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ABSTRACT

This paper attempts to examine whether a long-run theoretical relationship does indeed exist between the level of inflation in South Africa and the amount of FDI eventually received by the country. It also attempts to provide insight into the purported macroeconomic benefits of the policy of 'inflation targeting', by ascertaining whether any causality exists between stable inflation levels and improved FDI inflows from a South African perspective. Utilising annual data ranging from 1970 to 2012, we employ time series techniques to answer our research objectives. Our results indicate that there is a long-run inverse relationship between the level of inflation and FDI inflow in South Africa, implying that a rise in the level of inflation would have a negative impact on the amount of FDI received by South Africa. Furthermore, the paper successfully demonstrates that a degree of causality does exist between stable inflation levels and improved FDI inflows from a South African perspective, suggesting that the policy change that occurred with the adoption of 'inflation targeting' by the South African authorities did have a significant impact on the average level of FDI inflow to the country. Consequently, one of the implications of our findings is that the policy of 'inflation targeting', if well-implemented, actively managed and consistently applied, could represent a vital organ of the policy toolkit available to governmental authorities and policymakers in South Africa and indeed all developing countries, in their bid to enhance the inflow of FDI to their respective countries.

Key words: inflation; foreign direct investment (FDI); South Africa; timeseries techniques

1. INTRODUCTION: ISSUE AND MOTIVATION

In recent times, there has been increased attention devoted to the role that foreign direct investment (FDI) could play in ameliorating the general dearth of capital available for investment in most developing countries. Even though FDI is primarily meant to bridge the gap between the desired level of gross national investment and the prevailing amount of domestic savings and investment, it also results in positive externalities that often serve as a catalyst in the overall economic growth and development of the country that receives it. The inflow of FDI is known to yield indirect benefits, such as enhanced employment opportunities, the improvement of the balance of payments (BOP) account situation due to the increased availability of foreign exchange in an economy, and perhaps, most importantly, the prospect of the transfer of technology, managerial skills and other intangible knowledge to the host country which would allow domestic firms to improve their collective profitability and performance (Elijah, 2006).

In light of the above, many developing countries have sought to adopt and implement a number of progressive policies and incentives with a view to attracting foreign investors, and accordingly, enhancing the overall level of FDI received. A case in point is South Africa. During the *apartheid* era, South Africa experienced economic sanctions and political isolation from the rest of the world. Consequently, the country endured a sustained period of relatively immaterial foreign investment, as well as dwindling economic growth, with heightened inflation and interest rates (Nowak, 2005). In fact, in the decade leading up to the end of *apartheid* in the early 90s, South Africa witnessed an annual net outflow of invested capital, which could be largely attributed to the international pressure on the regime in power and the prevailing political uncertainty at that juncture. As democracy slowly returned to South Africa, so did foreign investment, both in the form of direct investment and portfolio flows. The abolition of sanctions and disinvestment actions against South Africa served to open markets to an array of foreign goods, services and, most importantly, financial flows. In fact, during 1995 alone, more than R21 billion worth of foreign capital flowed into the economy (SARB, 1996).

In order to take advantage of the newly-established political stability and improved investor confidence, the new government introduced a series of economic liberalisations and reforms

to further attract direct investment into the country. In as early as 1993, the late Nelson Mandela acknowledged that foreign investment would play an indispensable role in any economic progress and development by South Africa (Clark and Bogran, 2003). Since then, the country has implemented sound monetary and fiscal policies, and entered into regional groupings and trade agreements, so as to reduce any barriers to free trade. With a view to promoting FDI specifically, the Growth, Employment and Redistribution (GEAR) policy of 1996 was adopted, which sought to achieve the unbridled liberalisation of markets and the seamless integration of the economy with the rest of the world. This policy included a 'principle of national treatment' for foreign investors, as well as measures to reduce tax burdens and import tariffs, and to allow for the easier transfer and repatriation of profits (Clark and Bogran, 2003).

Nevertheless, by the new millennium, most of the broad-ranging initiatives undertaken and policies adopted by the South African authorities had yet to achieve the desired results. The level of FDI inflow at that time was quite disappointing and disheartening, relative to the size of the economy, and to similar developing countries in other regions of the world (Basu and Srinivasan, 2002). Many analysts attributed this to the macroeconomic instability that was prevalent at that juncture, namely the high rate of inflation and the volatility in the exchange rate of the South African Rand (Moolman *et al*, 2006). In order to achieve more consistency in its monetary policy and provide a more stable macroeconomic environment, the South African Reserve Bank (SARB) decided during the year 2000 to adopt a policy of 'inflation targeting', as opposed to any form of exchange controls (Nowak, 2005). In a nutshell, 'inflation targeting' sought to provide the private sector and financial markets with a more transparent and predictable macroeconomic framework, thus making it easier for them to infer the intentions of the central bank from its monetary policy announcements and hence, appropriately plan their future investment decisions.

It was envisaged that the reduced macroeconomic policy uncertainty would cause a decline in transaction and access to information costs, and in turn, enhance expected return rates and prospects of profitability for investors. Consequently, long-term FDI decisions that usually involve huge sunk costs and depend substantially on the confidence of the investor with regards to the soundness of the macroeconomic environment in South Africa would be significantly more favourable (Nowak, 2005). As such, the policy of 'inflation targeting' has successfully ensured the progressive decline of the rate of inflation, from levels of between

10 to 15 percent in the 1990s to its lowest levels ever recorded in thirty-seven (37) years during the period 2004 to 2005 (Moolman *et al*, 2006). In contrast to many African countries which experience double-digit inflation rates, inflation in South Africa has been on a declining trend for the greater part of the last decade. Thus, many academics and policy-makers, such as Mishkin and Schmidt-Hebbel (2007) and Waglom (2003), agree that the strategy of 'inflation targeting', could well be credited with creating a more investment-friendly environment in South Africa, and inducing net FDI inflow to reach never-before-seen levels of around US$10 billion in early 2011 (SARB, 2012).

However, the policy of 'inflation targeting' and its purported macroeconomic benefits is not without its detractors. Some empirical studies, such as Ball and Sheridan (2005), have questioned the viability of 'inflation targeting', after finding no significant difference in the major macroeconomic variables, including FDI received, between developed countries that chose to adopt such a policy and those that did not. More recently, Brito and Bystedt (2010) demonstrated that in most emerging market economies, lower inflation levels due to 'inflation targeting' have been achieved at the cost of the real output growth rate. Consequently, a lower real output growth rate would result in less optimistic expectations regarding productivity and profitability, thus discouraging foreign investors from entering the economy, and inevitably leading to an overall decline in FDI inflow for emerging markets, much like South Africa.

Furthermore, the very notion that the level of inflation has a significant impact on the amount of FDI received by a nation is not without contention itself. Recent empirical research conducted in order to analyse the determinants of FDI in developing countries, such as Hsiao and Hsiao (2006); Moosa and Cardak (2006); and, Wijeweera and Mounter (2008) have even refuted the perception that a long-run theoretical relationship exists between the level of inflation and the FDI inflow. In a similar manner, a few studies focussed on determining the broad macroeconomic variables that influence the inflow of FDI in the South African context, such as Fedderke and Romm (2006), Moolman *et al* (2006) and Rusike (2007), have all argued that the level of inflation is not a significant factor in the amount of FDI received by South Africa. Accordingly then, the question still remains as to whether the strategy of 'inflation targeting' could indeed be credited to some extent with the heightened levels of FDI inflow witnessed since the policy's inception or not.

This paper intends to shed further light on this issue. It first attempts to establish whether a long-run theoretical relationship does indeed exist between the level of inflation in South Africa and the amount of FDI eventually received by the country. Thereafter, it attempts to provide further insight into the purported macroeconomic benefits of 'inflation targeting', by ascertaining whether any causality exists between stable inflation levels and improved FDI inflows from a South African perspective. Due to FDI and its associated positive externalities being regarded as a catalyst in the overall economic growth and development of South Africa, the importance of understanding the significance of the level of inflation as a possible determinant of the eventual FDI received by the country cannot be stressed enough. Likewise, an awareness of the implications of such a relationship, if any, is essential for the relevant authorities, in terms of both macroeconomic policy and decision-making.

The rest of the paper is organised as follows: The next section identifies the primary objectives of this study. Section 3 outlines the theoretical framework for our study, while Section 4 presents a succinct literature review. This is followed by a discussion regarding the data and methodology utilised in this study. Thereafter, Section 6 is devoted to the reporting and interpreting of the estimation results obtained in our empirical analysis. Finally, the paper concludes by mentioning a few of the implications of the estimation results, some of the limitations of the study, as well as possible areas of future research.

2. RESEARCH OBJECTIVES

More precisely, this paper has three (3) main research objectives, namely:

I. To establish whether a long-run theoretical relationship exists between the level of inflation in South Africa and the amount of FDI eventually received by the country.

II. To determine whether any causality exists between inflation and FDI in South Africa, so as to ascertain whether the improved level of FDI inflow witnessed since the adoption of 'inflation targeting', could to some extent be attributed to the change in macroeconomic policy, *ceteris paribus*.

