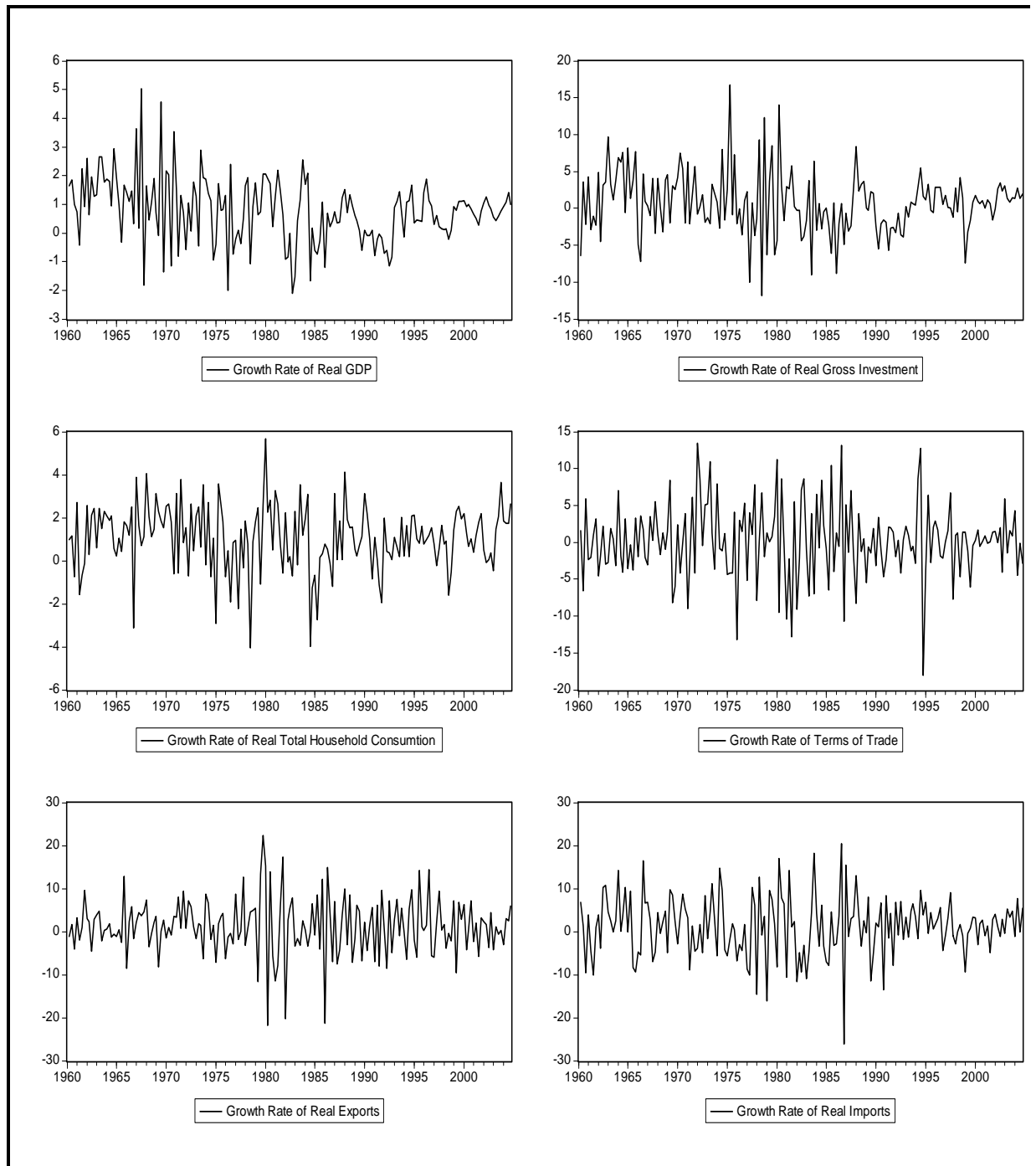
**Table 10: Distribution of Bonds by Issuer as at 2003**

<i>Issuer</i>	<i>Market share (%)</i>
Central Government (Treasury)	60
Municipal	1
Parastatals (state-owned enterprises)	11
Water Authority	5
Banks	7
Commercial paper	1
Securitization	11
Corporate	3

