



## Private investments in South Africa - An empirical analysis of investment behaviour

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### Abstract

This study examines the determinants of private investments in South Africa in an attempt to understand if the possibility of the Tobin Q can be used to interpret the patterns and trends in the South African business and residential subsections of investments. Using the South African annual time series data from 1960- 2010, the dynamic investment equation is estimated using general- to- specific ARDL approach to magnify the connection and trends. The study established that combined asset prices and the levels of business investment affect the long run investment performance rather than the Tobin Q. In the short run the lagged values of the Q, business investment and residential investments seemed to be the influential driving forces of private investment in South Africa. Even if the capital reserves in South Africa seem to be healthy, there is always a dire call for policy to be geared in the direction of credit accessibility to guarantee a supplementary conducive investment climate.

**Keywords:** business investments, general- to- specific ARDL, investment climate, private investments, residential investments, Tobin's Q

### Introduction

South Africa has been embodied by different business cycles over the past 5 decades, ranging from troughs to booms all enduring an invariant amount of time. Some were more severe than others while other were extensive and long lived, on contrary, some were diminutive and short lived. Of great interest was the turbulent and more volatile business cycles ever witnessed which cropped up in the first decade of the 21<sup>st</sup> century in South Africa. This period was essentially characterised with scores of economic upheavals such as the rand crises, global depression, and domestic strikes *inter alia*.

Investments in South Africa were equally affected by these events in the financial sector both globally and domestically, predominantly in asset markets such as the stock market and the residential market. Case in point, the global economy has been at the brink of recovery since the sub- prime mortgage recession in early 2007 and late 2008 in addition to the financial turmoil in Europe predominantly in Greece, Spain and Italy in 2010, erstwhile other parts of Asia, which caused investor uncertainty in the markets. Under such scenario, investors have shifted their portfolios towards emerging markets from the traditional developed markets, for the reason, such as highlighted by Mishkin (2004), which a decline in the stock market causes a decline in the net worth of companies hence collateral, this causes less protection for investors and results in investment and output to decline in these economies.

Despite the chaos of the past years, the global economy has grown to 3.6% on headline basis in the fourth quarter of 2011 (European Commission Board [ECB], 2012). This growth comes up due to the diminishing of the trail risk, particularly in Europe, and the supportive monetary policy in Europe that has continued to support growth and investments. On another global perspective, the on-going structural shift in China from investment led growth to consumption led growth is by all means not an easy and smooth

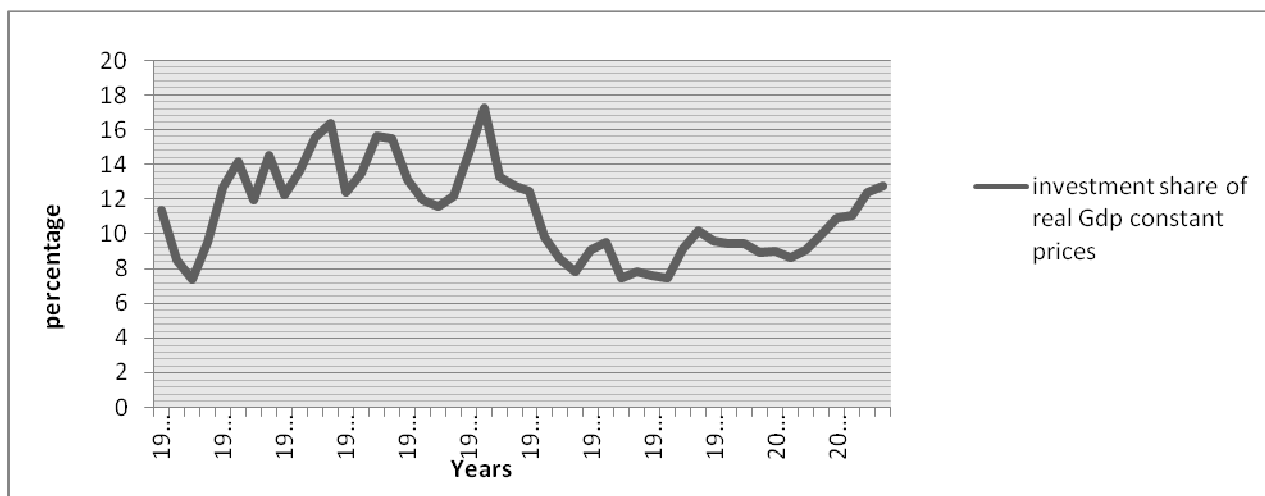
transition. This in turn has immense implication on the South African investment, furthermore asset price portfolio decisions by investors in South Africa (Schoeman, Schultz & Gable, 2012).

