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Financial liberalization and exchange rate volatility: evidence from South Africa

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A research article submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration

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DECLARATION

I, M. Masungwini, declare that this research article is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the Graduate School of Business Administration, University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Michael Masungwini 

(Type your name in full here, and sign in the space above)

Signed at Discovery, Sandton

On the 12 day of March 2018

DEDICATION

To my mom on your 70th birth year, your great soul and perseverance is a source of my strength and motivation. You never had an opportunity to get your education and develop your own career. I dedicate this degree in honour of you.

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Abstract

This paper investigated the impact of financial liberalization on the South African exchange rate, known as the rand estimated through Autoregressive Distributed Lag (ARDL) model. The focus of the paper includes the determination of cointegration relationship amongst balance of payments, interest rate, inflation and financial liberalization represented through the liberalization indices developed by Abiad from 1973 to 2005. The preliminary steps to estimating the mentioned ARDL included detecting any prevalence of unit roots in the variables through the augmented Dickey-Fuller (ADF), Kwiatkowski, Phillips, Schmidt and Shin (KPSS) and Phillips-Perron (PP) tests. The estimated coefficients were also tested for their significance using the Wald tests and also underwent stability tests using the cumulative sum of residuals (CUSUM) and the cumulative sum of squared residuals (CUSUMSQ). The results from all the tests conducted indicated the presence of unit roots with some variable and their return to stationarity after the first order differencing. The ARDL estimates indicated the existence of long-run cointegrating relationship amongst the variables exchange rate, balance of payments, inflation, interest rate, gross domestic product and financial liberalization.

Keywords: Financial liberalization, exchange rate volatility, cointegration, Autoregressive Distributed Lag, South Africa

JEL Classification:

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1. Introduction

The exchange rate is one of the closely watched macroeconomic indicators in the financial markets across the globe and particularly in South Africa. The performance of the exchange rate is indicative amongst other variables such as inflation rate, interest rate and balance of payments of the stability and predictability of growth in the local economy. As an emerging economy with high levels of poverty, unemployment and sluggish economic growth, the South African policymakers are constantly faced with a challenge of creating a consistent and enabling investment environment to stimulate economic growth in the country. The strategy which was adopted amongst others in post-apartheid South Africa was financial liberalization with the intent of integrating South Africa with the global financial institutions to enable the country to gain access to the much needed foreign capital and direct investment. The research on the impact of financial liberalization has yielded more ambiguous and conflicting results in the least developed economies than an affirmation of the benefits of the much advocated financial liberalization as proposed by (McKinnon, 1973; Shaw, 1973). Moreover, the part of studies concerned with the impact of financial liberalization on exchange rate volatility has focused on the Asian (Amor & Sarkar, 2009) and Latin American (Musacchio, 2012) economies than on the African context. This research is intended to contribute to the literature by providing a rand volatility analysis resulting from the liberalization of the South African financial markets and its integration with the rest of the world. It is within this context that this report was motivated to examine if there exist any unintended consequences brought about by financial liberalization in South Africa.

Financial liberalization theory is an economic development strategy which seeks to remove bureaucratic and regulatory controls on the monetary policy instruments primarily the interest and foreign exchange rates within a particular country. It is a process aimed at deepening the financial system of an economy with goals of widening the real size of the monetary system

and thus stimulating the economic performance of a country through access to finance and liquidity (McKinnon, 1973). This was the same view supported by Fischer (1997) that capital markets liberalization enhances the country's saving efficiency by optimally allocating financial resources to investments which in turn stimulate economic growth. The relaxation of capital controls and structural reforms creates an environment for maximum capital flows with a potency to stimulate economic growth while paradoxically creating an impetus for interest and exchange rates to respond to foreign policies and related economic events. Glick and Hutchison (2000) found that capital regulations are the more contributing factors to exchange rate volatility in non-reformed economies whereas countries with no capital controls experience a more stable environment and are less prone to speculative attacks. These two authors together with McKinnon (1973) and Shaw (1973) are some of the proponents of capital accounts reforms as the empirical study they conducted didn't establish any evidence of currency instability on economies with liberalized capital accounts.

Shaw (1973) was notably the second advocate after (McKinnon, 1973) for financial liberalization in less developed economies. He postulates that to provide less developed economies with an economic platform to create more opportunities for improving their respective economies; they needed to liberalize the financial sector. By liberalizing the financial sector, developing countries would effectively need to remove any form of financial repression. They would need to embark on efforts to relax capital controls and deregulate the banking sector. He argues that it is through liberalization efforts that sustainable investments could be guaranteed through an incentivised savings system which provide higher rates of return. Both McKinnon (1973) and Shaw (1973) agree that non-competitive financial markets result in low-interest rates which demotivate savings as the opportunity cost of investing becomes higher. The low savings lead to a phenomenon known as the savings-investment gap which transmits into less financial liquidity in the economy and in

consequence lead to less investment for the economy. Nasution (1998) proposes that introducing policies that are market-friendly would help lower barriers to entry which increases competition in itself. Deregulated and competitive environments have been known to promote efficiency and improve social benefits through price discovery mechanics facilitated by market demand and supply.

Following McKinnon and Show's 1973 publications, there has been considerable empirical research on the effects and impact of financial liberalization on economic growth. Equity markets liberalization in emerging markets has also received a fair share of empirical studies throughout the years. Henry (2003) focused his studies on determining the impact which equity market liberalization has on the country's cost of equity. He argues that poor countries would naturally encourage capital inflows which would invariably reduce the cost of equity, should they liberalize their equity markets. It was through his study that showed that marginal productivity of labour increases with liberalization in capital-scarce countries. The empirical work of Bekaert, Harvey, and Lundblad (2005) also established the positive economic growth effects of equity markets reform by allowing domestic and foreign investors to transact in international and local markets respectively. Thus through mobilization of financial resources, organized financial markets are able to allocate scarce resources and channel them through to potential high growth projects (King & Levine, 1993).