Source: [www.besa.za.com](http://www.besa.za.com), p.10



**Figure 1: Growth rates of macroeconomic series, South Africa (annual)**



**Figure 2: Growth rates of macroeconomic series, South Africa (quarterly)**

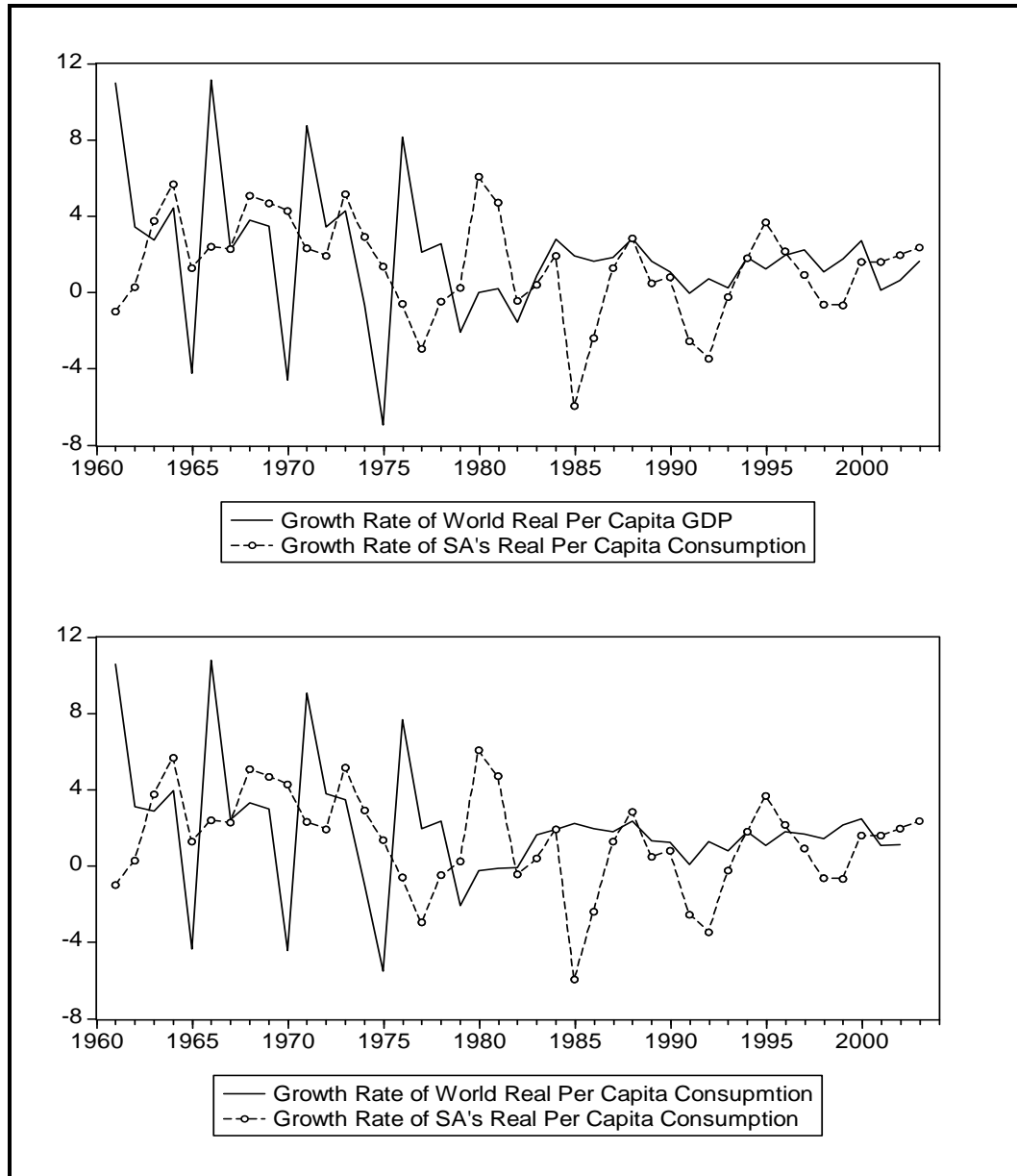
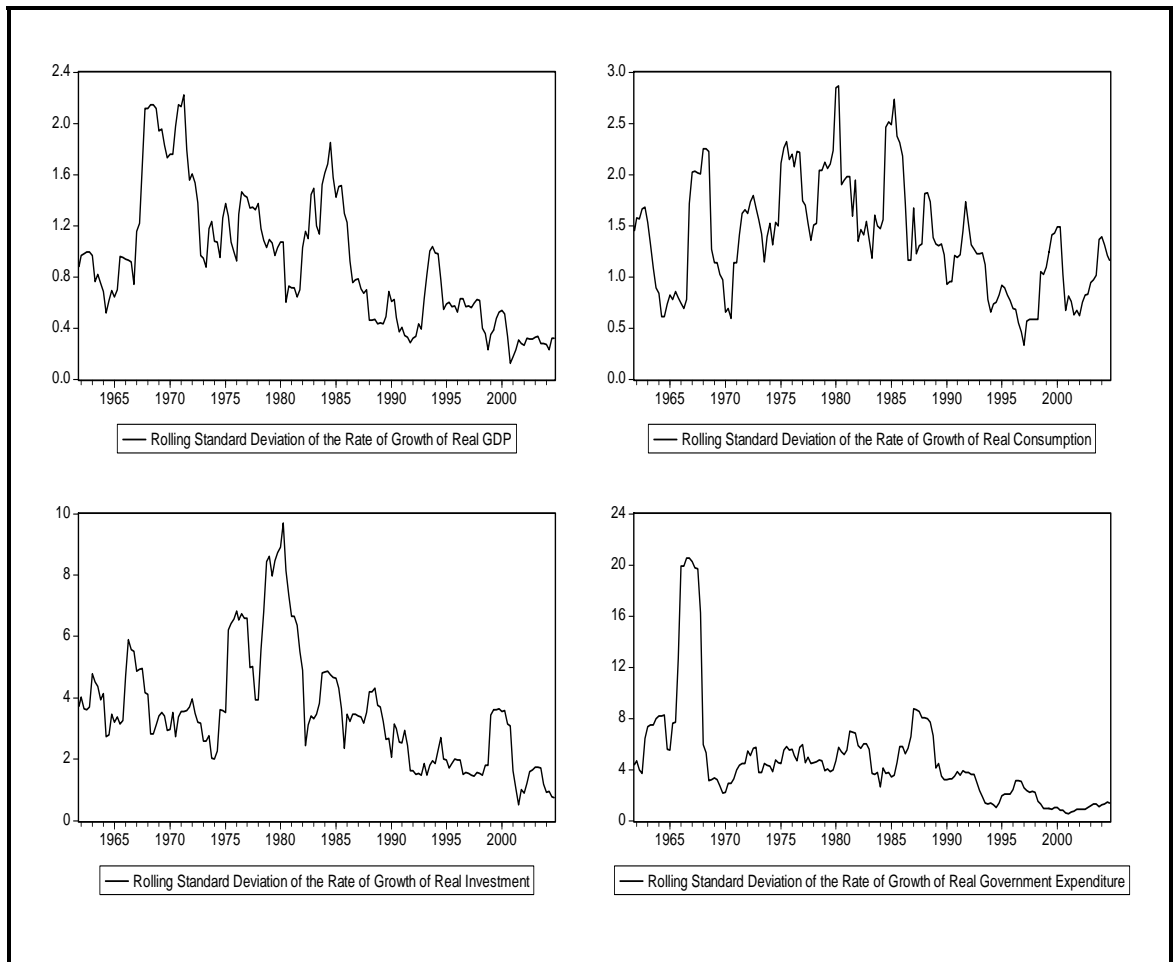