On a more domestic perspective, investments grew relatively higher than expected the initially anticipated, gross domestic fixed investment (GDFI) on the lead. The South African GDFI grew by 7.2% per annum in the last quarter of 2012, with a prior predicted growth of 5.9% (Schoeman et al., 2012). This GDFI seemed to be rather encouraging given that the business confidence in most sectors of the economy had plunged to an all-time low of 38 point from a 1 – 183 business index benchmark rankings (The World Bank 2012) in the same period. The South African Reserve Bank (SARB) has been incredibly supportive in that it has created a conducive interest rate atmosphere by maintaining the repo rate unchanged at 5.5% ever since the last quarter of 2010 (Polity, 2012), that has facilitated consumption and investments in a similar way.

On the other hand it is still an open question whether the monetary and fiscal policies adopted in 2002 and subsequent years were appropriate. The rand crisis resulted in speculate attack by monetary authorities (thus, treasury and South African Reserve Bank [SARB]) on the monetary policy and was further alluded by the Argentinean as well as the Zimbabwean crisis during the same period which resulted in an aggressive fiscal policy (Strydom, 2002). The South African asset prices fluctuated, with various ups and downs along the way making investments to be very unstable. These volatilities in the asset prices have resulted in detrimental effects on investments, in both financial and goods markets in South Africa thereby making investment very risky in South Africa relatively to other emerging markets partners.

### *South African GDP and Gross Investment*

South African has undergone tremendous changes both on the political arena as well as the economic terrain in the past five decades. All these changes have had significant influence on the investment performance of the country. Using the Gross Domestic Fixed Investment (GDFI) and Gross Domestic Product (GDP) values from the Department of trade and South African statistics respectively; Figure 1 below shows the patterns in which gross investments have gone through since 1960, as it should be noted this figure is given as a percentage of the South African GDP at constant 2005 prices.



Source: The dti (2012), Statistics South Africa (2012)

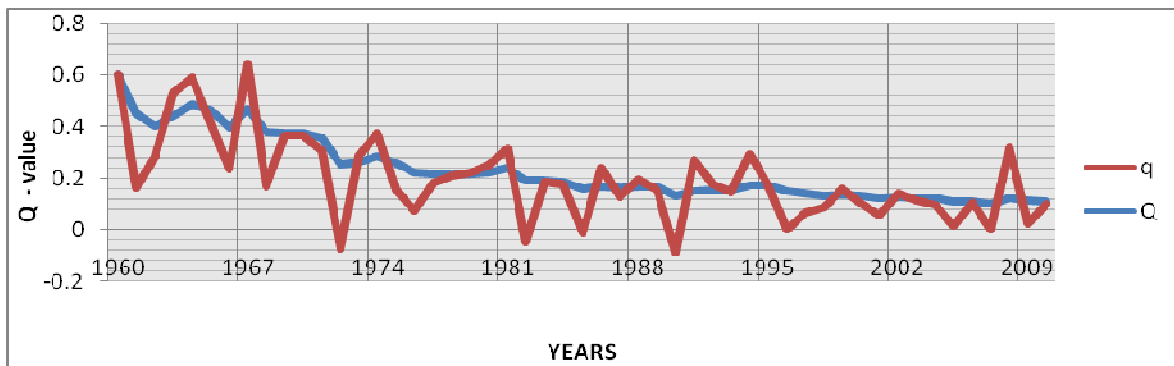
**Figure 1.** *Investment share of Real GDP for South Africa, 1960- 2010*

Figure 1 above shows the patterns in which the gross investment in South Africa fluctuated over the past years. From the figure above, investment plummeted to its all-time low in the period ranging from

1962- 1963 fiscal year, a 5- year movement shows that the gross investment were only slightly below 8 percent of the real GDP suggesting that in this period the South African government did not prioritise investment. This was followed by a massive increase in investment share to the real GDP. The South African GDP reached its maximum share of output in 1981, this was followed by the biggest plunge of investment share of the real GDP, and investment fell to 8 percent. The investment figures struggled to rise above the 9 percent share of the real GDP, this was due to the political and structural economic changes taking place at some stage in the period, this trend continued up to the end of the first millennium, while the investment share continued to rise ever since the 2000, this could have been as a result of a new political stability and economic policies that are aimed to achieve economic growth through an investment inclined policies.