III. To identify any related macro-variables besides the level of inflation that the relevant South African authorities should focus on in order to enhance the amount of FDI eventually received by the country.

3. THEORETICAL FRAMEWORK

There have been a number of theories that have developed in FDI literature. These have subsequently been grouped into micro- and macroeconomic approaches. The microeconomic theories tend to focus on firm specific characteristics that influence the decision-making of firms, such as the 'market imperfections' theory. On the other hand, macroeconomic theories seek to analyse country-characteristics that explain FDI flows within and across countries, namely internalisation and product cycle theories. Additionally, literature on FDI has developed another set of theories to better explain the distribution of FDI, based on the motives of the firms making such investments. These include resource-seeking, market-seeking and efficiency-seeking FDI.

Hymer (1976) developed the 'market imperfections' theory which aims at explaining the behaviour of firms in non-perfect competitive environments, that is, in oligopolistic or monopolistic environments. For firms to embark on FDI, they require some unique advantage, such as cutting-edge technology, to compete abroad with local firms who already have location-specific advantages. Considering the market disequilibrium hypothesis, FDI will only be transitory as it acts as an equalising force among segmented markets, and will shortly be eliminated through the re-establishment of equilibrium. This disequilibrium is usually found in factor markets, such as labour markets, where FDI flows from high labour cost countries to low labour cost countries. Accordingly, cost of labour emerges as an important determinant of FDI.

The internalisation theory of Buckley and Casson (1976) supports the idea that there is a tendency in the economic system to generate sophisticated information and to transfer this information internationally in the form of FDI (Trevino and Daniels, 1995). The generation and transfer of such information takes place due to the time- and cost-savings associated with transferring such information internally. The internalisation of markets across the boundaries

of national markets creates Multi-National Corporations or MNCs. Thus, in view of this theory, the level of knowledge and expertise seem to be important factors for the amount of FDI received in imperfect markets.

Vernon's (1966) product life-cycle hypothesis postulates that firms engage in FDI at a particular stage in the life-cycle of products that it had initially innovatively produced (Moosa, 2002). The theory is production-oriented, focusing on the production of industrial goods in manufacturing sectors. New products or initial production takes place in domestically developed countries, due to their economies of scale, easy access to markets and efficient communication process. Other countries are initially served through exports and once a customer base is established, offshore production usually follows. The maturity stage of the product life-cycle only occurs when production methods are completely standardised, and markets become saturated in emerging and less developed countries too. Thus, this theory seems to suggest that market size, cost of production and market openness are important determinants of FDI.

Similarly, the 'eclectic theory' attempts to answer the question of why a firm would want to produce in a foreign location instead of exporting or entering into a licensing arrangement with a local firm. According to Dunning (1988), three conditions must be satisfied for a firm to engage in FDI. These are ownership, internalisation and locational advantages, whose combination subsequently came to be known as the 'eclectic theory' or 'OLI paradigm'. 'Ownership advantages' entail advantages that arise from the ownership of some intangible assets, such as access to raw materials, enhanced technology and competitive advantages over similar firms. 'Locational advantages' occur in scenarios where expansion by a firm may be accomplished either at home or in a foreign country. Accordingly, some foreign countries may have certain advantages, such as the size of the local market, availability of resources, relative inflation levels, government incentives and other location variables. Finally, 'internalisation advantages' would be of importance in situations where multinationals have to choose between accomplishing further expansion internally, or by virtue of selling the rights to that expansion to other firms. Hence, the 'eclectic theory' highlights a number of possible determinants of FDI, including market size, inflation levels, government incentives and access to raw materials.

In addition, another theory has been developed in relatively more recent literature on FDI in an attempt to better explain the distribution of FDI, is based on the motive of the firm making such an investment. This theory suggests that there are mainly three types of FDI, namely 'resource-seeking', 'market-seeking' and 'efficiency-seeking' FDI (Narula and Dunning, 2000). The determinants of FDI are then discussed within this framework. For instance, 'resource-seeking' FDI is related to the presence of natural resources. This theory suggests that FDI is resource- or factor-driven, with the availability of low-cost unskilled labour, skilled labour and quality of physical infrastructure being the key determinants of FDI. Thus, given the abundance of natural resources in Africa, a greater amount of FDI would be expected to be in the primary sector. A case in point is the FDI that is channelled to resource-abundant less developed countries, such as Chad, Equatorial Guinea and Angola, which is manly in petroleum exploration (Moolman *et al*, 2006).

By contrast, the main objective of 'market-seeking' FDI is to serve domestic markets, which means that goods are produced in the host country and sold in the domestic market of the investing firm. This type of FDI is principally driven by domestic demand, which is based on the relative size of the market in the host country, and its relative level of income. Consequently, factors such as cost of labour and level of inflation become essential characteristics for countries which host market-seeking FDI (Asiedu, 2002). Finally, 'efficiency-seeking' FDI aims to minimise costs associated with the factors of production at an international level. The focus is on reducing costs through the utilisation of government-induced structural imperfections, such as tax differentials, or by reducing existing risks through production diversification. The determinants of such 'efficiency-seeking' FDI would thus be the level of productivity, the existence of a skilled, disciplined workforce and the degree of technological and physical infrastructure in the host country (Hawkins *et al*, 2001).

Thus, from a theoretical perspective, there are a host of factors that are important in determining the amount of FDI received by a certain country. As outlined above, these include market size, factor costs, fiscal incentives, investment climate, political and economic stability, trade openness and infrastructure quality, amongst others. While the level of inflation in the host country has been identified as a principal determinant of FDI in some of the related theories discussed above, there are some theories which do not consider inflation levels to have any substantial impact on the FDI received by a country. Thus, theoretically at least, it remains an unresolved issue as to whether the level of inflation can be considered as a

significant determinant of the amount of FDI eventually received by South Africa or not. With this in mind, we turn our focus to related literature, in order to ascertain whether this issue has been resolved from an empirical perspective.

4. LITERATURE REVIEW

In recent times, there has been a large amount of research and studies focussed on identifying those factors that influence the flow of foreign capital into both industrialised and emerging markets. Most of the literature on FDI determinants has tended to classify the respective determinants into various categories depending on the motivation of the study. One approach argues that as a result of globalisation, the nature of FDI determinants could have changed over time, and consequently categorises the determinants based on their traditional or non-traditional nature. Another approach has focussed on production and sought to classify the relevant factors as either demand or supply side determinants of FDI (Nunnekamp, 2002).

A widely accepted methodology though, has focussed on identifying country-specific characteristics in order to distinguish between two kinds of factors influencing the inflow of FDI, namely external or *push* factors and domestic or *pull* factors (Ahmed *et al*, 2005). *Push* factors represent the general economic conditions prevailing globally and reflect the opportunity cost of investing in the recipient countries, such as foreign interest rates and global economic stability, while *pull* factors are primarily concerned with the socio-economic conditions and the institutional environment, including market size, political stability and quality of infrastructure in the recipient countries (Wint and Williams, 2002). While it is important to note that a number of these determinants overlap in the different classifications, the crux of the matter is that the collective approaches have essentially been able to aptly capture and appropriately identify the broad categories of macroeconomic, institutional and policy variables that influence the inflow of FDI.

Most of the empirical analyses on the determinants of FDI use cross-country regressions to identify country characteristics that attract or deter FDI. It should be noted that the various factors that influence the inflow of FDI are dependent on individual country characteristics, policies and locations. To date, there remains no consensus as to the particular determinants

of FDI for developing countries. The variables considered include growth, skills, labour, market size, trade openness, infrastructure, exchange rate, international interest rates, national policy frameworks and government incentive policies, the importance of which varies across regions, countries and time. Whilst there have been numerous studies on FDI for developing countries and emerging markets, such as Ahmed *et al* (2005) and Narayanamurthy *et al* (2010), there have relatively few studies that have been carried out with a specific focus on South Africa.

One of the first studies was conducted by Schoeman *et al*. (2000) who examined how the fiscal policy of the South African government impacted on FDI. The results suggest that both of the fiscal policy variables under investigation, namely the deficit/GDP ratio, representing fiscal discipline, and the relative tax burden on prospective investors, had a negative effect on the inflow of FDI to South Africa. The authors suggest that the South African government needs to transform its economy into an investor-friendly environment, by adjusting its fiscal policy, with particular attention being paid to the tax burden which was still relatively high. Subsequently, Fedderke and Romm (2006) elected to investigate the determinants of FDI in South Africa over the period 1960 to 1997. Their results show that political stability, property rights, market size, trade openness, labour cost and corporate tax rates are important factors in attracting FDI. From the analysis, the authors recommend quite extensively that South African policymakers aim to reduce political risk, promote market growth and trade openness and moderate wage increases, amongst others.

A similar empirical study was carried out by Moolman *et al* (2006), who sought to examine the macroeconomic link between FDI in South Africa and its resultant impact on output for the period 1970-2003. In order to achieve their research objective, the authors first identified supply side determinants of FDI, prior to analysing their impact on output. Their findings indicate that market size, trade openness, the quality of infrastructure and the nominal exchange rate are factors which South African policymakers should focus on when seeking to secure additional FDI. Consequently, a relatively extensive study was conducted by Rusike (2007), in order to discover the trends and determinants of inward FDI to South Africa from 1975-2005. The author considered various variables such as economic growth rates, labour cost, market size, trade openness, financial development, exchange rate and international interest rates as possible major determinants of FDI, before concluding that financial

development, market size, trade openness and the exchange rate are the principal long-run determinants of FDI in the South African context.