Figure 3: South Africa and World consumption and output growth rates



**Figure 4: Volatility of South Africa's Key Macroeconomic Variables**

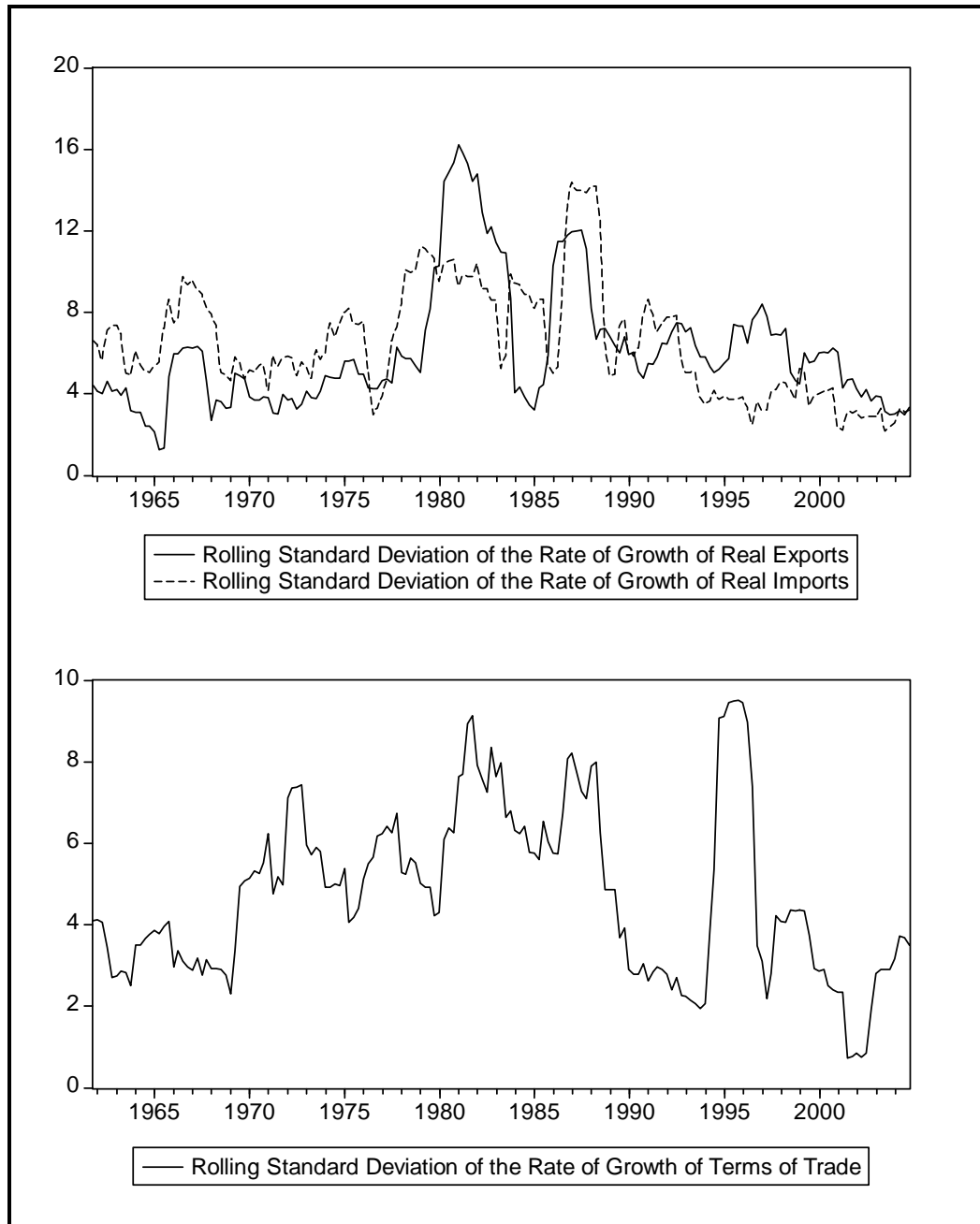


Figure 5: Volatility of Trade Sector in South Africa

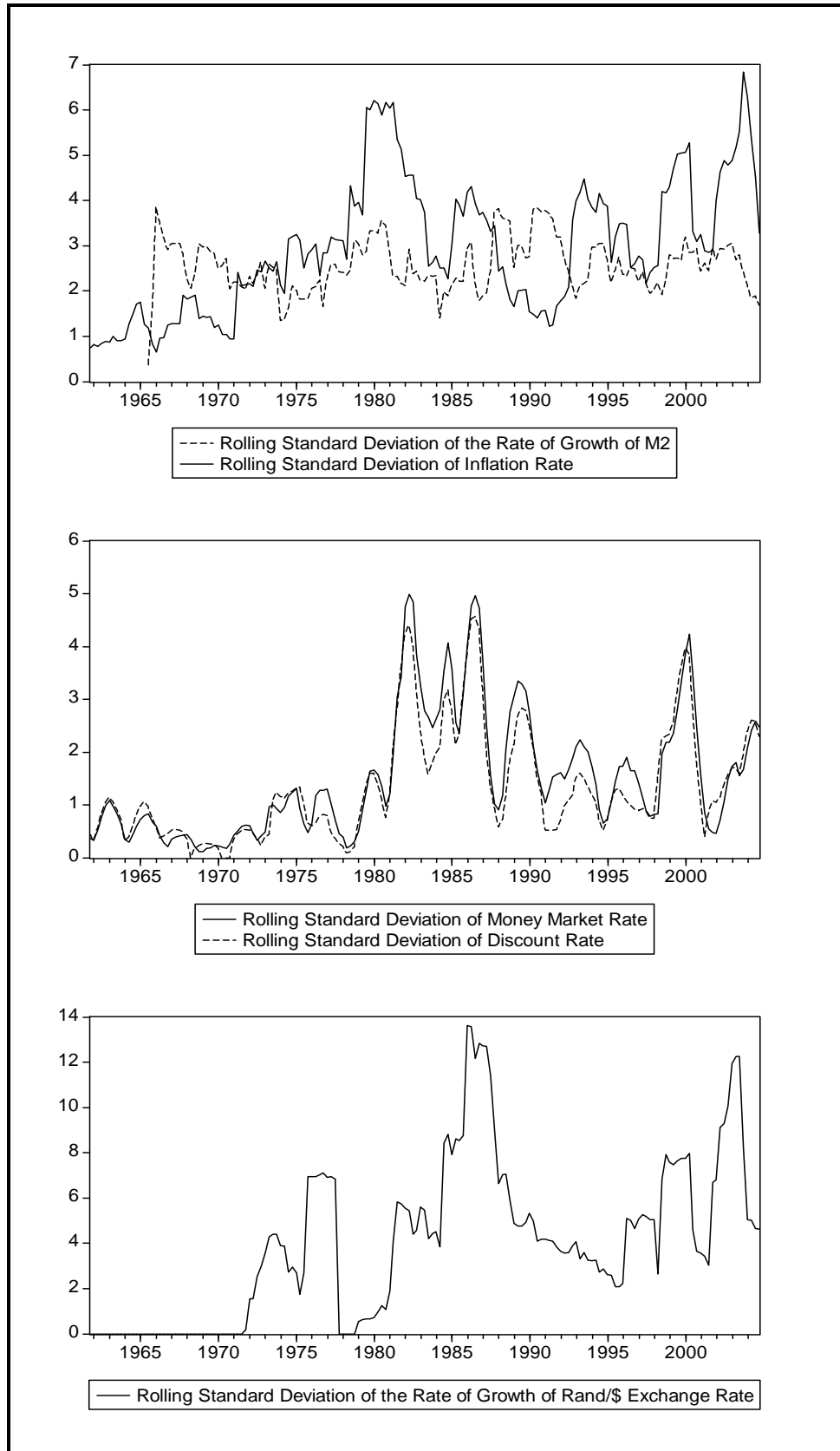
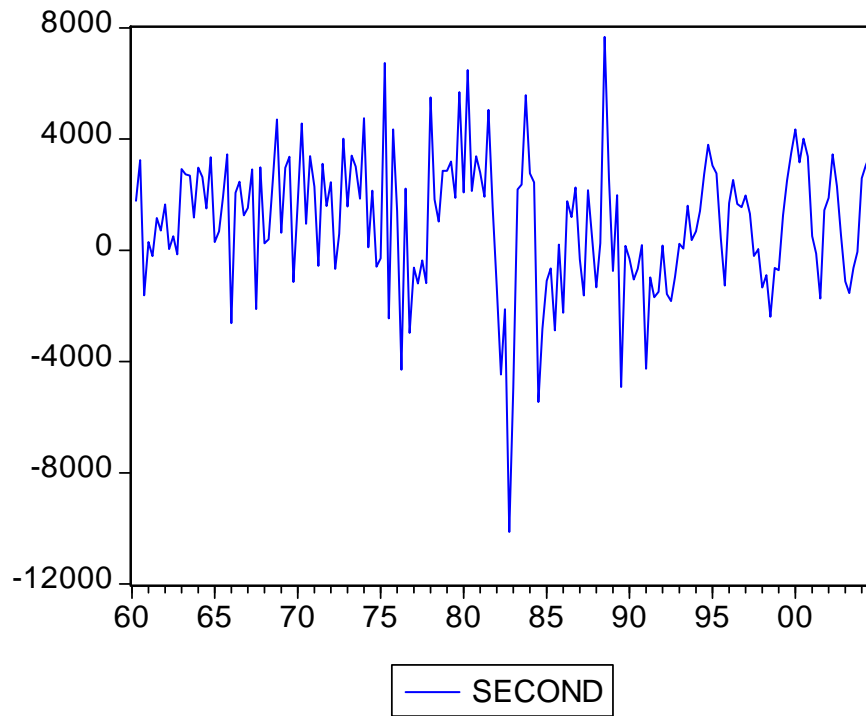