*The aggregate Q in South African residential and equity markets*

The Q theory suggested that the market value of old capital goods may differ up or down from its replacement cost, in other words, the differentials between producing and installing of capital goods. As a rule of thumb Tobin and Barnaid (1962), in their hypothesis suggested that the Q should be oscillating around 0 and 1, whereas 1 means the asset is overvalued and 0 being undervalued. Using a simple calculation adopted from the Nobel lecture essay of Professor Tobin (1982) applied to South African aggregated data in combined equity and residential market and aggregated capital figures, the following patterns are reported below by a graphical exposition figure 2 below:



Source: FNB household survey (2012), African Development bank, (2012) and South African Reserve Bank (2012)

**Figure 1.** *The aggregate (absolute) Q and marginal Q in South Africa, 1960- 2010*

Figure 2 above, shows that the Q value in South Africa has been virtually falling in the past 5 decades, suggesting that the property and equity has been slightly overvalued in the early 1960s. The slope shows that there has been a negative relationship between installation cost of new capital and its replacing cost over the years, thereby causing a gradual decrease in the Q value in these markets. The Q value improved in the years from 1964 – 1970 nevertheless it started to decline as rapidly as before. In the last decade from 2000- 2010 the Q has been relatively constant at the bandwidth between 0.1 – 0.2 suggesting slightly undervalued assets in these asset markets as suggested by the Q theory.

The dynamics in the Q figures can only be elucidated in relation to the levels of investment along with the amount of capital in each investment sector independently and their exposure to both systematic and unsystematic risks.

*Residential investment in South Africa*

The residential investments in South Africa, in the past 50 years have gone through numerous phases as the economy moved from one business cycle to the other. Many of the investment restrictions in the

residential investment exist between the constraints of gross fixed capital formation (GFC). If the value of residential investment is embedded in the construction value of the value added project of residential property constructed in the past 5 decades and Gross fixed capital formation is indexed for the productive capacity of the residential investment sector. The composite exposition graph in figure 3 shows the dynamics, patterns as well as the relationship among gross fixed capital and the construction, value added in the residential market, both figures are given in current United States Dollars (US\$), nonetheless the construction value is given in current dollars and the GFC is given in 2005 constant prices.



Source: African Development Bank (2012) and International monetary fund (IMF, 2012)

**Figure 2.** Residential investment and capital consumption in South Africa, 1960- 2010

Figure 3 shows an intertwined and interrelated relationship in the behaviour of residential investment and fixed capital. The graph shows a perpetual positive relationship between gross fixed capital and the construction value in South Africa. Both construction value and the GFC showed a steady increase from the early 1960s to the early 1980s. This shows that the favourable business cycles enjoyed in the period and favourable interest rates, inflation and a general stable macro environment, which in turn, lent a hand on mortgage and construction in this period. The construction figures and the GFC figures started fall from the early in 1980s followed by a fluctuations in the low regions, this phenomenon continued to 1995. This was a possibility of the hostile political, social and economic conditions that prevailed in this period. The phase was generally characterised with a low business cycle, high interest rate, high inflation and a poor performance of the rand. Other conditions included the sanctions against, at that time, apartheid government and the political transition that followed after in 1994; this caused a great distress on housing investment and capital formation as a way of exorbitantly high mortgage premiums and general low business confidence. In the last decade from 2000 – 2010 demonstrated a high levels of construction and Gross Fixed Capital (GFC) reaching an all-time highs in both the construction value and GFC, this be evidence for the South African government commitment in infrastructure development through various government initiatives and policies.

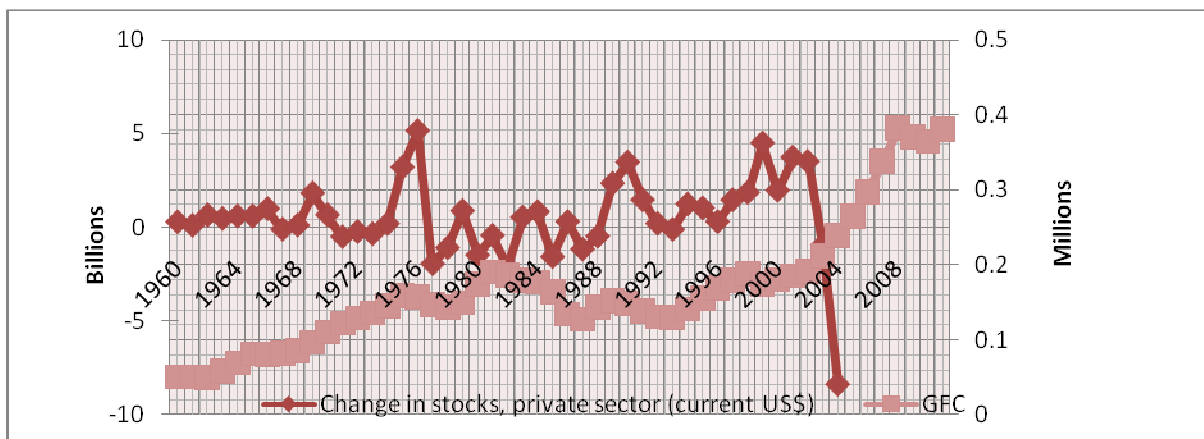
#### *Business/equity investment in South Africa*