One of the most recent empirical analyses in relation to identifying the determinants of FDI in South Africa was conducted by Kiat (2010), wherein the author examined whether the volatility in the exchange rate influences the level of FDI in South Africa, with a view to ascertaining whether the current macroeconomic policies in South Africa are conducive to its FDI growth or are in need of urgent improvement, at least in terms of the exchange rate. The findings suggest that even though the exchange rate is a significant factor in determining the eventual level of FDI received by South Africa, not much had been done by the authorities to combat the recent exchange rate volatility. Consequently, the author felt that this oversight by the South African government could be the cause of the stagnation in the inflow of FDI in the years leading up to the research.

At this juncture, it might be poignant to mention some of studies conducted in relation to developing countries and emerging markets, wherein the level of inflation was found to be a significant determinant of FDI. Most of the relevant literature suggests that increased inflation results in a reduction of the real returns on an investment, thus discouraging foreign investors from entering the economy, and consequently, a lower level of FDI. This is a view shared by Fuat and Ekrem (2002); Rogoff and Reinhart (2002); Nonnemberg and Cardoso de Mendonça (2004); Onyeiwu and Shrestha (2004); Ahmed *et al* (2005); Elijah (2006); and, Narayanamurthy *et al* (2010), amongst others. Nonetheless, there is a considerable amount of empirical studies that have found the level of inflation to be an insignificant determinant of FDI inflow, such as some of the exclusively South African studies mentioned above, as well as Hsiao and Hsiao (2006); Moosa and Cardak (2006); and, Wijeweera and Mounter (2008).

With regards to the policy of 'inflation targeting', it may well be considered as a *pull* factor in terms of FDI inflow, since it is essentially a reflection of the domestic macroeconomic environment. There exists a vast strand of empirical literature that has found evidence to support the notion that 'inflation targeting' results in a more transparent and predictable macroeconomic framework with reduced policy uncertainty, thus making it easier for investors to infer the intentions of the central bank from its monetary policy announcements and hence, appropriately plan their future investment decisions (Hodge, 2006). Consequently, the creation of a more investment-friendly environment would indeed have a positive impact

on the level of FDI in a country. This is a view endorsed by Mishkin and Schmidt-Hebbel (2007) and Waglom (2003), amongst others.

However, as mentioned previously, the policy of 'inflation targeting' and its purported macroeconomic benefits is not without its detractors. Some empirical studies, such as Ball and Sheridan (2005), have questioned the viability of 'inflation targeting', after finding no significant difference in the major macroeconomic variables, including FDI received, between developed countries that chose to adopt such a policy and those that did not. More recently, Brito and Bystedt (2010) have demonstrated that in most emerging market economies, lower inflation levels due to 'inflation targeting' have been achieved at the cost of the real output growth rate. Consequently, the lower real output growth rate results in less optimistic expectations regarding productivity and profitability, thus discouraging foreign investors from entering the economy, inevitably leading to an overall decline in FDI inflow for emerging markets.

As can be ascertained from the above, while inflation has been included among the principal determinants of FDI in developing countries in a substantial amount of the relevant literature, including Ahmed *et al* (2005) and Narayanamurthy *et al* (2010), most of the studies conducted in the South African context, such as Fedderke and Romm (2006) and Rusike (2007), have concluded otherwise. Thus, it remains an unresolved issue as to whether the level of inflation can be considered as a significant determinant of the amount of FDI eventually received by South Africa or not. In a similar manner, it is clearly evident from the aforementioned that the macroeconomic benefits associated with the policy of 'inflation targeting' are something that is not universally accepted. Thus, this paper intends to contribute to the existing literature by firstly, establishing whether a long-run theoretical relationship does indeed exist between the level of inflation in South Africa and the amount of FDI eventually received by the country. Thereafter, it attempts to provide further insight into the purported macroeconomic benefits of 'inflation targeting', by ascertaining whether any causality exists between stable inflation levels and improved FDI inflows from a South African perspective.

5. DATA AND METHODOLOGY

5.1) METHODOLOGY

This study employs time series techniques in order to achieve our research objectives, which as alluded to earlier, include the ascertainment of whether a long-run theoretical relationship exists between the level of inflation and the amount of FDI received by South Africa. This methodology is favoured over traditional regression analysis for a few reasons.

Firstly, most economic time series variables tend to be non-stationary in their original 'level' form, thus implying that any conventional statistical tests carried out on such variables would be invalidated. To explain further, if the variables are non-stationary but cointegrated, then the ordinary regression without the error-correction term(s) derived from the cointegrating equation would be mis-specified. However, if the variables are non-stationary and not cointegrated, then an ordinary regression with 'differenced' variables (which will be stationary) could be estimated. However, the conclusions drawn from such an analysis will be valid only for the short run, and no conclusions can be made about the long-run theoretical relationship among the variables. This is due to the fact that the 'differenced' time-series variables have no information about the long-run relationship between the trend components of the original series as these have, by definition, been removed. The long run co-movement between the variables cannot be captured by 'differenced' variables (Masih *et al*, 2009).

Hence on the one hand, if the variables taken are 'non-stationary' in their original 'level' forms, the conventional statistical tests are not valid, since the variances of these variables are changing and the relationship thus estimated will be 'spurious'. On the other hand, if the variables taken are turned 'stationary' by 'first-differencing', the long-term information contained in the trend element in each variable would have been, by definition, removed and the relationship estimated would only give only the short-run relationship between the variables. Thus, the regression analysis would only capture short-term, cyclical or seasonal effects, and would not be testing any long-term theoretical relationships (Masih *et al*, 2009).

Secondly, in traditional regression analysis, the endogenous and exogenous nature of variables is pre-determined by the researcher, usually on the basis of prevailing or *a priori*

theories. Cointegration techniques are advantageous in this sense, as it does not make any assumptions regarding the endogeneity and exogeneity of variables. Rather, in the final analysis, the data itself will be allowed to determine which variables are in fact exogenous, and which are exogenous. In other words, in traditional regression analysis, causality is assumed, whereas in cointegration techniques, it is empirically proven by data. This is achieved through the 'Long-run Structural Modelling' or 'LRSM' technique which endeavours to estimate theoretically meaningful long-run (or cointegrating) relations by imposing on those long-run relations (and then testing) both identifying and over-identifying restrictions, based on theories and *a priori* information of the economies (Masih *et al*, 2009).

Hence, in our study, we would apply the following methodology, as outlined by Masih *et al* (2009): After conducting unit-root tests to test the stationarity of the variables, we would proceed to determine the optimum order (or lags) of the vector autoregressive model or VAR. Utilising the lag order obtained in the previous step, we would conduct Johansen cointegration tests. The test of cointegration is designed to examine the long-run theoretical or equilibrium relationship and to rule out any spurious relationship among the variables. Thereafter, the cointegrating estimated vectors will then be subjected to exactly identifying and over-identifying restrictions based on theoretical and *a priori* information of the economy. This 'LRSM' technique as outlined above would confirm whether a variable is statistically significant, and also test the long-run coefficients of the variables against theoretically expected values.

Nevertheless, the evidence of cointegration does not necessarily mean causality. This can be achieved through the Vector Error Correction Model (VECM), which is able to indicate the direction of Granger causality both in the short- and long-run. While we would now be in a position to say which variable is leading and which is lagging, we would be unable to ascertain which variable is relatively more exogenous or endogenous. For this purpose, the Variance Decomposition technique has been designed to indicate the relative exogeneity or endogeneity of a variable by decomposing (or partitioning) the variance of the forecast error of a variable into proportions attributable to shocks (or innovations) in each variable in the system, including its own. The proportion of the variance explained by its own past shocks can help to determine the relative exogeneity or endogeneity of a variable. The variable that is explained mostly by its own shocks (and not by others) is deemed to be the most exogenous of all and vice versa.

Towards the end, the Impulse Response Function (IRF) will be applied. It is designed to map out the dynamic response path of a variable due to a one-period variable-specific shock to another variable. The IRF is just a graphical way of expressing the relative exogeneity or endogeneity of a variable. Finally, the Persistence Profiles (PP) technique will be applied. It is also in graphical form, and is designed to estimate the speed at which the variables would return to equilibrium, assuming that there was a *system-wide shock*. This is unlike the Impulse Response Function (IRF) which maps out the effects of only a *variable-specific* shock on the long-run relationship (Masih *et al*, 2009).

5.2) DATA

As mentioned earlier, one of the primary objectives of our study is to ascertain whether a long-run theoretical relationship exists between the level of inflation and the amount of FDI received by South Africa. Keeping this in mind, the focal variables of our study would be FDI inflow and level of inflation. Since we have chosen to utilise the same or similar proxies for the different variables in our analysis to those that have previously appeared in FDI literature, the amount of FDI received was proxied by the ratio of net inflow of FDI to nominal GDP (Moolman *et al*, 2006; Rusike, 2007; and Kiat, 2010). Similarly, the level of inflation was approximated by a relatively standard measure of inflation known as the consumer price indices or CPI, with the base year being 2005 (Fedderke and Romm, 2006; Rusike, 2007; and Kiat, 2010).