Popov (2014) used equity market liberalization and credit constraint theory to conduct a research that concluded that liberalized financial sectors are susceptible to increase in the negative skewness of GDP growth rates compared to their non-liberalized sectors. He argues that credit shocks on asset prices are more transmittable in countries which are financially integrated with the rest of the world. Popov (2014) further alludes that financial openness increases the frequency and severity of crises which is transmitted via a banking sector.

The volatility the exchange rate brings with it a certain level of uncertainty and macroeconomic instability in the country such as South Africa and other emerging economies. Fluctuating exchange rate has a direct impact on the relative prices of goods and services that are imported for consumption within an economy. Exports are also directly affected by volatile currency. Alagidede and Ibrahim (2017) found that volatility in the Ghanaian cedi currency had a direct influence on the economic growth through the inflation growth nexus. Their study drew significant conclusions that unstable currency affects the competitive index of domestic exporting and importing firms. It is within the same study that they established an inverse relation between exchange rate movement and capital inflows through the interest rate transmission channel.

The uncertainty associated with exchange rate volatility on foreign direct investment was determined to be ambiguous in nature. Depreciation of the host country's foreign exchange rate, with the host country receiving the investments has been recognized to encourage capital inflows whilst the strengthening of the currency discouraged foreign investments (Kiyota & Urata, 2004). These findings suggest that volatile foreign exchange rate can have beneficial or stifling effects on the emerging country’s economy depending on the direction of the currency movements.

Fourie, Falkena, and Kok (1992) argue that exchange rate movements are mostly determined by the volatility of balance of payments. The instability in the balance of payments is prevalent in monetary systems that peg their currency towards a stronger foreign currency. Krugman (1979) found evidence that high inflationary periods are usually accompanied by a reduction in foreign exchange reserves. The rationale put forward is that inflation erodes the value of the currency which triggers a sell-off of foreign reserves in order to maintain the value of the currency. The gradual reduction of foreign reserves triggers speculative attacks on the currency which deepens the currency crisis as the authorities lose the capability and

capacity to defend the domestic currency. This phenomenon seemed to be the common cause of the exchange rate crisis in Latin America and Southeast Asia whose policymakers have instituted for a pegged currency and attempted to maintain the pegs through foreign reserve management. In consequence, the pegged currency appreciates when demand for local currency increase due to increase in domestic exports and depreciates with increased imports. The rationale put forth by these authors is that foreigners need to buy domestic currency which increases its demand in exchange for goods and services they import from the domestic economy. An expansion in domestic exports increases the domestic size of foreign reserves with a desirable effect on the current account of the balance of payment. The balance of payments, in turn, responds positively to a growing economy through attracting foreign capital investments. Second to factors contributing to the balance of payments which is central to this study is the interest rate whose higher effects contribute to the appreciation of the domestic currency through attracting foreign portfolio investments. Interest rate differentials between markets tend to attract foreign capital until parity is restored as will be explained in the case of Mexico and the United States. The third economic factor whose higher levels erodes the value of the currency and is central to this study is inflation. Inflation reduces the international competitiveness of domestic products and services which puts a strain on the current account as a result. The last non-economic factors contributing to the balance of payments adjustments are politics which is beyond the scope of this study.

This paper is organized as follows. Section 2 reviews the theory and literature on financial liberalization, Section 3 describes the ARDL model used to analyse the impact of liberalization in South Africa. Section 4 presents the econometric results and discussion of findings from the regression. Section 5 draws conclusive remarks and highlights policy implications from the findings.

2. Review of Literature

2.1 Theoretical review

It is with a deep recognition that financial liberalization has influenced economic discussions from the times of McKinnon (1973) and Shaw (1973) and has further influenced policy decisions in developing economies. This chapter discusses the theory of financial liberalization and the underlying factors for its advocacy. The sections that follow review contrasting theory to liberalization by expounding on the effects that capital markets liberalization may bring to countries which do not have sufficient resources to insulate themselves against the tremors of global financial shocks. Financial liberalization is the process of removing legal controls and structural barriers to the domestic financial markets. This process is often complemented with macroeconomic reforms designed to reduce the level of government influence and regulations in the financial sector. A successfully liberalized financial market is theorised to increase the liquidity of the financial sector and offers domestic investors access to an integrated global financial market for portfolio diversification.

The treatment of financial liberalization bears different results depending on whether it is treated as a process or an event as will be observed in Mexico, Argentina, Indonesia and Malaysia. The timing of the efforts to liberalize also plays a deterministic role as to the success or failure of liberalization activities. Sound macroeconomic policies should complement the efforts to drive an economy towards full global financial integration. As desirable a policy as financial liberalization, much of the promised benefits such as growth and economic stability have not been experienced in some developing economies. Edwards (1984) and McKinnon (1993) have attempted to add to the growing discussions relating to the potential obstacles to economic growth associated with freeing up and the opening of the

economy to the rest of the world. Some of the reasons brought forward by these contributors were the ordering and prioritization of the economic sectors that should be reformed before the others. Edwards (1984) brings forward an argument that capital account of the balance of payments should be only liberalized after the domestic interest rates have been allowed to increase sufficiently to eliminate interest rate differentials with the external financial markets. The underlying reason for this proposition is that capital will always chase the most rewarding returns and the lower the rates in the domestic market relative to foreign the more capital will leave the domestic economy for the foreign economy. As will be demonstrated below, capital outflow has a destabilizing effect on the exchange rate and inflation whose consequence lead directly to economic growth and employment levels. Coupled with an upward adjustment of interest rate levels should be the reform of the domestic capital market, removing controls and credit rationings.