Analogous, to the residential investment, the business sector investment have also been exposed to various up and downs in the South African business environment. The business sector has been affected by both systematic and unsystematic risks such as interest rate exposure and other macro-economic

factors. In order to verify investment behaviour, trends and patterns in the business sector investment, the study looks at two peculiar relationship that seem to exist between changes in the equity sector and the Gross Fixed Capital as well as the relationship between changes in the business investment and price level of investment in the past 50 years in South Africa.

*Equity investment and GFC in South Africa*

The possible relationship between the value of investment and the capital structure or the capital index is shown by the Penrose effect by Uzawa (1969). Business investment has been more volatile than residential investment in the past 50 years; in the annual South African data, from the onset, one can see that there they seem to be a more obscure relationship between the levels of business investment and Gross Fixed Capital. This may be due to the sensitivity and lag relationship between the two variables. This relationship between the change in stocks (equity), private sector measured in current US\$ from 1960- 2008 and the GFC from 1960- 2010; measured in constant 2005 US\$ is given below as Figure 4.



Source: African Development Bank (ADB) (2012) and IMF (2012)

**Figure 4.** Change in equity investments in private sector and GFC in South Africa, 1960- 2010

These variations in the South African stocks in the private sector shown above, manifest that the stock market has been relatively unstable as suggested by various economic theories such as the AD- AS Keynesian framework, Tobin macroeconomic flow, Robert Solow’s growth model and the Harod-Domar growth models.

In the early 1960s, the equity investment remained fluctuating around negative US\$1000 000 and US\$2000 000 up to 1975. The level of business investment increased by approximately US\$ 5000 000 to an all-time high of US\$ 5000 000 change in stock in 1977, however this was followed by a huge –US\$ 6000 000 fall. Surprisingly, the changes in the stocks in private investment sector in South Africa are rather consistent with GFC figures; the fall in the changes in stock in 1977 was also in line with the fall in the GFC in the same period up to 1979. The changes in the stock market were moderately low in terms of variations with the changes in stock market remain fluctuating around negative US\$1000 000 from the late 1970s to early 1990s. The GFC in South African followed by almost similar positive fluctuations in the same period however the GFC was relatively stable with minimum fluctuations and in most cases GFC was slow to respond to the abrupt changes in the stock market more so, showing another consistence and harmony with economic theory.

The last decade from 1998- 2008 in the stock changes in the South African Stock of equity market demonstrates a strange trend, were stock in the private sector plummeted showing an abrupt change in the stock market. Reaching an all-time low of negative US\$ 8000 000 in 2008 within a space of 4 years, from 2004- 2008. On contrary, the GFC continued to improve in the same period however it grew with a slow

growth most probably from the poor performance of the private equity sector. It continued to soar up to 2010. The fall in the equity market can be explained in two possible economic events; that could have affected the South African economy during this period, the first being the rand crisis in 2002- 2003 which made domestic investments nearly worthless and was also coupled by the interest rate cuts by the South African Reserve Bank (SARB) in its bid to curb inflation and meet the inflationary target of 3- 6 %. This proved to be almost harmful to private investment. The other possibility of the high negative change in stocks in South African equity market could have been a result of the sub- prime mortgage crisis of 2007- 2008 in United States of America which caused a major economic recession across the globe. This affected South African private sector investment since at the period no one really knew how much exposure and risk associated with South African stocks and bonds.

To test out, if private investments in South Africa are related to the price level of investments in South Africa this study takes a closer look at this relationship below.