The approach that we have adopted in terms of the selection of the control variables for the estimation of our focal relationship through the application of Long Run Structural Modelling (LRSM), is to focus on those variables that have been shown to have theoretical relationships with the amount of FDI received by a country in previous FDI literature, particularly in South African studies. For this reason, those variables that have been found to be significant in all the aforementioned South African studies are selected to be included in our model, namely 'market size' and 'trade openness'. The variable of 'market size' is proxied by real GDP (Schoeman *et al*, 2000; Moolman *et al*, 2006; Rusike, 2007; and Kiat, 2010), while the variable of 'trade openness' is represented by the sum of exports and imports as a ratio of nominal GDP (Fedderke and Romm, 2006 and Rusike, 2007).

Next, those variables that have been found to be significant in some of the aforementioned South African studies are also selected to be included in our model, namely 'financial development' and 'real effective exchange rate' or 'REER'. The variable of 'financial development' is proxied by the amount of domestic credit to the private sector as a ratio of nominal GDP (Moolman *et al*, 2006 and Rusike, 2007), while the variable of 'real effective exchange rate' is represented by the nominal exchange rate adjusted for inflation (Fedderke and Romm, 2006; Rusike, 2007; and Kiat, 2010). In addition, all of the variables are transformed into natural logarithms in order to achieve stationarity in variance.

Finally, a dummy variable is introduced into our model to enable us to control for the change in policy that occurred with the adoption of 'inflation targeting' by the South African authorities in the year 2000. The inclusion of this dummy variable is thus essential to maintain the structural stability of our model. The dummy variable is a binary variable that would be assigned the value of zero for the period prior to the policy change (1970-2000), and the value of one for the period after the change (2001-2012).

The variables used in the analysis are defined in the following table:

FDI	Ratio of net FDI inflow to nominal GDP	As a proxy for FDI inflow
CPI	Consumer Price Indices (with a base year of 2005)	As a proxy for level of inflation
SIZE	Real GDP	As a proxy for market size
OPEN	Ratio of the sum of exports and imports to nominal GDP	As a proxy for trade openness
FINDEV	Ratio of domestic credit to private sector to nominal GDP	As a proxy for financial development
REER	Real Exchange Rate (with a base year of 2005)	As a proxy for exchange rate volatility
DUMMY	Dummy Variable	As a proxy for the policy change

Accordingly, time series data from the year 1970 through to 2012 was sourced for this study, mainly due to a lack of data for some variables prior to the year 1970. Annual data is employed since FDI is usually an incremental phenomenon with sporadic flows during the course of a year. Thus, there are 42 annual observations in total. The relevant data is sourced from the World Development Indicators (WDI), which is available on the World Bank Databank (URL: http://databank.worldbank.org).

6. EMPIRICAL RESULTS AND DISCUSSIONS

6.1) UNIT ROOT TESTS

We begin our empirical analysis by determining the stationarity of the variables utilised in the study. To reiterate, a variable is stationary when its mean, variance and covariance are all constant over time. It is important to determine the stationarity of the variables before we proceed towards tests for cointegration. Ideally, our variables should all be I(1), implying that in their original 'level' form, they are non-stationary, and in their 'first differenced' form, they are stationary. The 'differenced' form of each variable is created by taking the difference of their logarithmic forms. For example, $DFDI = LFDI - LFDI_{t-1}$.

Consequently, we conducted both the Augmented Dickey-Fuller (ADF) test and Philips-Perron (PP) test on each variable (in both level and differenced form). The difference between the two tests is that while the ADF test is only able to resolve the autocorrelation problem, the PP test takes care of both the autocorrelation and heteroskedasticity issues. Table A and B summarise the results of the ADF test, while Table C and D collate the results of the PP test. See Appendix 1A for details regarding the ADF test results, and Appendix 1B for further details relating to the PP test results.

Table A: ADF Test – Variables in Level Form

Variable	Test Statistic		Critical Value	Results
	AIC	SBC		
LFDI	-1.8933	-1.8933	-3.5348	Non-stationary
LOPEN	-2.6248	-2.6248	-3.5348	Non-stationary
LSIZE	-1.6919	-1.6919	-3.5348	Non-stationary
LFINDEV	-2.7246	-2.7246	-3.5348	Non-stationary
LREER	-2.3623	-2.3623	-3.5348	Non-stationary
LCPI	-0.7748	-1.4226	-3.5348	Non-stationary

Table B: ADF Test – Variables in Differenced Form

Variable	Test Statistic		Critical Value	Results
	AIC	SBC		
DFDI	-3.6673	-3.6673	-2.9446	Stationary
DOPEN	-3.7847	-3.7847	-2.9446	Stationary
DSIZE	-3.9106	-3.9106	-2.9446	Stationary
DFINDEV	-4.0667	-4.0667	-2.9446	Stationary
DREER	-4.3031	-4.8694	-2.9446	Stationary
DCPI	-4.3769	-4.3769	-2.9446	Stationary

Relying primarily on the Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC), the conclusion that may be drawn from the above results is that all the variables that we are utilising for our analysis are I(1), and thus we may proceed to the cointegration tests. This is because the null hypothesis for the ADF test is that the variable is non-stationary. In all cases of the variables in level form, the test statistic is lower than the critical value and hence, we cannot reject the null. Conversely, in all cases of the variable in differenced form, the test statistic is higher than the critical value and thus, we can reject the null and conclude that the variable is stationary (in its differenced form). It should also be noted that in determining which test statistic to compare with the 95% critical value for the ADF statistic, we have selected the ADF regression order based on the highest computed value for AIC and SBC. In just two instances, namely LCPI and DREER, the AIC and SBC give different orders and in those cases, we have taken the different orders and compared both. Nevertheless, this is not an issue, as in both cases, the implications are consistent.

Consequently, we used the Philips-Perron (PP) test to examine the stationarity of the variables. As with the ADF test, the variables were tested in both 'level' form (Table C) and 'differenced' form (Table D). The null hypothesis for the PP test once again is that the variable is non-stationary. The obtained results are assessed based on the p-value of the test statistic, which informs us of the percentage error we are making in rejecting the null. In all cases of the variables in level form, the null hypothesis cannot be rejected suggesting that all the variables are non-stationary. Conversely, in all cases of the variable in differenced form, we are able to reject the null and conclude that the variable is stationary. In sum, the results of the PP test are consistent with the ADF test, thus confirming that all the variables that we are utilising for our analysis are I(1). Hence, without testing the variables any further, we may proceed to the cointegration tests.

Table C: PP Test – Variables in Level Form

Variable	Regressor	Test Statistics (p-	Results
DFDI	LFDI(-1)	.313	Non-stationary
DOPEN	LOPEN(-1)	.250	Non-stationary
DSIZE	LSIZE(-1)	.219	Non-stationary
DFINDEV	LFINDEV(-1)	.189	Non-stationary
DREER	LREER(-1)	.191	Non-stationary
DCPI	LCPI(-1)	.235	Non-stationary

Table D: PP Test – Variables in Differenced Form

Variable	Regressor	Test Statistics (p-	Results
D2FDI	DFDI(-1)	.000	Stationary
D2OPEN	DOPEN(-1)	.000	Stationary
D2SIZE	DSIZE(-1)	.000	Stationary
D2FINDEV	DFINDEV(-1)	.000	Stationary
D2REER	DREER(-1)	.000	Stationary
D2CPI	DCPI(-1)	.000	Stationary

6.2) DETERMINATION OF THE ORDER OF THE VAR MODEL

Prior to proceeding with the cointegration tests, we need to first determine the order of the Vector Auto Regression or VAR, namely, the optimum number of lags to be used. The lag length is usually determined by evaluating the amount of lags recommended by the AIC and SBC. As per the table below, the results show that AIC recommends an order of 2, whereas SBC favours zero lag (see Appendix 2A for details). This discrepancy is due to the fact that AIC normally recommends the highest order of VAR, while the minimum lag of VAR is suggested by SBC.

Table E: Order of the VAR

	Criteria	
	AIC	SBC
Optimal Order of the VAR	2	0

Given this apparent conflict between the recommendations of AIC and SBC, the issue was addressed this in the following manner. First, we tested for serial correlation in each equation. The following results were obtained. Please see Appendix 2B for details.

Table F: Serial Correlation Test

Variable	Chi-Sq. p-value	Implication (at 10%)
DFDI	0.169	There is no serial correlation
DOPEN	0.951	There is no serial correlation
DSIZE	0.046	There is serial correlation
DFINDEV	0.019	There is serial correlation
DREER	0.622	There is no serial correlation
DCPI	0.767	There is no serial correlation

In choosing the optimum order of the VAR, we should be mindful of the fact that if we adopt too low an order, we may encounter the effects of serial correlation. As is evident from the above results, there is an issue of autocorrelation in two (2) of the six (6) variables. Thus, if we adopted a lower order, we may encounter the effects of serial correlation. Conversely, the disadvantage of taking a higher order is that we risk over-parameterization. Nevertheless, in our case, given that we have a time series of reasonable length (42 observations); we do not think that over-parameterization should be an issue of concern. Thus, considering the trade-off between lower and higher lag orders, we decided to choose the higher VAR order of 2.