Edwards (1984) suggests that hyperinflationary environments require fiscal discipline before any economic reforms could be considered for a financial sector. This view was later acclaimed by (McKinnon, 1993) that a firm control of the country's treasury should precede any efforts of financial capital development. The recommended step subsequent to fiscal consolidation in the order of liberalization is to stabilize inflation since higher inflation levels erode the value of deposits and the value of monetary holdings. Banking reform, on the other hand, has been recommended to start with strengthening the regulatory environment of the commercial banks followed by consolidating the capital structure of the banks and preventing new entries into the banking sector in the short-term (Nasution, 1998). Earlier arguments on managing increasing prices were developed by (Mathieson & McKinnon, 1981) who suggested finding an optimal level of reserve requirements to manage inflation. The optimal reserve requirement arises due to an anticipation of a reduced reserve ratio after liberalizing reforms. The credence of this relationship between reserve requirements and inflation stems

from the quantity theory of money which states that lowering of reserves is a form of money stock creation which according to monetarists triggers inflation in the long run. Bacchetta and Caminal (1992) went as far as empirically conclude that reserve requirements surge before reforms followed by a government-initiated decrease after financial reforms. As a secondary precondition to financial sector reformation, it is further suggested that the currency should be devalued before liberalizing the main accounts of the balance of payments. The rationale behind this hypothesis is that liberalizing capital account in a large fiscal deficit setting attracts large capital inflow which pushes up the value of the domestic currency. The consequential effects of overvalued currency are expensive exports and increased inflation with a further strain on the balance of payments accounts as will be shown in cases of Mexico and Argentina.

2.1.1 Financial Repression

Financial repression is a common practice amongst capital constrained nations, especially developing countries where controls are put in place to moderate the level of capital inflow into these countries' financial markets and outflow away from these economies. These economies' capital accounts are so weak that they risk gravitating towards a failed state should capital be allowed to come in and fly out without much regulation. Another common characteristic of these economies is their large endowment in natural resources which they are unable to beneficiate due to low capital reserves and lack of sufficient investments. The rationale for exchange controls runs from protecting foreign reserves from drying out to the weakening of the exchange rate which would invariably result in uncontrolled inflation and skewed economic growth. The panic associated with volatile exchange rate is enough to trigger red alerts to the authorities and bureaucrats that the economy is headed towards a crash. The natural inclination is a mercantilist reaction towards preventing the economy from

free fall and random movements as it is believed that it undermines the sovereignty of the economy as reflected by junk grading with the rating agencies amongst other indicators.

Gidlow (1995) and Odhiambo (2011) argue that financial repression has the propensity to drive unsatisfied borrowers to seek alternate sources of credit as the banks are forced to have large reserves and smaller lending portfolios. These authors contend that financial repression through credit ceilings and high reserve requirements reduce the effectiveness of monetary policy. They argue that the velocity of money supply increases without the control of the authorities as a result of alternate sources of credit that gets augmented into the financial sector. This argument is supported by (Shaw, 1973) that financial deepening increases the liquidity of the financial sector. Repressive instruments used in the least developed countries needed to overcome liquidity crisis include amongst others, the high reserve requirements which are essentially non-interest bearing deposits, institutional credit rationing which promotes rent-seeking and resource allocation distortions, and interest ceilings on deposits and ceilings on loanable funds (McKinnon, 1993) as will be discussed in the South African context below. As already discussed above through Edwards (1984), inflation often leads to another form of financial repression using exchange rate controls and currency indexing or pegging against major currencies. McKinnon (1993) argues that pegging often has undesirable consequences once the economy opens up to international integration as was observed in Latin America.

2.1.2 Case for liberalization

McKinnon (1973) encourages financial liberalization to improve and increase the pool of financial resources available for the participating economy. This view was the main motivation during the (Fischer, 1997) speech, who at the time was the First Deputy Managing Director of the International Monetary Fund (IMF), about the importance of liberalizing

domestic capital markets amongst the crisis-hit countries in Latin America and South East Asia. Liquidity has always been a concern within least developed economies and reforming their institutions has always been at the top of terms and conditions for attracting foreign investments. At the core of Fischer's address was the notion that economic and policy reforms would enable the IMF to extend its support to countries overburdened by the economic crisis of the Asian in 1997 and the Latin American 1995 stock market collapse and currency turmoil. Fischer's argument was that capital market openness increases the pool of investible funds and affords local investors with potential foreign markets to divest their portfolios. Capital market liberalization provides a source of funding that also allows for spreading the risk of global volatility through crowdfunding capital. Less developed countries are not sufficiently equipped to raise their own capital and thus would benefit more from international capital flow by integrating their capital markets with the rest of the world (Kose, Prasad, & Terrones, 2003).

The conditional funding would ensure that recipient countries improve their macroeconomic policies, regulatory environment and governance. These structural improvements in policies and regulatory environments would attract foreign direct investment and ultimately lead to economic development. Kose et al. (2003) argue that financial globalization leads to improved welfare of society and that the supposed macroeconomic volatility associated with integration does not have enough empirical support. Liberalization efforts are necessary to attract stimulus capital inflow required to facilitate sustainable projects. Samuel (2013) recommends that it is essential that financial liberalization process attracts foreign direct investment that accentuates economic development rather than rent-seeking investments aimed at profit extraction similar to what African countries have gone through.