Figure 6: Volatility of Monetary Sector in South Africa



**Figure 7: Output growth-secondary sector**



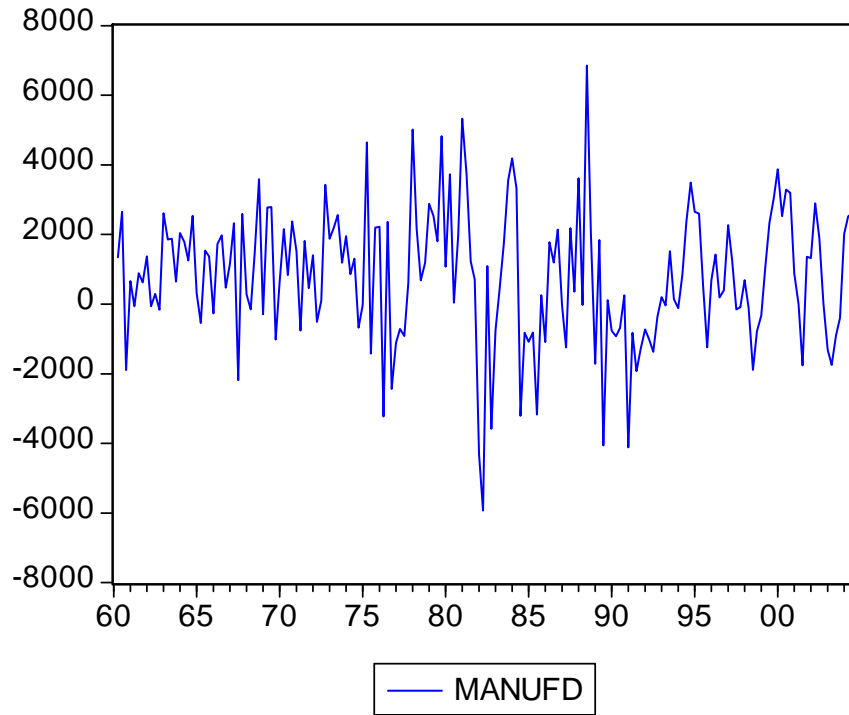


Figure 8: Output growth-manufacturing sub sector

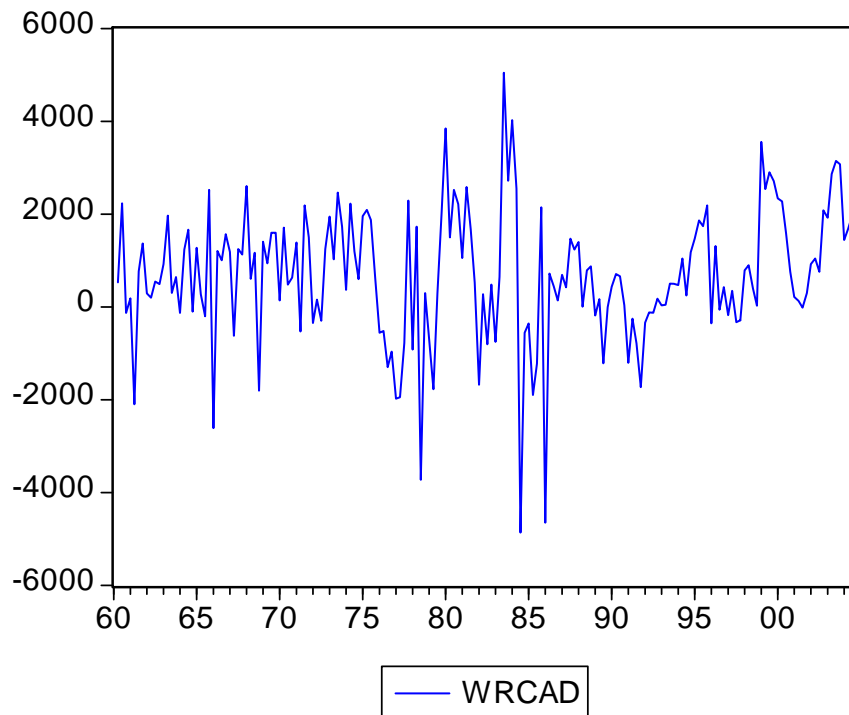
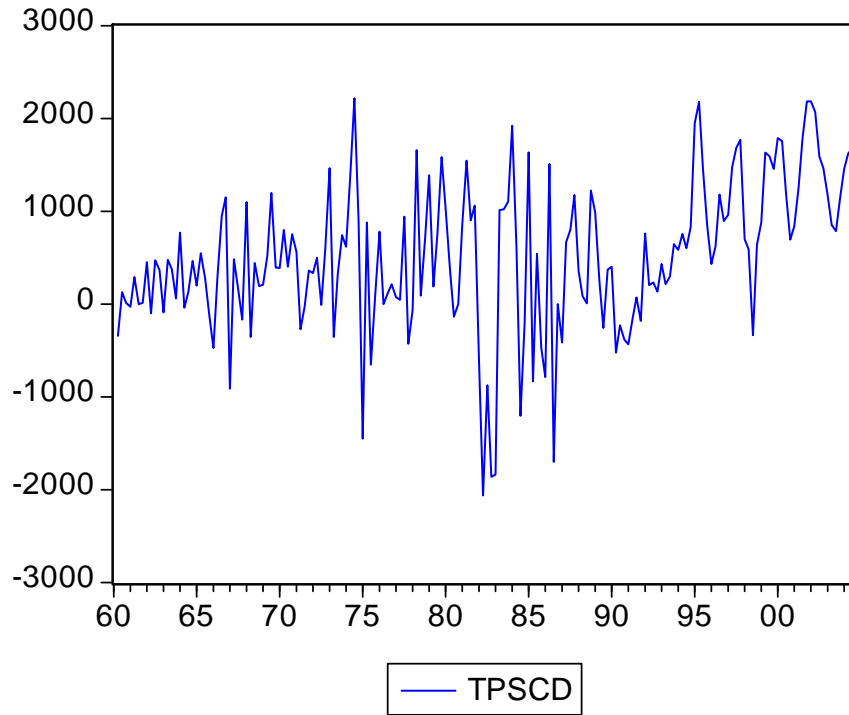
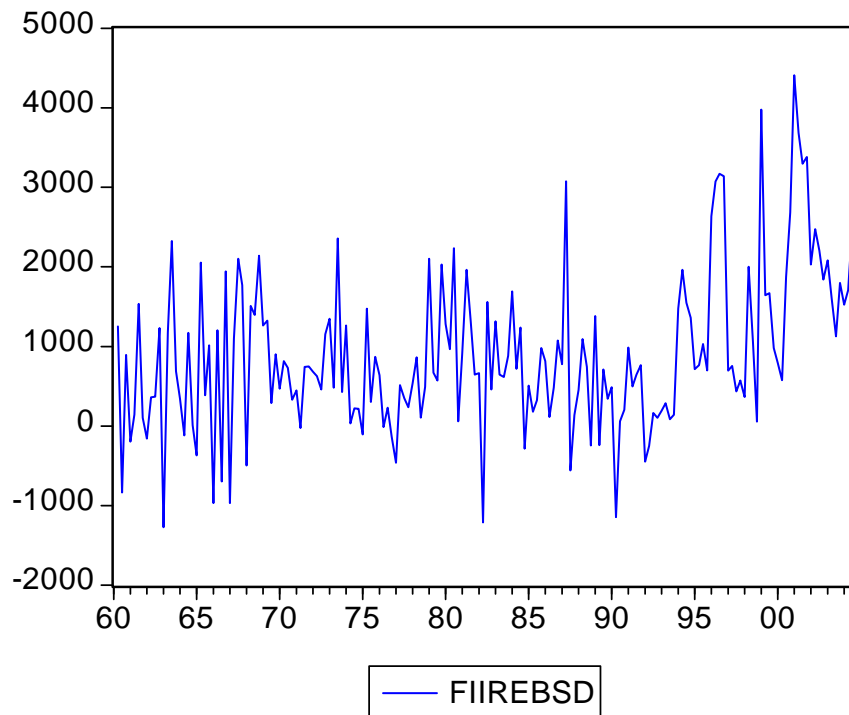