## Theoretical literature

### *The Tobin “Q” theory of investment*

The Tobin q- theory was first proposed by James Tobin and later advanced by Tobin and William Brainard. The Tobin q- theory of investment looks at the microeconomic foundation of business and capital investments. This study underpins the literature of this theory from two angles, with the first angle being how the q- theory of investment implies in business investments and how the q- theory of investment can be implied on housing investments. According to the advanced q- theory by Tobin and Brainard in Yoshikawa (1980) gives a summarised version of the q- theory as;

*“The neoclassical theory of corporate investment is based on the assumption that the management seeks to maximize the present net worth of the company, the market value of the outstanding common shares. An investment project should be undertaken if and only if it increased the value of the shares. The securities markets appraise the project, its expected contributions to the future earnings of the company and its risks. If the value of the project as appraised by investors exceeds the cost, then the company's shares will appreciate to the benefit of existing stockholders. That is, the market will value the project more than the cash used to pay for it. If new debt or equity securities are issued to raise the cash, the prospectus leads to an increase of share prices.” (Tobin and Brainard, p. 242)*

The study as mentioned above will review separately the q- theory and how it has affected the financial assets markets particularly the stock market and the housing market. The study uses the assumption that a different objective function between the managers and shareholders and that the share price or asset price movements may not always reflect changes in ‘fundamentals’ (Blanchard et al., 1990), this rather contrary to the arbitrage pricing theory that reflects the concept of market fundamentals.

### *The Tobin q- theory on stock prices and investments*

The major question that Tobin q- theory of investment tries to answer in terms of business investment is; what level of investment will maximize the market value for the company share since individual firms do not have control of  $r$  and  $\epsilon$  as mentioned by the arbitrage pricing model of investments. The Tobin neoclassical model assumes that the representative firm is a price taker furthermore, Cuthbert and Gasparo (1995) suggested that the firm will maximize the discounted present value of dividends subject to firstly, the production functions and secondly, an increasing and concave installation cost function for investment.

### *The q- theory of housing investments*

Wildasin (1984) suggested that the Tobin q theory can be examined for investments with many capital goods, while Sorensen and Whitta-Jacobsen (2005) also applied the q theory of investment and modified it to the q- theory of housing investment. Wildasin (1984) pointed that the q- theory is a theory of the firm with an appealing behavioural hypothesis and value maximization. The earlier models of the q- theory treated capital as a homogeneous good but rather, there are certain situations where it may be desirable or even essential to be able to study investment disaggregated by a type of good. In the general q theory, the marginal q is basically shown as a determinant of investment because it shows how much increase in market value accompanied by a rand's worth of investment, while the actual stock market value of the firm reflects the profitability of existing total capital. In this regard, housing investment is an important component of the private investment and is highly volatile than business investment due to the fact that housing investments are durable, hence the fluctuations in prices of residential investments and assets plays a vital role in business cycles. Sorensen and Whitta-Jacobsen expanded the working q-theory of investment by extending the theory to formulate a hypothesis for housing market to explain the housing investments. The q- theory of housing investment is analogous with the q- theory of business investments.

### **Estimation issues and econometric estimation**

Finally, from the above analysis, the study now puts together the empirical dynamic behavioural framework to formulate an aggregative dynamic model of investment behavioural patterns as well as to the undeviating investigation of both the short run and long run statistical processes. In order to convert the empirical into a practical econometric model, the study thus, will construct variables to choose a efficient form based on the properties of the error term, in this regard the functional form is added to an error term. Thus the study will test various error correcting techniques as given in this section below.

### *The general to specific ARDL approach*

If the investment behaviour is imbedded in behaviour in capital, in turn, which is given as stock, then the relationship between actual investment and the changes in capital service can be shown through the decision making by the agents in both of these markets. Given that capital and investment expenditures require time to completion then the study assumes that there is no lag between the claim of old investment goods and the purchase of new investment.

To estimate the investment equation, the study uses an Auto Regressive Distributed Lagged (ARDL) framework. Using the postulation that capital is regarded as a stock while investment is regarded as a flow. This section of the empirical testing will largely test the theory of investment behaviour in relation to the Tobin Q and changes in the demand for capital uses in addition to actual investment in the subsectors of investment using the general- to- specific approach ARDL econometric technique.

### *General- to specific approach to co-integration of ARDL*

After conducting a stationarity test and in the case where long run relations of interest are trend stationary, the accepted convection in econometrics when one is using a time series analysis is to de- trend the series and to model the de- trended series as stationary distributed lag or autoregressive distributed lag (ARDL) model (Pesaran & Shin, 1997). An alternative and widely used method to establish a valid dynamic model is to use the specific to general approach methodology developed by Hendry in 1983 (Cuthbertson & Gasparro, 1995). Considering the following general simple ARDL ( $p,q$ ) model:

$$I_t = \alpha_0 + \alpha_1 Q + \sum_{i=1}^p \phi_i I_{t-i} + \beta' X_t + \sum_{i=0}^{p-1} \beta_i' \Delta X_{t-i} + \mu_t$$