Regulations are not always impeding to the independent functioning of the financial sector as highlighted by (Fourie et al., 1992). A regulatory environment which seeks to enhance the

efficiency of the financial market should be encouraged and promoted. Regulation can only be effective if it improves the stability of the market without restricting entry into the financial sector. Through competitive neutrality, regulatory bodies would eliminate unfair advantages which prevail in protected markets, especially the elimination of monopolies enjoyed by state-owned companies similar to the case studies of Mexico, Argentina, Malaysia and Indonesia below. International participants should be allowed entry to enhance market competition and local participants should be allowed access to the international sector to promote globalization and risk diversification. Regulation should be aimed at imposing prudential standards and enhance its supervisory role to avert social costs associated with market failures. The aims of financial legislation should be aimed at promoting the operational efficiency of the financial markets than hinder its development through excessive controls. The authorities should strengthen their detection of potential market failures and establish mitigating strategies to minimize the impact of financial collapse. The strategies selected should minimize the negative impact on other parts of the market as this would likely be viewed as negative effects of financial globalization.

2.1.3 Liberalization process

The advocates for financial liberalization acknowledge the unintended consequences that may arise from the liberalization process. Shaw (1973) and Fischer (1997) both agree that the removal of financial and exchange controls should be addressed in a gradual stepwise process that takes into account the strength of macroeconomic policies and financial sector of an economy. The maturity and stage of development of each sector should be thoroughly evaluated to enable proper risk management and aversion. The sensitivity of exchange rate to the balance of payments and current account movements also dictates the need to evaluate the strength of financial and exchange controls. If the exchange rate, balance of payment and

current account are not strong enough to withstand sharp capital movements, the controls should be kept in place until such time when the economy can fully absorb the shocks transmitted from other parts of the world. Fischer (1997) argues that not taking necessary precaution has the ability to send the economy out of orbit which would take longer to refocus and stabilize. It is therefore quintessential to only remove controls that introduce the greatest distortions in the economy and enforce the ones that dissuade speculators and provide economic prudence to the country.

2.1.4 Case against full liberalization

Financial liberalization has not always had its intended effects amongst developing nations. Stiglitz (2000) and Popov (2014) independently found evidence that liberalized financial and capital markets do not necessarily lead to economic growth, in fact opening up of the financial system often leads to economic volatility and skewed economic growth amongst emerging economies. Similar to Fry (1995)'s criticism of financial liberalization, Stiglitz (1993) advanced the role the state can play on regulating and stabilising the financial markets after observing the failures that came about with capital reforms. Stiglitz (1993) cites inadequate monitoring on the solvency of financial institutions as amongst the causes of market failures. He also cites incomplete market information that often leads to lack of sufficient monitoring of the externalities which cause instability throughout the financial sector. Similar to the proposals suggested by Fourie et al. (1992), the setting of regulatory standards was also proposed by Stiglitz (1993) to guide the financial firms to operate within a prudential framework. The capital accounts of least developed economies more often attract huge short-term capital inflows and outflows with resulting instability and a weakened balance of payments. Countries which need foreign direct investment to stimulate growth are often subjected to credit conditions which do not support their growth needs. These

developing countries without matured financial infrastructures often fall victim to stifling terms of borrowing and currency manipulation strategies as indicated by (Stiglitz, 2000). Nasution (1998) reinforces the argument against full liberalization by citing the monetary policy issues associated with increased ownership of domestic assets by foreign investors. He argues that external shocks under these conditions are more prevalent and severe than in economies where foreign ownership is less.

Ramey and Ramey (1994)'s research on the relationship between volatility and economic growth observed that economic volatility has negative implications for economic growth. These results augment the argument which proposes that policymakers should aim at policies which do not leave the country vulnerable to financial shocks when they integrate with the rest of the world. Evidence from Latin America and Indonesia serves as a comprehensive lesson that financial integration can lead to some hazardous outcome when the process is carried out whilst other structural problems still exist. It has also been argued that full financial liberalization can have less of the desired growth effects when a country is running a negative balance of payments and this would usually result in exchange rate instability. Samuel (2013) argues that the exchange rate fluctuation invariably affects the purchasing power of a country's currency to less desirable effects especially to the importing and exporting sectors. A currency in crisis more often signal divestments to investors which leads to further instability as more capital is likely to leave the country. The exchange rate will likely lose value in the process, leading to increased cost of servicing capital and debt obligations of the country and resulting in more pressure on the balance of payments and capital accounts.

Broner and Ventura (2010) have suggested that there is enough empirical evidence that disproves that financial liberalization leads to economic growth and improved social welfare in developing economies. The primary factor motivating these two authors was that countries

do not have similar financial markets; there are richer and poor emerging economies with varying financial and economic structural setups. Thus the effects of liberalization will vary across countries based on the strength and weaknesses of the financial sectors. The main supporting argument to this hypothesis is that the elasticity of macroeconomic volatility to capital flows is higher for poorer countries than it is for richer countries. Poorer countries tend to spiral negatively out of control with a flux of capital outflows. The argument is based on the fact that poorer countries have weaker financial institutions and immature macroeconomic policies that are subject to political interference. Broner and Ventura (2010) also base their argument on the premise that domestic financial markets are not fully developed to cope with large capital inflows which are likely to increase the supply of loanable funds and drive down the profit margins for domestic capital providers. The short-term capital outflows, on the other hand, are likely to reduce the current account and capital reserves which have a direct impact on the exchange rate as investors sell off their positions of local currency.

The other dimension put forth by (Broner & Ventura, 2010) was that of foreign debt enforcement; they argue that struggling countries are naturally inclined to default or defer payments at the slightest possible opportunity. The high propensity to default was attributed to be the main reason for fewer capital injections towards less developed economies. Defaults have a circular effect on capital movements; they tend to trigger capital flights which have first-order effects on macroeconomic volatility, especially the floating exchange rate regime. Broner and Ventura (2010) declare that default on foreign debt can be eliminated by deepening the financial markets. The reason provided is that a default in foreign debt may also mean a default in domestic debt which would drive local debt providers into insolvency in the medium term.