6.3) TESTING COINTEGRATION

Once we have established that the variables are I(1) and determined the optimal VAR order as 2, we are ready to test for cointegration. We have performed two tests to identify co-integration between the variables, namely the Johansen method and Engle-Granger method. The Johansen method uses the maximum likelihood approach (i.e. Eigenvalue and Trace) and is able to identify more than one cointegrating vector. It gives hypothetical values to the coefficients of all the variables to see which combination makes the error term stationary. On the other hand, the Engle-Granger method utilises a residual-based approach and can identify only one co-integrating vector. It simply tests for the stationarity of the error term.

The null hypothesis for the Johansen test implies that there is no cointegration among the variables. However, since the Eigenvalue and Trace Statistics are both higher than their respective critical values at the 95% significance level, we may reject the null. Furthermore, in Table G below, r<=1 indicates the null hypothesis that the number of cointegrating vectors are less than or equal to one. As our test statistics are unable to reject this null, we accept that there is only one cointegrating vector among the variables. Thus, on the basis of the standard Johansen cointegration test (see Table G below); we are able to conclude that the variables have one cointegrating vector at the 95% significance level, as per the maximal Eigenvalue and Trace Statistics. Please refer to Appendix 3A for details.

Table G: Cointegration Test (Johansen)

H_0	H_1	Statistic	Critical Value		Implication
			95%	90%	
Maximal Eigenvalue Statistics					
r = 0	r = 1	51.7233	39.8300	36.8400	Cointegration
r < = 1	r = 2	29.5892	33.6400	31.0200	
Trace Statistic					
r = 0	r > = 1	119.1861	95.8700	91.4000	Cointegration
r < = 1	r > = 2	67.4628	70.4900	66.2300	

Notes: The statistics refer to Johansen's log-likelihood maximal Eigenvalue and Trace test statistics based on cointegration with unrestricted intercepts and restricted trends in the VAR. The underlying VAR model is of order 2 and is computed using 41 annual observations.

In addition, we have used the Engle-Granger method to test for cointegration among the variables too. Accordingly, we have carried out OLS-regressions on all the variables in their logarithmic or non-stationary form, by arbitrarily choosing one variable as the dependent variable. Thereafter, we have performed unit root tests on the respective residuals of each regression, in order to see which of them is stationary. This is done in lieu of the fact that if any error term is found to be stationary, then the variables will be said to be cointegrated. Despite running six (6) individual OLS-regressions, we find a stationary error term in only one of the regressions, namely with LOPEN as the arbitrary dependent variable. This conclusion is due to the fact that the estimated test statistic (as per the highest AIC and SBC value) is greater than the critical value. This indicates that the non-stationarity of the null hypothesis can be rejected. Thus, we may conclude on the basis of this Engle-Granger test too that the variables are cointegrated. Please see Table H below and Appendix 3B for further details.

Table H: Cointegration Test (Engle-Granger)

Variable	Test Statistic		Critical Value	Results – Implication
	AIC	SBC		
Residual / error term	-5.6551	-5.6551	-5.1631	Stationary - Cointegration

An evidence of cointegration implies that the relationship among the variables is not spurious. Rather, there is a theoretical relationship among the variables and they are in equilibrium in the long-run (although they could deviate from each other in the short-run). The evidence of a cointegrating relationship also implies that each variable contains valuable information for the prediction of the other variables.

6.4) LONG-RUN STRUCTURAL MODELLING (LRSM)

As mentioned above, the evidence of cointegration implies that the relationship among the variables is not spurious. In other words, there is a theoretical relationship among the variables and they tend towards equilibrium in the long-run. However, in order to make the coefficients of the cointegrating vector consistent with the theoretical and *a priori* information of the economy, we applied the 'Long-run Structural Modelling' or LRSM procedure. This is really an attempt to quantify this apparent theoretical relationship among the variables, so as to be able to compare our statistical findings with theoretical (or intuitive) expectations. Relying on the LRSM component of MicroFit, and normalising our variable of interest, namely FDI, we initially obtained the results in Table I (also see Appendix 4A). By calculating the t-ratios manually, we find three variables, namely OPEN; SIZE; and CPI, to be significant. However, both FINDEV and REER prove to be insignificant.

Table I: Exact Identifying Restrictions on the Cointegrating Vector

Variable	Coefficient	Standard Errors	Implication
LFDI	1.0000	(*NONE*)	-
LOPEN	3.75691	(0.52898)	Significance
LSIZE	1.54406	(0.70181)	Significance
LFINDEV	0.33318	(0.25056)	Insignificance
LCPI	-3.1493	(1.7375)	Significance
LREER	1.6634	(0.92069)	Insignificance
Trend	-2.1816	(1.5477)	-

These initial results were quite understandable given the previous literature of FDI determinants in South Africa. As mentioned previously, 'market size' and 'trade openness' are variables that have been found to be significant in <u>all</u> the aforementioned South African studies, such as Schoeman *et al*, 2000; Moolman *et al*, 2006; Rusike, 2007; and Kiat, 2010. On the other hand, 'financial development' and 'real effective exchange rate' or 'REER' are variables that were found to be significant in only <u>some</u> South African studies (Fedderke and Romm, 2006; Rusike, 2007; and Kiat, 2010). Nonetheless, since FINDEV and REER were actually found to be significant in some studies, we decided to verify the significance of the variables by subjecting the estimates to over-identifying restrictions. We did this for all the variables (making one over-identifying restriction at a time). The results, which are displayed

in Table J below, confirmed that FINDEV was indeed insignificant. REER, on the other hand, was shown to be significant. Please see Appendix 4B for further details.

Table J: Over-Identifying Restrictions on the Cointegrating Vector

Variable	Chi-Sq. p-value	Implication
LFDI	-	-
LOPEN	0.651	Significance
LSIZE	0.567	Significance
LFINDEV	0.005	Insignificance
LCPI	0.437	Significance
LREER	0.178	Significance

Based on the results of the over-identifying restriction on REER, as well as the fact that the 'real effective exchange rate' was found to be significant in a few South African studies related to the determinants of FDI, such as Fedderke and Romm, 2006; Rusike, 2007; and Kiat, 2010, we are more inclined to believe that REER is a significant variable. Intuitively too, it is highly likely that the real exchange rate would have an influence on the amount of FDI received by a country. Investors would not find the prospect of investing in a country whose real exchange rate is depreciating as a very viable option for their investment. Consequently, they might channel their investment to other more financially viable pastures.

From the above analysis, we arrive at the following cointegrating relation (numbers in parentheses are standard deviations):

$$\underset{}{FDI} + \underset{(0.529)}{3.76\,OPEN} + \underset{(0.702)}{1.54\,SIZE} - \underset{(1.738)}{3.15\,CPI} + \underset{(0.921)}{1.66\,REER} \rightarrow I(0)$$

6.5) VECTOR ERROR CORRECTION MODEL (VECM)

From our analysis thus far, we have established that at least five (5) of the variables used in this study are cointegrated to a significant degree – FDI, OPEN, SIZE, CPI and REER. However, the cointegrating equation reveals nothing about the direction of Granger causality between the variables as to which variable is leading and which variable is lagging (i.e. which

variable is exogenous and which variable is endogenous). Information on direction of Granger-causality can be particularly useful for the South African authorities. By knowing which variable is exogenous and endogenous, the policymakers can better construct their policies and interventions, and better forecast or predict their expected results. Typically, a policymaker would be interested to know which variable is exogenous, as he would then direct his intervention at that variable, thus causing a significant effect on the expected movement of the remaining variables. Thus, to discern the endogeneity or exogeneity of the variables, we applied the 'Vector Error Correction Modelling' or VECM technique.

In addition to decomposing the change in each variable to short-term and long-term components by virtue of VECM, we are able to ascertain which variables are in fact exogenous and which are endogenous. The principle in action here is that of Granger-causality, a form of temporal causality where we determine the extent to which the change in one variable is caused by another variable in a previous period. By examining the error correction term, e_{t-1}, for each variable, and checking whether it is significant, we found that there are two exogenous variables, namely REER and CPI. The other four variables, namely FDI; OPEN; SIZE; and FINDEV were found to be endogenous, as depicted in the table K below. Please see Appendix 5 for more details.

Table K: VECM Results

Variable	ECM(-1): t-statistic [p-value]	Implication
LFDI	1.1178 [.002]	Variable is endogenous
LOPEN	3.2002 [.003]	Variable is endogenous
LSIZE	3.3847 [.002]	Variable is endogenous
LFINDEV	-4.2609 [.000]	Variable is endogenous
LREER	-.24672 [.807]	Variable is exogenous
LCPI	2.0306 [.151]	Variable is exogenous

The implication of this result is that, as far as the variables included in this study are concerned, the variables of interest to the South African authorities and policymakers should be REER and CPI. The reason for this is that since these variables are exogenous, they would receive shocks and transmit the effects of those shocks to the other variables. More importantly, in terms of the research objectives of our study, this result indicates that FDI would respond to the CPI variable. Nevertheless, the limitation of VECM is the fact that it

does not tell us which variable between REER and CPI is more exogenous. Thus, purely on the basis of these results, it would be difficult for policymakers to make any serious commitments either way. For this reason, we will carry out Variance Decomposition (VDC) in the next stage of our analysis in order to determine relative exogeneity and endogeneity, so as to further guide the authorities in their decision-making process.