Figure 9: Output growth, wholesale-retail sub sector



**Figure 10: Output growth, transport-communications sub sector**



**Figure 11: Output growth - financial & bus services sub sector**

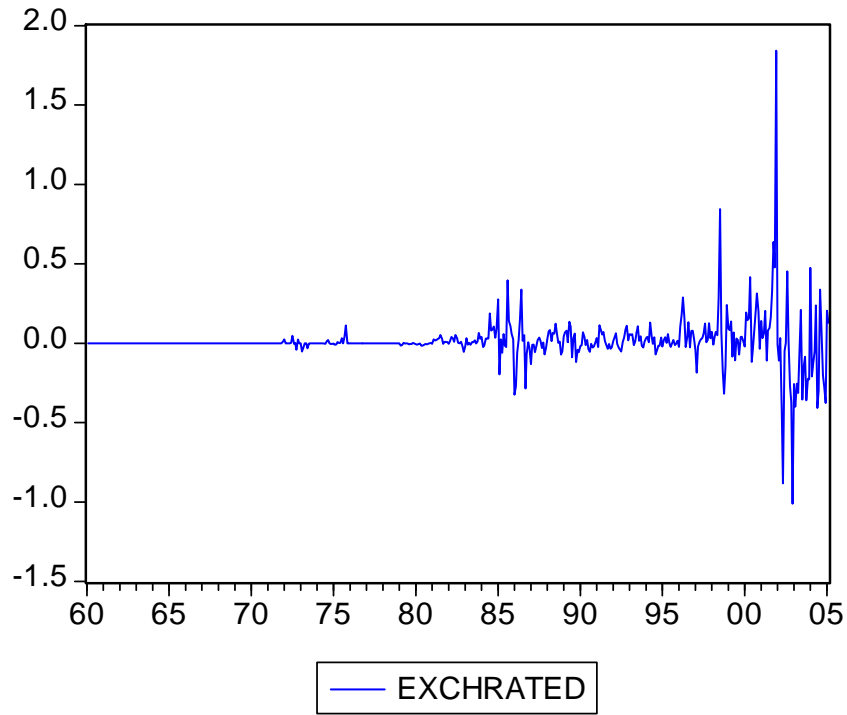


Figure 12: rand per dollar- monthly changes

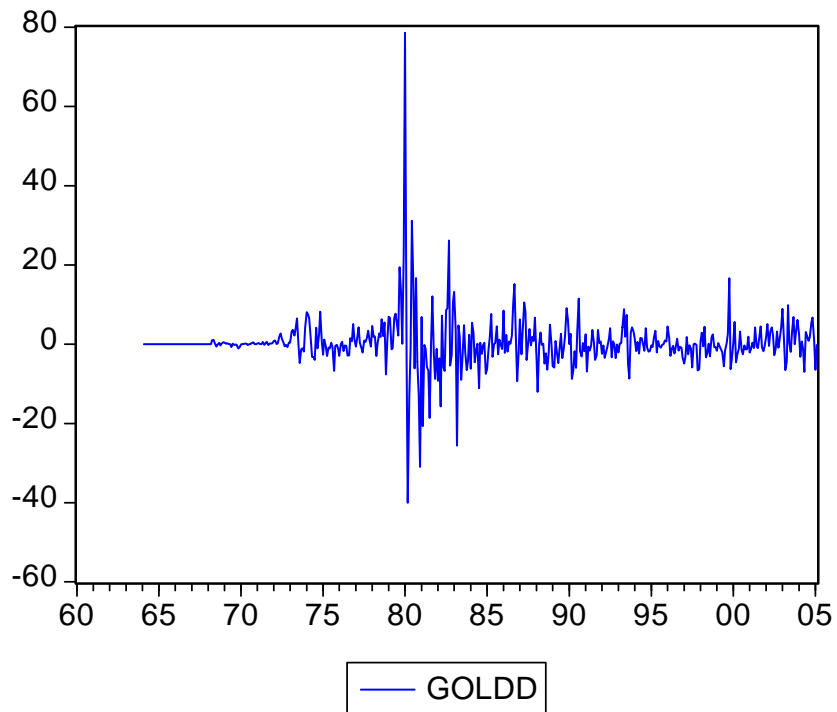