Arestis and De Paula (2008) argue that full liberalization could be to the detriment of an emerging economy, especially countries whose liquidity has dried out such as South Africa in the years towards the first democratic elections. It was argued that easing the process of moving capital out of the system by the country's residents would encourage capital flights from proceeds of apartheid. These two authors proclaim that citizens of a country are the first to move their investments out of the country with the slightest signal of political instability thereby triggering a capital flight crisis.

2.2 Empirical review

2.2.1 Liberalization efforts in Mexico

The evidence from Latin America and parts of East Asia may as well dissuade on the presumed economic benefits of financial reform. After going through phases of hyperinflation, struggling economic growth and what (Sharma, 2001) refers to as crushing debt burdens and chronic capital shortages, Mexico went on an elaborate plan to control the high levels of inflation and unemployment. The country succeeded in reforming the financial sector in the short-term and entered into free trade agreements with other North American countries. The early stages of the Mexican reform successes became the proof that (McKinnon, 1973; Shaw, 1973) would have needed to convince emerging countries about the successes of liberalization until the gains from the liberalization of the financial sector were reversed when the peso suffered currency crash against the dollar (Calvo, 1998) in late 1994 spilling over to 1995. Various explanations of the collapse were put forth some of which include the lack of adequate sequencing and the rate of liberalization in the financial sector. Sharma (2001) went as far as to suggest that the political ambitions of the then Mexican president Carlos Salinas de Gortari and his populist ideologies may have influenced his decision to pay less attention to the growing bubble in the Mexican peso's overvaluation. The

contagion theory also received a fair share of consideration where it was found that interlinked and regional markets experience market crash one after the other (Kumar, Moorthy, & Perraudin, 2003). It was Kumar et al. (2003) whose observations in predicting currency crashes in emerging markets concluded that as much as contagion plays a role in influencing financial implosion, declining reserves and exports are also an important signal that sound macroeconomic fundamentals are not being pursued.

The macroeconomic tools applied by the Mexican authorities went from experimenting with pegging the peso towards the dollar in the late 1980s to adopting a crawling peg system which allowed them to monitor and control the depreciation of the peso against other currencies. The early 1990s saw the authorities adopt a more flexible currency regime with adjustable bands with the peso given room to bounce between the upper and lower bands of 3.04 pesos and 0.0004 pesos to the dollar respectively. In accordance with classical orthodoxy, prices should be allowed to move towards their equilibrium levels without interventionist and protectionist policies which are known to distort the markets. Kaminsky and Reinhart (1999) also note that it is natural for the exchange rate to appreciate when the general price level is converging to their international levels.

The unsustainable pegging in Mexico saw an initial knee-jerk improvement in the Mexican economy when capital started to flow into the country in the form of net portfolio investments and foreign direct investments. This inflow of capital boosted the Mexican equity market which witnessed growth and strengthening of the stock market. Unemployment and GDP per capita also showed some improvement during the early 1990s with inflation going from the higher levels of the late 1980s of 160 percent to just less than 10 percent (Sharma, 2001). As it turned out, Mexico didn't accumulate sufficient foreign reserves to keep funding the peso's perceived strength against the dollar; they exhausted their foreign

currency reserves by selling their dollar-denominated reserves and buying back the peso to the detriment of the country's balance of payments' current account in the long run. The fragility of the peso was magnified by its perceived overvaluation against the dollar when the first depreciation triggered a secondary level depreciation due to investors pulling out of Mexico for fear of default against their investments as well as adverse expectations about inflation levels similar to the ones observed in the early to late 1980s (José Maria Fanelli & Medhora, 1998; José María Fanelli, Rozenwurcel, & Simpson, 1998; Sharma, 2001).

During the ensuing strengthening of the peso against the dollar, current account deficits also increased to proportionate amounts as the Mexican exports became expensive whilst their imports became cheaper. The Mexican trade balance started to weigh heavily on their reserve balances as the economy started spending more than they were producing due to reduced demand for their expensive exports. The situation worsened when the demand for cross-border goods and services increased due to lower global prices relative to local prices which were kept low under the earlier Pacto agreement of 1994. It is also reported in (Sharma, 2001) that the Mexican authorities failed to anticipate the impact of the improving interest rate in the neighbouring American financial sector which naturally made the US market more attractive for investment relative to Mexico. Sharma (2001) adds to the debate by highlighting that Mexico's attempt to liberalize their institutions were conducted in a haste and misguided principles to keep attracting foreign capital flows in the country. The collapse of the peso suggests that Mexico used a wrong macroeconomic tool in the exchange rate to control the prevailing inflation. The consequence of this exchange rate controls perpetuated the impression that the country was running a progressive monetary policy which turned out not to be as the peso took a significant knock during the month of December 1994 and the months that followed. The unsustainable widening of the trade deficit created panic amongst the speculative and jittery investors in the words of (Sharma, 2001) that it eventually

triggered speculative attacks on the peso currency which resulted in accelerated depreciation as noted by (Kaminsky & Reinhart, 1999). It is also recommended that transparency in the financial sector should be increased and that the authorities should aim to disseminate economic and financial information diligently to alleviate fear and panic amongst investors. Panic and fear of losing an investment only trigger a speculative response to events as noted above. The panic induced speculative attack theory is further substantiated by (Sachs, Tornell, & Velasco, 1996) that credibility and trust get eroded easily once expectations about the economic policies have become uncertain and shifted. The swift changes in the exchange rate regime from pegged to crawling and ultimately floating was more than enough to create policy uncertainty in the perspective of the short-term debt speculative investors to start pulling their funds in the Mexican financial market. Sachs et al. (1996) conclude by emphasizing that pegging leaves the exchange rate vulnerable to currency attacks, and thus it should be avoided in a liberalized financial environment.