Where  $I_t$  is the level of total investment and  $X_t$  is the vector of determining variables, thus the study will estimate the General- to- Specific (*Gets*) ARDL model specified below:

$$TINV = \alpha_0 + \alpha_1 TINV_{t-1} + \alpha_2 BINV_{t-1} + \alpha_3 HINV_{t-1} + \alpha_4 Q_{t-1} + \alpha_5 AP_{t-1} + \varepsilon_t$$

*Model development: Data sources and variable construction*

To empirically test the model specification the study adopts annual South African data from 1960- 2010. The study makes use of time series data since it gives an idea about the representation in economic dynamics and that some the variables, notably prices in these asset markets move virtually continuously. The data has been adopted from the South African Reserve Bank, Penny World database, African Development Bank (ADB), World Bank, World Economic Report, Statistics South Africa (Satsa), the ABSA capital and FNB household survey for housing prices and indices, and the department of trade (the dti). The following study variables are constructed to test empirically the hypothesis.

- TINV** : is the gross private investment in South Africa.
- BINV** : is the variable representing net private business investment given in the model specification as the ratio of the level of investment indexed to productive capital
- HINV** : is the net private housing investment given as the level of housing investment indexed to the productive capital.
- AP** : is the variable representing the adjusted prices given as the ratio of housing prices and business prices.
- Q** : is Tobin’s average Q to explain the business and housing investment. Q ratio is given as defined as the ratio of the market value to its replacement cost.

**Empirical findings**

The study performs a formal analysis of stationarity using both the Augmented Dickey-Fuller (ADF) test and the Phillip-Peron (PP) test, the results are given below:

**Table 1. Results for unit root tests**

Variable	TINV	BINV	HINV	Q	AP
<b>Augmented Dickey- Fuller (ADF)</b>					
<i>Level</i>	-7.276179*	-5.167815*	-1.241387	-2.529351	-3.201001
<i>1<sup>st</sup> difference</i>	-9.766281*	-8.045755*	-4.999056*	-3.323333*	-4.736234*
<b>Phillip- Peron test (PP)</b>					
<i>Level</i>	-7.31325*	-5.08430*	-1.338395	-2.682600	-5.03574*
<i>1<sup>st</sup> difference</i>	-28.56453*	-28.13252*	-4.884535*	-10.63441*	-5.52811*

Notes: \* represent a stationary variable at 1%

The stationarity results show that both the ADF and the PP tests show that all the variables of interest are stationary at 1%.



A pre- analysis of variance was conducted by the study to ascertain the distribution of the variable to allow a correct estimation technique, to achieve this; the study implemented a simple multivariate analysis to check the dispersion and volatility of each variable in question. The results from the estimation are given as Table 2 and Table 3:

**Table 2. Results of analysis of means, standard deviation, correlation and covariance**

Variable	Mean	S.D	Correlations				
			1	2	3	4	5
TINV (1)	12.557	36.781	1				
BINV (2)	7091.17	17554.279	-0.058	1			
HINV (3)	17370.29	10838.49	0.032	0.092	1		
AP (4)	0.00	0.01	-0.037	0.004	-0.124	1	
Q (5)	0.23	0.13	-0.041	-0.112	-0.420	0.4490	1
N = 56 for all variables							

Table 2 gives the means, standard deviations and the correlation of the variables of interest, the results shows that BINV and HINV have a higher means and standard deviation this is attributed to the GFC deflators used to compute the variables, while TINV, AP and Q have a lower means and the standard deviations, particularly the adjusted prices since the prices tend to diverge with the replacement cost in the long run. In order to examine the influence of each variable on the other the study thus performed a correlation test given by the correlation matrix above. The correlation matrix shows that most of the data to weakly correlated with the exception of  $r_{Q,AP}$  and  $r_{Q,HINV}$  this may, perhaps be because of the fact that Q is particularly important in the Residential and asserting prices in each market. The correlation matrix also shows that multicollinearity is not a problem in this analysis. The covariance in the variables is as below:

**Table 3. Covariance matrix results**

Covariance matrix results					
	<i>TINV</i>	<i>BINV</i>	<i>HINV</i>	<i>AP</i>	<i>Q</i>
TINV	1326.34				
BINV	-36468.44	302110506.3			
HINV	12341.25	17158771.62	115169396.1		
AP	-0.0070	0.3813	-6.937	2.71E-05	
Q	-0.185	-242.95	-562.552	0.000292	0.0156

The covariance matrix shows that BINV and HINV have high variances hence, volatilities this is in line with economic theory of neo- classical investments and are in line with other studies such as conducted by Cuthbertson and Gasparro (1995).