Nonetheless, the VECM does produce a statistic that may be of interest to the South African authorities. The coefficient of e_{t-1} informs us of how long it will take to get back to long-run equilibrium if that particular variable is shocked. The coefficient represents the proportion of imbalance that is corrected in each period. In other words, the speed of short-run adjustment to bring about the long-term equilibrium is given by the coefficient of the error-correction term. For instance, in the case of OPEN, the coefficient is 0.57094. This implies that, when there is a shock applied to this variable, it would take, on average, 2 years for this variable to restore the equilibrium with the other variables. For more details, please see Appendix 5. Moreover, the fact that there is at least one variable that is shown to be endogenous in the VECM, implies that the error term of at least one variable is significant. This is actually a further proof that cointegration does exist among the variables. This approach of proving cointegration is known as the ARDL approach.

Furthermore, the diagnostics of all the equations of the error-correction model (testing for the presence of serial correlation, functional form, normality and heteroskedasticity) tend to indicate that the equations are more or less well-specified. In addition, we have used the CUSUM and CUSUM SQUARE to check the stability of the coefficients. The CUSUM and CUSUMSQ tests employ the cumulative sum of recursive residuals based on the first set of observations, which is updated recursively and then plotted against the break points. If the plots of the CUSUM and CUSUMSQ statistics are found to be within the critical bounds of the 5 percent level, the null hypothesis that all coefficients in the model are stable cannot be rejected. On the other hand, if the critical bounds are found to be crossed, the coefficients would be deemed to be structurally unstable.

In our study, we initially found evidence of a structural break, and by using the CUSUM test, we were able to isolate the point at which this structural change occurred. The structural break that is of note here is the change in policy that occurred with the adoption of ‘inflation targeting’ by the South African authorities in the year 2000. In order to enable us to control

for this change and ensure the stability of the coefficients, we included a dummy variable. This dummy variable is a binary variable that would be assigned the value of zero for the period prior to the policy change (1970-2000), and the value of one for the period after the change (2001-2012).

Furthermore, we re-performed all the necessary tests after the introduction of the dummy variable in our modelling. The results from the tests seem to indicate the presence of a unique cointegrating vector linking these variables together in the long-run regardless of whether the dummy is included or not. Thus, the dummy variable was included in our modelling, and with its inclusion, we carried out the CUSUM and CUSUM SQUARE to re-check the stability of the coefficients. As be ascertained from Figure 1 and 2, our test results indicate that they are stable.

Figure 1: CUSUM Test

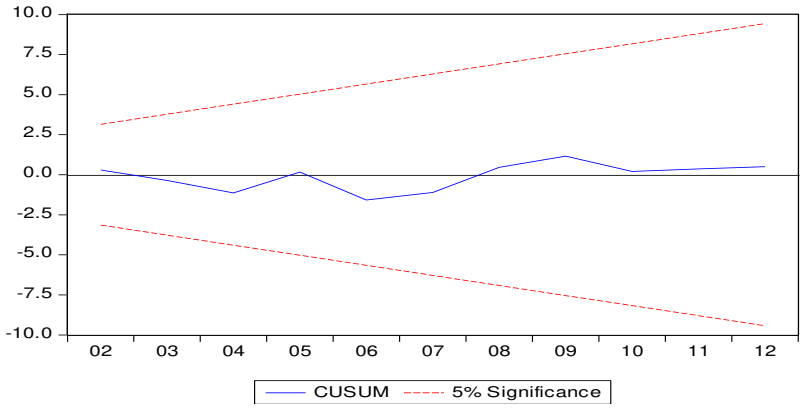
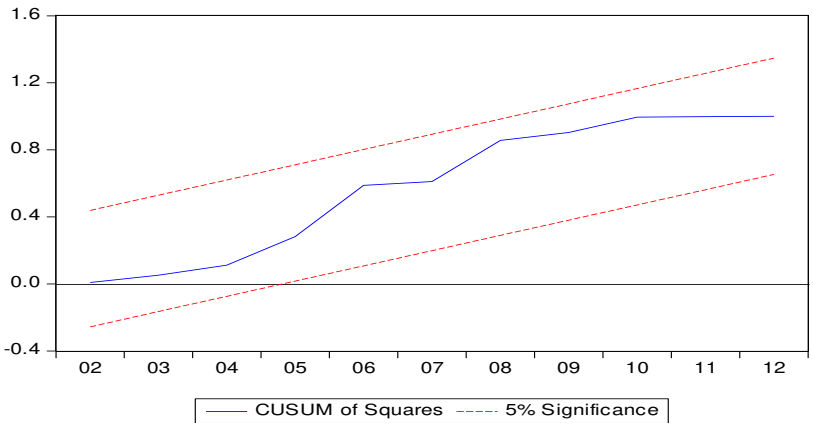


Figure 2: CUSUMSQ Test



6.6) VARIANCE DECOMPOSITION (VDC)

Despite having established that REER and CPI are the exogenous variables in our study, we have not been in a position to make any pronouncements regarding the relative exogeneity of these two variables, and the relative endogeneity of the remaining variables. In other words, of the remaining variables, which is the most laggard variable compared to others, or, indeed the least? As the VECM is not able to assist us in this regard, we turn our attention to Variance Decomposition (VDC). In a nutshell, VDC decomposes the variance of the forecast error of each variable into proportions attributable to shocks from each variable in the system, including its own. The variables which are explained most by their own past are regarded as the most exogenous variables, while variables which least explain their own past are classified as the most endogenous.

For our study, we have utilised both the Orthogonalized VDC and the Generalised VDC approach. We started out by applying the Orthogonalized VDC approach, and obtained the following results, as depicted in Table L and Table M. For further details, see Appendix 6A.

Table L: Orthogonalized VDC Results

Forecast at Horizon – 15 years						
	FDI	OPEN	SIZE	FINDEV	CPI	REER
FDI	**86.44%**	**0.85%**	**0.54%**	**2.75%**	**0.32%**	**9.10%**
OPEN	**4.27%**	**65.89%**	**22.95%**	**5.48%**	**0.02%**	**1.38%**
SIZE	**0.16%**	**2.13%**	**82.43%**	**11.40%**	**0.40%**	**3.48%**
FINDEV	**0.16%**	**59.74%**	**9.23%**	**15.07%**	**3.09%**	**12.71%**
CPI	**0.01%**	**2.62%**	**4.52%**	**8.85%**	**83.79%**	**0.21%**
REER	**2.13%**	**16.07%**	**14.36%**	**0.57%**	**0.74%**	**66.14%**

Table L: Orthogonalized VDC Results

Forecast at Horizon – 30 years						
	FDI	OPEN	SIZE	FINDEV	CPI	REER
FDI	**86.61%**	**0.87%**	**0.49%**	**2.63%**	**0.32%**	**9.08%**
OPEN	**4.24%**	**65.07%**	**24.70%**	**4.82%**	**0.01%**	**1.17%**
SIZE	**0.16%**	**1.93%**	**82.72%**	**11.30%**	**0.42%**	**3.46%**
FINDEV	**0.09%**	**60.53%**	**9.55%**	**13.43%**	**3.15%**	**13.26%**
CPI	**0.01%**	**2.51%**	**4.98%**	**8.92%**	**83.43%**	**0.15%**
REER	**2.15%**	**16.71%**	**15.48%**	**0.36%**	**0.73%**	**64.56%**

For the above two tables, rows read as the percentage of the variance of forecast error of each variable into proportions attributable to shocks from other variables (in columns), including its own. The columns read as the percentage in which that variable contributes to other variables in explaining observed changes. The diagonal line of the matrix (highlighted) represents the relative exogeneity. According to these results, the ranking of the variables by degree of exogeneity (extent to which variation is explained by its own past variations) is as follows:

(1) FDI ~ (2) CPI ~ (3) SIZE ~ (4) REER ~ (5) OPEN ~ (6) FINDEV

This result seemed somewhat strange. This is because, from the previous VECM analysis, we determined that CPI and REER were the only exogenous variables, and yet, in the VDC, they are ranked only second and fourth respectively in terms of relative exogeneity. In order to make sense of this result, we need to understand that there are two important limitations of Orthogonalized VDCs. Firstly it assumes that when a particular variable is shocked, all other variables are 'switched off'. This assumption implies that as one variable is shocked, the others remain constant, and do not change at all. Without doubt, this is an unrealistic assumption. Secondly and more importantly, Orthogonalized VDCs do not produce a unique solution. The generated numbers are dependent upon the ordering of variables in the VAR. Typically, the first variable would report the highest percentage and thus would likely to be specified as the most exogenous variable. This is the case in our data, where FDI, which appears first in the VAR order, is reported to be the most exogenous.