2.2.2 Liberalization efforts in Argentina

On the other end of the liberalization continuum was Argentina which treated financial liberalization as a single event and took a big-bang strategy to institute an industry-wide radical approach to financial sector reform. Argentina went against the prescripts of financial reforms which treated sequencing as a necessary ingredient to a successful reform to avert the possibility of financial and currency collapse. The government of Argentina introduced a macroeconomic policy known as the Convertibility Plan similar to the Mexican Pacto whose purpose was to address the concerns of hyperinflation and poor economic growth experienced during the late 1980s and early 1990s. The devised plan would be implemented by the Argentine Currency Board which used amongst others a pegging strategy of the Argentine peso against its American dollar equivalent. The peso was to be fully backed by foreign

currency reserves just as Mexico had done leading to the Mexican peso collapse of 1994. The Convertibility Law became the binding thread between Argentina and the international financial community which then exposed the local economy to shocks of the outside world. The Convertibility Plan introduced a degree of dollarization which rendered the efforts of the Central Bank sterile as policy instruments (José María Fanelli et al., 1998) and increased the financial market's vulnerability as a result. The implementation of the convertibility law increased Argentina's liquidity of the banking sector through credit generation in the short run and also its vulnerability against speculative currency attacks as the law made no provisions for restrictions or stipulations on the size of foreign currency denomination to be used when drafting contracts with Argentinian firms.

As pointed out by José María Fanelli et al. (1998), the enactment and execution of the convertibility law prompted an initial positive thrust into the economy, the country started experiencing a reduced level of inflation, a strengthening of the Argentinian peso and positive GDP growth much to the endorsement of the theory of McKinnon (1973) and Shaw (1973) and to a much earlier works of (Tobin, 1965). Capital inflows started increasing with a rising trade deficit as it became cheaper to import goods and services due to the appreciation of the currency. Tax revenue collection also improved and financial deepening index revealed an improving financial sector due to higher liquidity brought about by foreign currency. These significant improvements came when the Mexican crisis known as tequila effect (José María Fanelli et al., 1998) was about to erupt. The tequila effect would later be contagious throughout the region and transmits its severe effects to the Southern Cone countries of Brazil, Argentina, and Uruguay.

During the period of 1991 to 1995, the monetary base of Argentina included a larger portion of capital inflows with a noticeable strain on the current account. The deficit in the current account would then be compensated by a reserve surplus in the capital account. The

unrestricted flow of capital into the country reversed the demonetization effects of the 1980s whilst at the same time reconstituted the demand for money to include foreign currency through increased dollarization. The effects of dollarization would increase the levels of dollar-denominated deposits at the expense of peso-denominated deposits in the financial sector. As José María Fanelli et al. (1998) pointed out, dollarization increased even further when the Argentina peso was substituted even more due to the noise and panic of the Mexican peso depreciation of 1994. Liberalization in Argentina attracted more and more of foreign savings which started to overshadow that of domestic savings. Liquidity was further improved through an increase in money supply from foreign credit induced money creation. This financial deepening and liquidity came at a much-increased risk of potential peso devaluation since the dollar deposits far exceeded that of peso-denominated deposits. To mitigate some of the systemic risk associated with devaluation, the government of Argentina signed a debt relief program known as the Brady agreement in 1992 and incremented the pace of privatization facilitated through debt for equity swap transactions. The total debt owed by the government reduced significantly to a much lower debt/GDP ratio as a result of this intervention. The government effectively transferred its exposure to the dollar-denominated debts to the public and private sectors.

The impact of liberalization on firms encouraged the sector to restructure their capital composition in favour of the more available dollar debt compared to the previously rationed peso credit of the 1980s. Firms were thus able to expand their production due to greater availability of investment credit. Thus the effects of financial deregulation were starting to culminate in the improved market value of firms relative to their asset base (José María Fanelli et al., 1998), which was another signal for overvaluation. The new financial leverage of these firms which became significantly higher than before also suggested a more potential magnified risk in case of a systemic crisis in the private sector. The liberalization activities in

Argentina have eradicated market allocation inefficiencies and distortions which became prevalent during the inflationary and credit rationing period of the 1980s. Firm-wide working capital levels have been restored to an efficient market level with fewer liquidity concerns due to financial deepening. Despite the financial sector depth increasing in Argentina due to the convertibility plan, the country still trailed behind Mexico, Chile, and Brazil in regard to banking activities by the population despite the three countries having a similar geopolitical and social makeup. The level of financial intermediation during and after financial deregulatory and structural reform efforts was still at its lowest levels albeit the growing size of its banking sector. José María Fanelli et al. (1998) would go on to describe this population disparity and financial mismatch as physically oversized with an excessive number of financial intermediaries for a financial system still struggling to penetrate the informal sector. The critiques of the convertibility plan restrict inter alia the collapse of the peso to the reduced effectiveness of the Central Bank of Argentina due to this reformatory law. It is suggested that all safety nets and potential effective maneuvering of the bank as the lender of last resort were removed which increased the economy's systemic vulnerability to the tequila effect risk exposure. This ineffectiveness of the Central Bank was reversed after the 1995 crisis and thereby increasing the autonomy of the Central Bank which restored its ability to implement monetary policy in the country. Further criticism of the law regards the near complete removal of deposit insurance intended to protect depositors against the inability of the banks to repay their debts when due and defaulting as a result. Again, the peso crisis of 1995 forced the authorities to revert the depository insurance scheme to protect depositors. The effect of this protection scheme brought back confidence in the financial sector and improved the level of deposits in the system. This increased financial deepening; they say reduces the stability of the financial system and exposes it to external systematic shocks into the financial sector. The convertibility triggered crisis perpetuated pessimism amongst

depositors and potential investors. The depositors and investors in general became more risk averse and maintained short-term maturity positions in their respective portfolios of assets. They reflected what (José María Fanelli et al., 1998) describes as monetary hysteresis which became a structural rigidity for potential depositors to hold their money more in short-term liquid assets. This preference of short over long-term financial instruments had a long and negative effect on the availability of supply of loanable funds for long-term lending in Argentina. The growth of dollarization was also evidence of lack of trust in the Argentine financial system. The tendency towards dollarization also reflected in the higher diversification of domestic portfolio towards international assets due to pessimism culminating from the capital flights of the 1980s. As highlighted earlier, the financial sector in Argentina was enriched and deepened through an inflow of capital from the international sources of funding. The effect of this inflow of capital increased the demand for the peso and public together with the private debt within the financial system with a resulting appreciation and overvaluation of the currency.