*Results using the ARDL Approach to Co- integration*

The study tested co integration among the variable to substantiate for any long run association. This was conducted through the ARDL approach to co integration. The regression conferred the following results:

**Table 4. Results of the ARDL approach to co- integration**

Variable	Constant	@TREND	BINV	HINV	AP	Q
Coefficient	266.4086	- 5.257527	- 0.0004	- 0.0049	- 0.0049	- 0.0049
Error	0.311	8.4075	1.4725	0.00083	-0.6377	260.6046
t- statistic	-6.658	3.168	-0.5844	-0.6377	-0.637	-0.45637

The given that a trend and constant in the regression equation were statistically significant in the model, the study included the trend element as well as the constant element. The ARDL (1,1) tested the long run parameters of the model to check for any long run dynamics in the model. The study showed that all the long run parameters TINV, BINV, TINV, AP and Q were statistically significant at 5%. Table 4 above showed that HINV, AP, and Q have any long run association with DTINV.

*ARDL general to specific approach results*

The study after an inspection for co integration in the variables, the study implemented a general to specific approach econometric modelling technique to the annual data to perform the ARDL (2, 2) model.

A final parsimonious ARDL model with its long- run elasticities calculated from the steady- state solutions given in parenthesis. The estimation of Equation below using the ARDL model is reported above. Using Hendry’s general-to-specific method, the ARDL general to specific approach regression, the model gave the following long run and short run dynamics given by the following equation below:

$$\Delta TINV_{t-1} = \begin{matrix} C & @ TREND & AP_t & TINV_{t-1} & TINV_{t-2} & BINV_{t-2} \\ 21.184 & - 4.8916 & - 0.3446 & + 0.7235 & + 0.3858 & + 0.00067 \\ - 2.0756 & (0.00979) & (0.4330) & (0.1419) & (-0.5464) & (0.187) & (-0.5091) \end{matrix}$$

$$+ \begin{matrix} HIV_{t-2} & AP_{t-2} & Q_{t-1} \\ + 0.00671 & + 5.12998 & - 3.9533 \\ (0.1012) & (-0.1306) & (0.1297) \end{matrix}$$

The ARDL (2, 2) model showed that a one percent shock in the Average Housing and Private Business investments prices results in a 14.19 percent decrease in total gross investments in South Africa in the long run. The variable AP shows that prices of the asset prices as a considerable influence on the total gross investment in South Africa. This is in line with economic theory, since most economic literature dictate that there is a negative relation between asset prices and the stock of keeping these assets. The long run relationship between TINV and AP suggest that the economic transmission of prices in these asset markets has a long run effect on the behaviour of investors since the investors do not necessarily act on current information.

The short run partial coefficient of net private business investment (BINV) in the second lag suggest that for every one percent increase in the net business investment (BINV) results in approximately 50 percent increase in total gross investments (TINV) response in South African Asset market. The transmission of business investments in the second lag means that at least in the short run investments in the stock market takes two years to transmit into the economy to affect total gross investments.

The short run coefficient of Average prices (AP) also affect Total investments (TINV) in the second period of the model suggesting that a 13 percent increase in Total gross investments in South African investments will be as a result of a one percent short run change in average prices in these two asset markets. The ARDL results suggest that in the short run the transmission of Asset prices affect the TINV

in a two year period lag system. Analogously, to the long run AP. The short run variable of AP, exhibit the same negative relationship between TINV and AP suggesting that an increase in price of assets in the residential or the stock market results in a decrease in holding these assets.

The short run coefficient on the ‘levels term’ the Tobin’s Q and gross investment in the first lag suggest that, the Tobin’s Q only affect the total gross investment only in the short run and at its first lag. Suggesting that the Tobin Q accounts for only 12 percent increase in total investment, thus for every one percent change in the Tobin Q, total investment (TINV) decrease by 12 percent which is in line with economic theory which suggest that a higher Q value suggest that capital assets are overpriced and most investors will not hold these assets. It should noted that the Tobin’s Q actually performed well in this model exhibiting some levels of stability, however it should be noted that the Tobin’s Q only affect in the short run and there seem to be no significant long run relationship between the Tobin’s Q and TINV in the South African data modelled therein.

Mutually the long run and the second lag of the short run coefficient of TINV affected itself in a statistically significant way. A one percent change in TINV in the current period is a result of 54 and 18 percent change in TINV in the long run and second lag of the previous period. In the long run period, an increase in Total gross investment (TINV) results in a decrease in TINV in the current period but in the short run, the second lag showed that there is a positive relationship in TINV and its second lag. This makes economic sense in that the transmission of investments in South Africa is not direct in the long run, and that an increase in total investments is influenced by other exogenous factors such as the Tobin Q or government policies. On the other hand, there seem to be a direct transmission in the mechanism that affects total gross investments.