Figure 13: gold prices in dollar per fine ounce- monthly changes

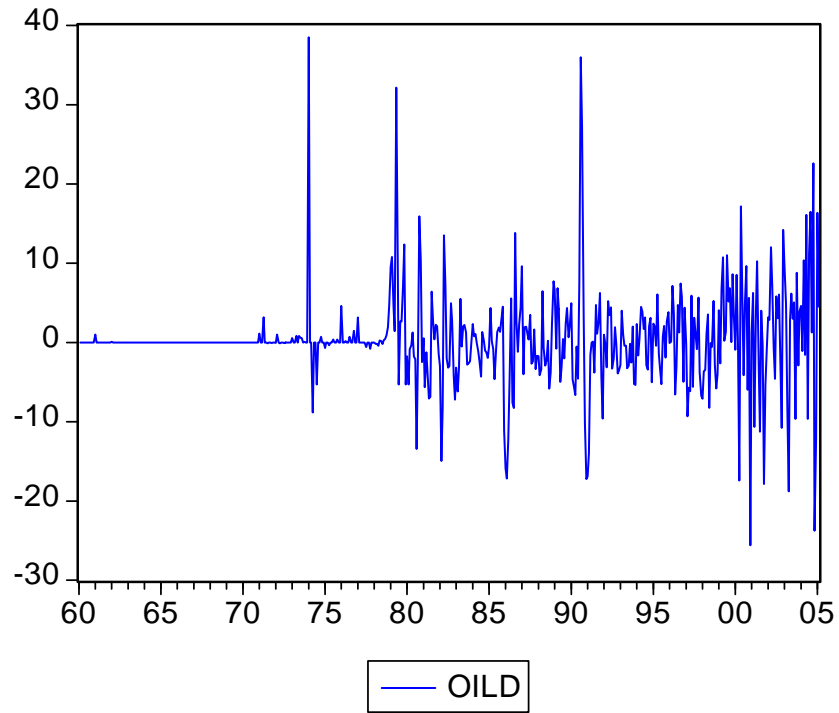


Figure 14: Brent crude in dollars per barrel - monthly changes

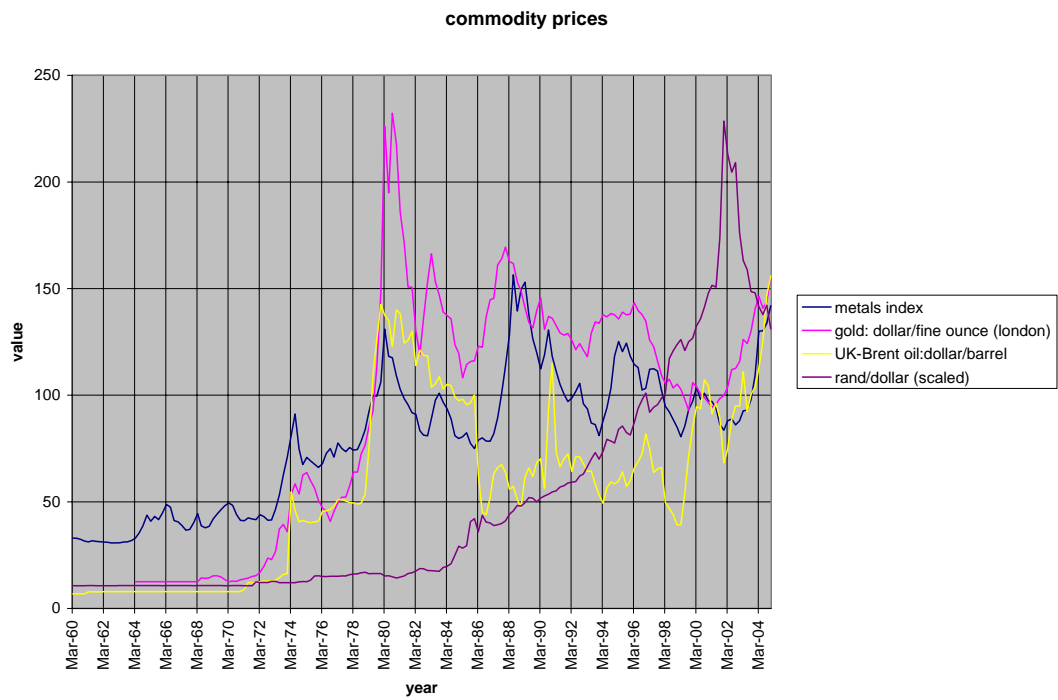
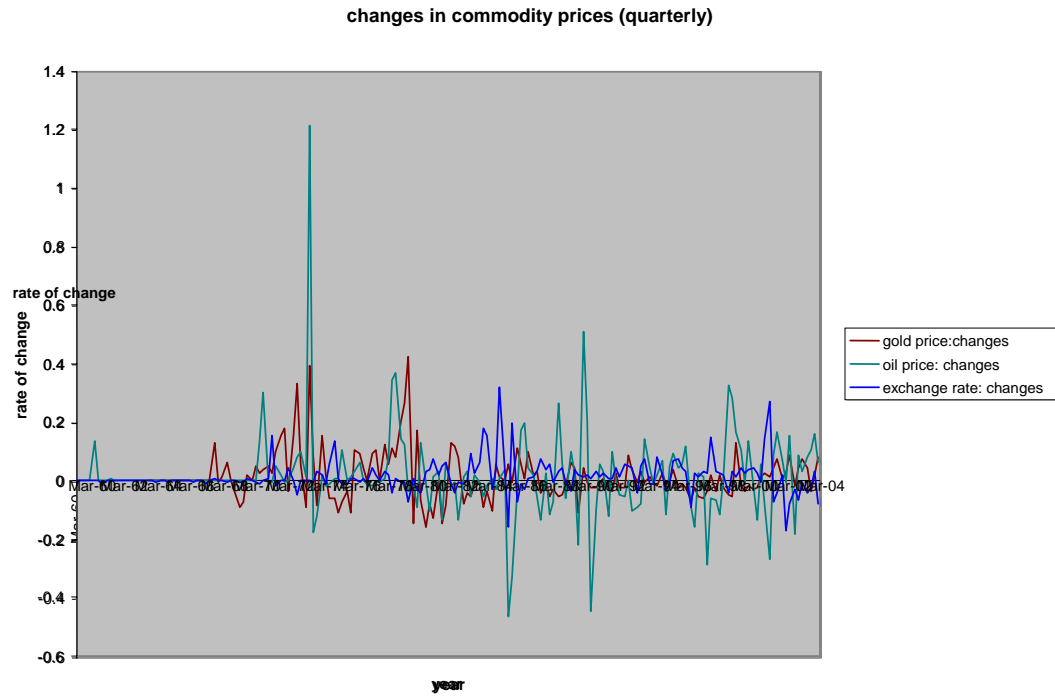
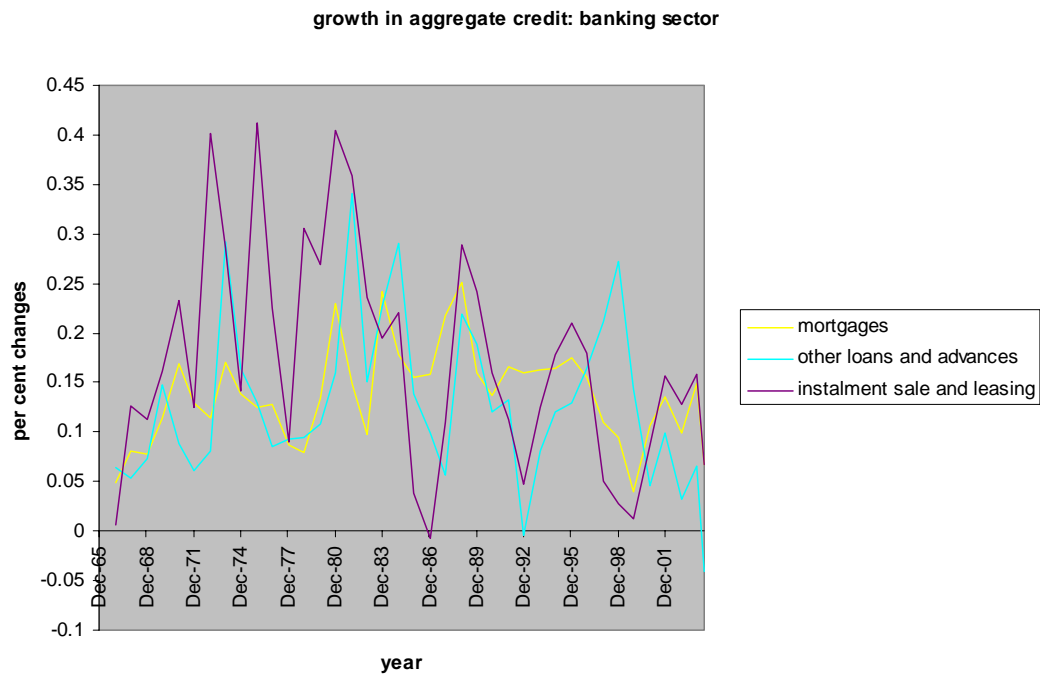