2.2.3 Liberalization efforts in Malaysia and Indonesia

Similarly on the other side of the globe, contrasting to the approaches taken by Mexico and Argentina were the liberalization strategies of Malaysia and Indonesia, the two south-eastern Asian neighbours. Malaysia pursued a more gradual and stable reform strategy whilst radicalism became synonymous with the policies that characterized the Indonesian island. Indonesia's structural repressive legacy of the 1970s became an inhibiting factor during its pursuit of liberal reforms. Prudential standards across the banking sector were set at lower standards to accommodate structural deficiencies and inadequacies of state-owned banks in Indonesia. The further contrasts presented by Nasution (1998) relate to the stable and matureness of the financial sector in Malaysia compared to that of stagflation and high levels

of state control on the financial sector in Indonesia. The monetary policy strategies of Indonesia were not effective due to its hyperinflationary setting compared to the north-western Malaysia. He defines the state of economic governance as more patrimonial in Indonesia and a more liberal form in the neighbouring Malaysia. The stark contrast between the two Asian countries can also be found on their debt management as a proportion of GDP. The fiscal deficit in Malaysia was financed through bonds issued in its domestic financial market whereas the higher Indonesian fiscal deficit was financed through foreign aid with accustomed terms and conditions about prudential management. Indonesia became more vulnerable to exchange rate risk and other foreign economic events than Malaysia due to the borrowing conditions imposed on the Indonesian government.

The 1988 banking liberalization reforms of Indonesia covered a wider range of instruments which included interest rate deregulation, structural reforms in the financial markets to improve competitiveness by allowing new entrants and prudential measures to strengthen liquidity and solvency of the banking industry (Nasution, 1998). These reforms were carried out with a sterile and ineffective central bank of Indonesia. The lack of autonomy in the Indonesian central bank reduced its capacity to fulfil its supervisory mandate which invariably led to the banking crisis immediately after implementing the liberal reforms. Malaysia, on the other hand, initiated its financial reforms in 1981 and went on to liberalize the interest rates in 1987. Nasution (1998) argues that Malaysia was able to thwart the undesirable impacts associated with liberalization especially on the balance of payments through its improved prudential measures and restrictive policies into the banking sector. The prudential measures in Malaysia were achieved through a minimum liquidity ratio prescription and regulatory reserve requirements.

2.2.4 Liberalization efforts in South Africa

South Africa has gone through a process of financial repression in the late 1930s to the mid-1980s. The 1980s were the period which the country attempted to liberalize its financial and economic sectors. During this period South Africa was constantly facing huge capital outflows due to the political instability in the country. In an attempt to curb the worsening balance of payments account due to an outflow of capital, Gerhard de Kock instituted exchange and capital controls during his tenure as the governor of the Reserve Bank of South Africa (Gidlow, 1995). Historically, in the late 1950s, financial repression was so prohibitive in South Africa that even repatriation by foreign-controlled companies in the country was carefully controlled. By 1985, capital outflow was so magnified that the exchange rate took a massive knock which triggered another reversal towards a tighter exchange control environment and a temporary deferment of the country's sovereign debt.

Subsequently, after the democratic transition in 1994, South Africa embarked on a more deliberate and cautious liberalization strategy for fear of exposing the economy's vulnerabilities as the skills and technologies required to efficiently operate a fully liberalized economy had not yet been acquired. March 1995 saw the first stage of liberalization through freeing of foreign owed capital movements in the foreign exchange market. By mid-1995, the country's residents were then allowed to move their capital outside the republic through an asset-swap system. The system was designed to ensure the balance of payments account remained consistent after the transaction and that the current account was not drained by any of the transactions that ensued (Arestis & De Paula, 2008).

Amongst the central tenets of financial liberalization is that of deregulating interest rates. The proponents argue that deregulation leads to a free market price determination which fosters competitive rates that stimulate and enhances growth through the saving-investment growth nexus. These liberalization advocates further assert that free markets are necessary to enable

an efficient resource allocating environment (Shrestha & Chowdhury, 2007). The financial system facilitates the task of resource allocation by matching the demand side of an investment fund with the suppliers of funding through households and other institutional level savings. The South African Reserve Bank (SARB) imposed credit restrictions in the South African financial sector in 1967 with the intent (Gidlow, 1995; Odhiambo, 2011; Sibanda, 2012) to curb capital outflows. These credit ceilings contributed to the relative rate stickiness at relatively high levels and disintermediation of short-term credit. Gidlow (1995) further suggests that this process stifled the ability of banks to issue large amounts of credit as borrowers shifted away from non-competitive bank rates to non-intermediated credit from semi-formal markets in South Africa. The gaps between the lending and borrowing rates introduced by the restrictions further reduced the efficiency of the banking sector by discouraging more deposits which resulted in undersupply of loanable funds and an excess demand of funds in the financial market. The unintended consequence of these lending restrictions culminated in reduced availability of loanable funds with a negative impact of financial market liquidity. This consequential scarcity of loanable funds through reduced credit ultimately led to rationed credit amongst a few borrowers. Shrestha and Chowdhury (2007) argue that an environment whose liquidity is strained or drained creates an environment where rent-seeking thrives.