The ARDL included a trend and a constant in the time series to cater for lag weights, in the selected lag criteria. Both the Constant and Trend were significant at 5% showing that both the trend and the constant affect the ARDL model. The ARDL model shows that all the four variables excluding the Tobin Q (which so far has been treated as exogenous) to be showing some degree of overshooting since these variables in this dynamic model shows that the adjustment completes after three – six years.

*The diagnostic checks*

Table 5 below shows a list of diagnostic checks that to check for the model ability to predict the economic data. The following results were obtained:

**Table 5. Summary of diagnostic results**

Test	Null Hypothesis	t- statistic	$\chi^2_c$
JB	There is no normal distribution	3.56	6.0
ARCH (6)	There is ARCH process	0.0191	8.3
BPG	presence of heteroscedasticity	0.8965	5.8
RAM (6)	evidence of misspecification	2.8	7.8
HF	parameter constancy	6.098	10.78

The Jarque-Bera (JB) statistic was 3.56 and a  $\chi^2_c$  of 6.0 this suggest that the residuals in the data were clearly normally distributed. The results of the ARCH (6) was equal to 0.0191 at  $\chi^2_c$  value of 8.3 suggesting no evidence of heteroscedasticity hence the study rejects the null hypothesis and accept the alternative of no ARCH process in the ARDL. The study found that the BPG statistic was 0.8965 and White’s test 0.7259 showed that the data did not exhibit any heteroscedasticity hence the data showed

homoscedasticity. The Ramsey Reset test for functional form misspecification and the Reset test showed that there is no evidence of misspecification in the data, the RAM (6) was equal to 2.8 at  $\chi^2_c=7.8$ . Finally the study conducted the Hendry Forecast (HF) test with the t- statistic of 6.098 was given as 10.78 at  $\chi^2_c$  equal to 7.8 this suggest that the study does not reject the null hypothesis of parameter constancy in the periods of failure predictive ability.

The study conducted a Chow test for any structural breaks in the South African data 1960- 2010. The First Chow test (Chow 1) showed some elements of predictive failure in the dynamic model (that is, out-of- sample forecasting ability) of the ARDL model in the period of 1982- 1984, since this period was the peak of political turmoil and the worst industrial relations<sup>1</sup> ever in the recorded history of South Africa. This is also evidenced by the recursive residual graph below. The second Chow (2) break was in the period of 1993- 1994, to test the ability of the ARDL to predict the out- of- sample period of 1993- 1994 to forecast the dependent in this period. Chow (1), F (1, 22) was equal to 0.91 at the p- value of 0.46 showing that the model correctly predicted the crisis.

### **Policy implications and recommendations**

The study showed a statistically significant relationship between the levels of investment and its sub sectors such as the business investment and residential investment in South Africa. The study has shown that the investment behaviour in both of these markets is policy relevant. The South African government through institutional arrangements should intervene in the business and residential markets in order to influence the total gross investment in South Africa. The study has revealed that business investment is the largest contributor to the total gross investment, thereby making it a very influential variable in the economy. More than 40 percent of private investment in South Africa has been used as replacement cost than capacity building in the last 15 years, this is shown by the ARDL. This could raise concern in the South African economy, since this have a huge impact on the growth objective of the country.

The short run coefficients of the ARDL model showed that investment determinants such as the lagged variables such as BINV, HINV, AP and the exogenous Q were the most important determinants of the short run shocks in the gross investments. This might have been due to the recent aggressive growth policies implemented by the South African government such as Accelerated and Shared Growth Initiative for South Africa (ASIGSA), industrial policy Action Plan (IPAP2), Growth Employment, and Redistribution (GEAR), New Growth Policy (GNP). The performance of the Tobin Q was rather sufficient though not conclusive in the short run.

In the long run, Gross investment in South Africa is mainly affected by the average asset prices in both the residential and the business investment. The other long run variable that seem to affect the level of it's the variable net business investment which might have been triggered by the ever increasing business opportunities in South Africa and that the South African market is virtually the economic harbour of the African economy as a whole. It is actually saddening that, the performance of the Tobin Q is not satisfactory in affecting the Long run investments in South Africa.

In South Africa, government intervention in the asset markets especially in enhancing availability credit condition to ensure high capital structures of private firms and households; this consecutively can have a positive as well as huge impact on enhancing both short- run and long run investments in these two asset markets. As an alternative, the role of government can be through creating business opportunities as well as providing policies such as low interest bearing loans to investors in both of these markets.

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