In light of these shortcomings of Orthogonalized VDCs, we decided to rely instead on Generalized VDCs, which does not make the unrealistic assumption that all variables are 'switched off', and is invariant to the ordering of variables. We obtained the results as per Appendix 6B. In interpreting the numbers generated by the Generalized VDCs, we need to perform additional computations. This is because the numbers do not add up to 1.0 as in the case of Orthogonalized VDCs. For a given variable, at a specified horizon, we total up the numbers of the given row and we then divide the number for that variable (representing magnitude of variance explained by its own past) by the computed total. In this way, the numbers in a row will now add up to 1.0 or 100%. The results of the Generalized VDCs are displayed in Tables N and O below.

Table N: Generalized VDC Results

Forecast at Horizon – 15 years						
	FDI	OPEN	SIZE	FINDEV	CPI	REER
FDI	60.75%	3.70%	2.67%	31.48%	0.76%	0.65%
OPEN	7.80%	63.54%	0.35%	19.16%	0.17%	8.98%
SIZE	1.45%	0.13%	63.38%	13.23%	2.37%	19.45%
FINDEV	46.21%	0.13%	0.35%	38.20%	5.41%	9.70%
CPI	2.28%	0.01%	6.08%	2.36%	87.61%	1.67%
REER	17.64%	2.10%	3.98%	5.87%	2.00%	68.41%

Table O: Generalized VDC Results

Forecast at Horizon – 30 years						
	FDI	OPEN	SIZE	FINDEV	CPI	REER
FDI	61.60%	3.77%	2.61%	30.85%	0.85%	0.33%
OPEN	8.00%	63.86%	0.19%	19.13%	0.16%	8.65%
SIZE	1.28%	0.13%	63.52%	13.10%	2.44%	19.52%
FINDEV	46.93%	0.07%	0.19%	37.18%	5.58%	10.05%
CPI	2.17%	0.01%	6.54%	2.40%	87.54%	1.35%
REER	18.34%	2.12%	4.30%	5.76%	2.12%	67.36%

We can now more reliably rank the variables in terms of relative exogeneity, as depicted below:

(1) CPI ~ (2) REER ~ (3) OPEN ~ (4) SIZE ~ (5) FDI ~ (6) FINDEV

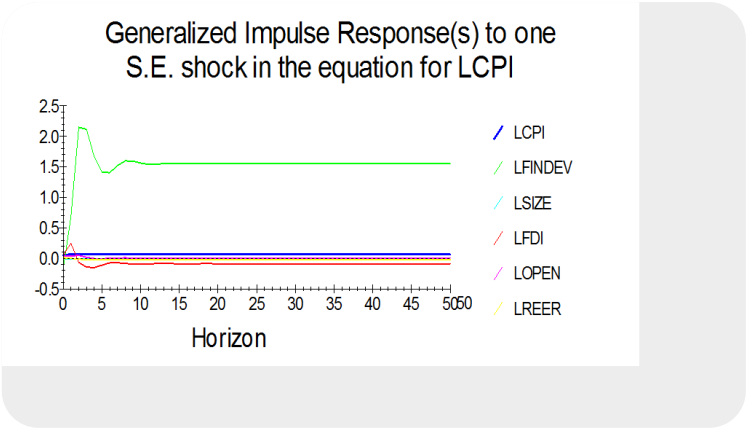
There are a few key observations that can be made from the following results. Firstly, the Generalized VDCs actually confirm the results of the VECM conducted previously, wherein CPI and REER were found to be the most exogenous variables. However, the results of the VDC analysis have allowed us to ascertain the relative exogeneity of these two variables. Consequently, CPI is shown to be relatively more exogenous than REER too. Another important observation is that the relative rank in exogeneity is quite stable as time passes. Between 15 years and 30 years, there was no change in the ranking. Furthermore, the difference in exogeneity between the variables is not as substantial as it might seem to the naked eye. For instance, in the 30-year time horizon, only about 5.76% separate four of the variables, namely REER; OPEN; SIZE; and FDI.

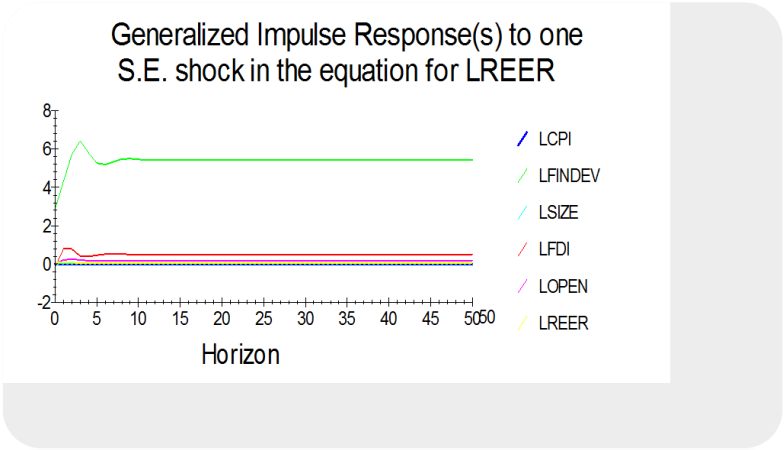
The implications of the information provided by the VDC analysis could be of extreme value to the South African authorities. By knowing which variable is exogenous and endogenous, the policymakers can better construct their policies and interventions, and better forecast or predict their expected results. Typically, a policymaker would be interested to know which variable is exogenous, as he would then direct his intervention at that variable, thus causing a significant effect on the expected movement of the remaining variables. The implication of this result is that, as far as the variables included in this study are concerned, the primary variable of interest to the South African authorities and policymakers should be CPI or the level of inflation. The reason for this is that since this is the most exogenous variable, it would receive a shock and transmit the effects of that shock to the other variables included in our study. Furthermore, as REER or the real effective exchange rate displayed some relative exogeneity too, it should also feature in the policy decision-making process of the authorities in South Africa. The remaining variables in the study would thus by implication, be of lesser interest to policymakers, at least in terms of stimulating the inflow of FDI into South Africa.

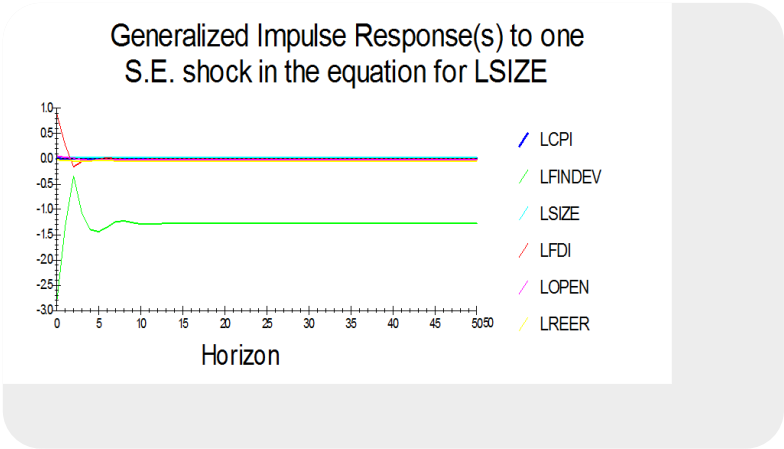
6.7) IMPULSE RESPONSE FUNCTIONS (IRF)

The impulse response functions (IRFs) essentially map out the dynamic response path of a variable owing to a one-period standard deviation shock to another variable. Thus, they produce similar information to VDCs, except that they can be presented in graphical form. We have carried out both orthogonalized and generalized IRFs for the all variables. For the sake of brevity, we will only focus on the generalized IRFs here, and have included the graphs of the orthogonalized IRFs in Appendix 7. We find that our results are quite consistent with those obtained in the VDC analysis. As per Figure 3, we see that FINDEV is the most responsive to the individual shocks given to the other variables. This suggests that FINDEV is the most endogenous variable among all the variables included in this study. Furthermore, we notice that FDI also exhibits a strong response to the individual shocks given to the other variables, albeit less than FINDEV. This suggests that FDI is the second most endogenous or laggard variable among all the variables, which is also consistent with our VDC analysis. On the other hand, we notice that CPI is the least responsive to the individual shocks given to the other variables. This suggests that CPI is the most exogenous variable among all the variables included in this study, which is also consistent with our VDC analysis.