Figure 15: Selected commodity price series -quarterly

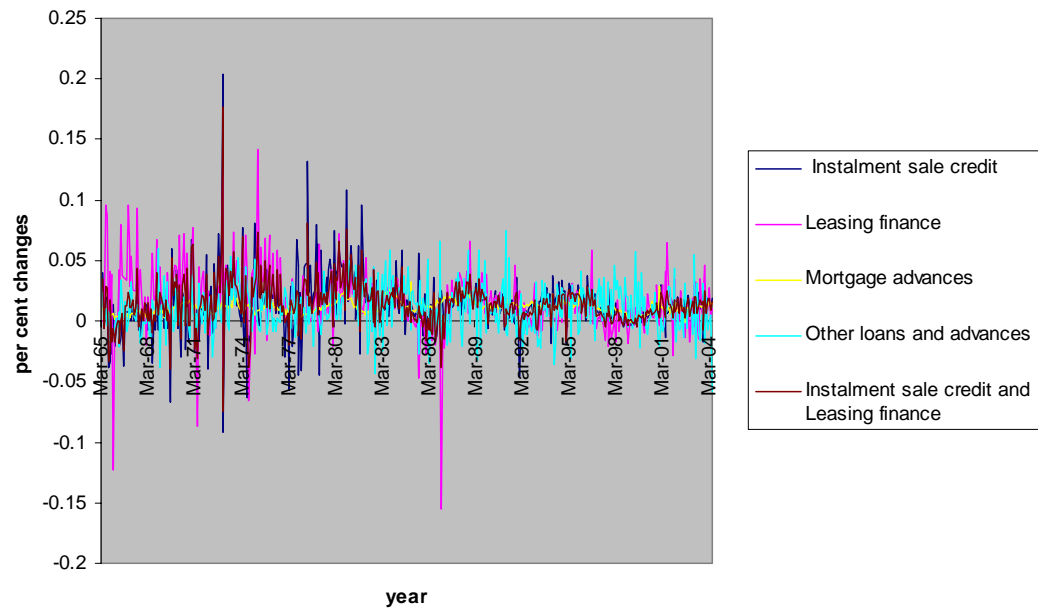


**Figure 16: Changes in the prices of selected commodities - quarterly**



**Figure 17: Growth in aggregate credit by major categories - banking sector (annual)**

## Aggregate domestic credit (quarterly): banking sector



**Figure 18: Growth in aggregate credit by major loan categories - banking sector (quarterly)**