Figure 3: Generalized Impulse Response Functions (IRFs)


Generalized Impulse Response(s) to one S.E. shock in the equation for LCPI
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
0 5 10 15 20 25 30 35 40 45 5050
Horizon
LCPI
LFINDEV
LSIZE
LFDI
LOPEN
LREER

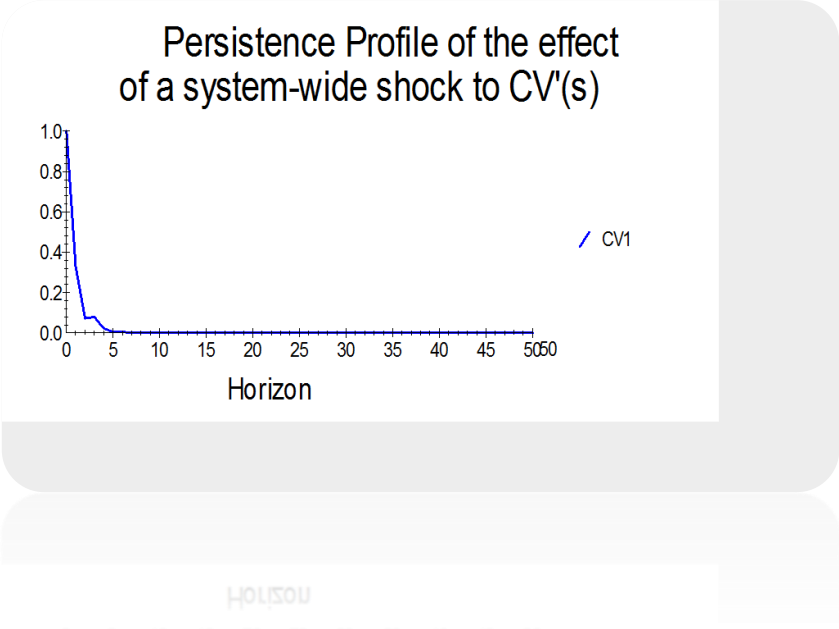

Generalized Impulse Response(s) to one S.E. shock in the equation for LREER
8
6
4
2
0
-2
0 5 10 15 20 25 30 35 40 45 5050
Horizon
LCPI
LFINDEV
LSIZE
LFDI
LOPEN
LREER


Generalized Impulse Response(s) to one S.E. shock in the equation for LSIZE
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
0 5 10 15 20 25 30 35 40 45 5050
Horizon
LCPI
LFINDEV
LSIZE
LFDI
LOPEN
LREER

6.8) PERSISTENCE PROFILE (PP)

The Persistence Profile (PP) illustrates the situation when the entire cointegrating relationship of the variables is shocked, by a factor that is external to our cointegrating relationship. More specifically, it indicates the time horizon that is required for the relationship to return to equilibrium. The focus here is on the effect of a system-wide shock on the long-run relations, instead of a variable-specific shock as in the case of IRFs. Figure 4 below shows the persistence profile for the cointegrating relationship of this study. It indicates that when the external shock is initially imposed on the variables, they temporarily deviate away from their state of equilibrium. However, it would take approximately seven (7) years for the cointegrating relationship to return to equilibrium following the system-wide shock.

Figure 4: Persistence Profile (PP)



7. CONCLUSION

Due to FDI and its associated positive externalities being largely regarded as a catalyst in the overall economic growth and progress of any developing country, there has recently been increased attention devoted by academics and policymakers alike towards identifying the determinants and factors that significantly promote the inflow of FDI to such countries, including South Africa. This paper attempts to add to the existing research and literature in this regard by determining whether a long-run theoretical relationship does indeed exist between the level of inflation in South Africa and the amount of FDI eventually received by the country. It also attempts to provide further insight into the purported macroeconomic benefits of 'inflation targeting', by ascertaining whether any causality exists between stable inflation levels and improved FDI inflows from a South African perspective. Finally, the paper seeks to identify any related macro-variables besides the level of inflation that the authorities should focus on, in order to enhance the amount of FDI inflow to South Africa.

Utilising annual data ranging from 1970 to 2012, we employ time series techniques of cointegration, long-run structural modelling (LRSM) and variance decompositions (VDCs) to answer our research objectives. The results of our LRSM analysis indicate that there is a long-run theoretical relationship that does exist between the level of inflation in South Africa and the amount of FDI eventually received by the country. Furthermore, this relationship is shown to be an inverse one, implying that a rise in the level of inflation would have a negative impact on the amount of FDI inflow to South Africa. This finding is in line with our initial expectation and intuition which suggests that increased inflation would result in a reduction of the real returns on an investment, thus discouraging foreign investors from entering the economy, and consequently, a lower level of FDI inflow. Moreover, this finding is in congruence with most of the mainstream literature on the topic, and is a view shared by Fuat and Ekrem (2002); Rogoff and Reinhart (2002); Onyeiwu and Shrestha (2004); Ahmed *et al* (2005); Elijah (2006); and, Narayanamurthy *et al* (2010), amongst others.

With regards to our second research objective, the paper successfully demonstrates that a degree of causality does exist between stable inflation levels and improved FDI inflows from a South African perspective. Based on our VECM and VDC results, FDI proves to be a highly endogenous variable. By contrast, CPI or the level of inflation is shown to be the most

exogenous variable in the cointegrating relationship, thus suggesting that it would the variable most suited to receiving an external shock, and transmitting the shock to FDI and other related variables. This causal effect may be direct, such as a scenario where increased inflation results in a reduction of the real returns on an investment, thus discouraging foreign investors from entering the economy, and consequently, a lower level of FDI inflow. However, this causal effect could be direct too. For instance, the level of inflation could have an influence on other determinants of FDI, such as labour cost and infrastructure development, which in turn are important criteria in a foreign investor's decision-making process with regards to the entering of the South African market. Nonetheless, our finding of causality between CPI and FDI suggests that the policy change that occurred with the adoption of 'inflation targeting' by the South African authorities in the year 2000 did have a significant impact on the average level of FDI inflow from the year after its adoption.

Finally, our paper also sought to identify any related macro-variables besides the level of inflation that the authorities should focus on in order to enhance the amount of FDI inflow to South Africa. While the initial LRSM analysis did suggest that both the 'size of the market' and the 'degree of trade openness' did have the tendency to promote the inflow of FDI, our subsequent VECM and VDC analysis pointed out that a variable of note in securing further FDI for South Africa was in fact, REER or the 'real effective exchange rate'. Consequently, the manipulation of this highly-exogenous variable could also have a positive impact on the amount of FDI eventually received by South Africa.

8. Policy Implications

The findings of our paper do have a few important implications for the policymakers in South Africa, and by extension, most developing countries in Africa and beyond. Firstly, our findings suggest that the level of inflation is something that the relevant authorities in South African should be overly concerned with, in their bid to attract sustainable and increased FDI inflows for the country. Policymakers need to be cognisant of the extensive theoretical and empirical literature, including this one, which advocates that a negative relationship exists between inflation and the inflow of FDI to developing countries. Some of these studies have been conducted in the South African context as well, such as Moolman *et al* (2006) and Kiat (2010), and are thus worth paying heed to.

Another obvious implication of our findings is that the policy of 'inflation targeting', if well-implemented, actively managed and consistently applied, could, in addition to the traditional FDI *pull* factors, represent a vital organ of the policy toolkit available to governmental authorities and policymakers, both in South Africa and other developing countries, in their bid to enhance the inflow of FDI to their countries. It should be noted though, that our study is not for one moment suggesting that 'inflation targeting' is the ideal framework for monetary policy in South Africa or any developing country for that matter. Rather, it proposes that the relevant authorities should at least consider the strategy of managing their inflation through such policies in their attempt to secure improved levels of FDI.

A third implication of our study would be a consequence of the real effective exchange rate (REER) being confirmed as a possible important determinant of FDI inflow in the South African context. This finding suggests that it is essential for the relevant authorities, in terms of macroeconomic policy and decision-making, to promote exchange rate stability. As South Africa currently boasts a free-floating exchange rate regime, any resultant volatility in the exchange rate would undoubtedly have a negative consequential impact on trade and FDI inflow. Thus, in this case too, the relevant authorities need to consider avenues and strategies related to the promotion of exchange rate stability, in their attempt to secure improved levels of FDI for South Africa.

9. Limitations and Suggestions for Future Research

In terms of caveats, readers should be mindful of the fact that a relatively small dataset was employed in this study. We have chosen to employ annual data in our analysis in accordance with most of the studies related to FDI determinants, and also due to inherent data limitations. Although most related FDI literature has utilised annual data in its empirical estimations, the major limitation of this practice is that not too many variables can be included in such a model, due to its small sample size. The reason for this is that the inclusion of too many variables in such a scenario would lead to loss of degrees of freedom, and consequently, the resultant sample may not be regarded as sufficient enough to make exceedingly accurate inferences. Thus, in future, the usage quarterly data would be more appropriate and perhaps, provide the basis for more precise estimations and inferences.

Furthermore, the number of variables utilised in the study are relatively few in number. Consequently, the model has the ability to explain the variation in FDI in light of only a few variables, resulting in there being limited implications of the study in the area of practice. This caveat can be taken care of in future, by increasing the number of variables employed in the model, thereby enabling the model to explain the variation in FDI more adequately. While this research focuses on only a few parameters with regards to FDI, there is a wide array of socio-economic and political factors that have major influence on the attractiveness of a country to a foreign investor. A better understanding of most of these factors would enable policymakers to more effectively market South Africa as an investment destination.

Finally, we have adopted basic time series techniques as the basis for our empirical estimations. Even though these robust and advanced estimation techniques surpass ordinary OLS regression analysis, they are still based on an assumption, namely the existence of a linear relationship among the variables. To overcome this caveat, we recommend the application of cutting-edge econometric techniques and dynamic modelling to a more extensive data set in related future research.

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