The period from 1968 to 1970, witnessed the South African Reserve Bank extending credit ceilings to cover private sector securities and non-monetary banks (Odhiambo, 2011; Rossouw, 2011). Odhiambo (2011) further argues that the widening of credit ceilings reduced competition in the financial sector which invariably reduced the amount of credit available and money supply as a consequence. Credit ceilings were abandoned in 1972 but emerged through private sector securities introduction in 1976 and a further tightening of credit ceilings by late 1977. During the same period, Rossouw (2011) states that the SARB

experimented with pegging the currency to the pound followed by a subsequent peg to the dollar from 1971 to 1979. Currency pegging and its consequences have been highlighted in detail above in cases of Mexico, Argentina and Indonesia. Regressive financial policies reached their peak in South Africa during the year 1979 when credit ceilings were further tightened to the detriment of monetary policy's effectiveness on economic growth. Between 1980 and 1983 the SARB abolished both interest and credit controls, and reduced reserve requirements in 1983 and thus effectively increasing the quantity of money supply in the economy. The capital flights witnessed in 1985 due to international financial sanctions imposed towards South Africa saw the immediate reversal on the efforts towards financial liberalization by the reintroduction of more credit tightening. The lifting of sanctions and beginning of negotiations towards a democratic South Africa witnessed broad-based financial reforms including lifting restrictions on foreign entry into the banking sector in 1990. The final journey towards free market occurred in 1995 through the elimination of credit controls for non-residents (Odhiambo, 2011; Rossouw, 2011). By the year 2000, South Africa had successfully transitioned from exchange rate policy stabilizations towards inflation targeting policy (Rossouw, 2011).

Financial liberalization theory remains a contentious and debatable topic, it has influenced academics and policymakers for almost half a century since the pioneering work of McKinnon (1973) and Shaw (1973). The theoretical discussions are further complicated by the ambiguous results from experiments conducted between liberalized financial markets and non-liberalized financial sectors in the emerging markets. Shaw (1973) and Arestis and De Paula (2008) support the idea of gradual reform which in principle should not expose the economy to external shocks similar to the liberalization strategy adopted by the South African authorities. In conclusion, financial liberalization may stifle efforts to grow an

economy; prudential measures need to be considered with adequate preparation and sequencing to be prioritized when embarking on a liberalization process.

3. Data and Methods

3.1 Data description and source

The data used has been collected from the World Bank for the period 1967 to 2016 and Abiad's liberalization dimensions for the period 1973 to 2005. The research assumes zero liberalization for the period 1967 to 1973 and thus assigns zero liberalization for this period. The period 2006 to 2016 assumes liberalization similar to 2005, thus the report assumes there was no financial regression from 2005 to 2016. The report uses annualised values of the gross domestic product, interest rate, inflation and balance of payment as quarterly values are not available for some of these variables. The real exchange rate and gross domestic product have been standardised to their linear form by taking the logarithmic function to the base ten using Eviews log function. The rest of the variables; liberalization index, interest rate, inflation and balance of payments have been left at their original level data to enable testing for cointegration and stationarity.

3.2 Methodological approach

The theoretical review of the literature on financial liberalization has shown conflicting views on the benefits of removing exchange controls and other credit-related controls in an economic system. Some authors have put more emphasis on the stimulus growth nexus of a liberalized financial market; some have shown the negative consequences that come with the opening up of the financial sector through capital outflows and the impact on the balance of payments and exchange rate instability. Edwards (1984) and McKinnon (1993) have instituted a specific ordering and sequencing of financial reforms to minimize crisis associated with capital inflows and outflows on the exchange rate. This section builds on the theory already covered to interrogate the available data to determine the impact of

liberalization in the South African environment. Consequently, unit root tests on the variables are conducted using augmented (Dickey & Fuller, 1979) test, (Phillips & Perron, 1988) and (Kwiatkowski, Phillips, Schmidt, & Shin, 1992).

The subsequent step after establishing the existence of unit roots is to explain the data characteristics using descriptive statistics and conduct analysis using the bounds testing approach outlined by (Pesaran, Shin, & Smith, 2001). The process follows an autoregressive distributed lag (ARDL) model to detect the existence of cointegration amongst the variables and establishes any long-run relationship that might exist between the variables. As an alternate methodology, vector error correction model (VECM) was considered but the variables were not of the same integration order which led to spurious results and hence the settlement on ARDL. Nkoro and Uko (2016) proposed the use of Wald tests to detect the presence of long-run relationship where the greater the F-statistic on the critical bounds implies the existence of the relationship and consequently rejection of the null hypothesis. Pesaran et al. (2001) and Nkoro and Uko (2016) further postulate that the model will be inconclusive when the computed F-statistic lie within the critical boundary values of the ARDL model. Lastly, if the computed F-statistic is below the critical lower bound of the associated Perasan table, we accept the null hypothesis of no long-run relationship between the variables. Nkoro and Uko (2016) caution the analyst to verify that none of the variables are of integration order I (2) and above when conducting the bounds methods. The bounds testing approach is only applicable when the integration is of orders zero and one or a mix of the two. Following on from (Bildirici, 2013; Nkoro & Uko, 2016; Owusu & Odhiambo, 2014; Pesaran et al., 2001) on the use of ARDL approach to bounds testing, the model below is presented.

$$\Delta \mathbf{R_t} = \beta_0 + \sum_{i=1}^{n_1} \delta_{1i} \Delta \boldsymbol{R}_{t-i} + \sum_{i=0}^{n_2} \delta_{2i} \Delta \boldsymbol{BOP}_{t-i} + \sum_{i=0}^{n_3} \delta_{3i} \Delta \boldsymbol{INF}_{t-i} + \sum_{i=0}^{n_4} \delta_{4i} \Delta \boldsymbol{INT}_{t-i} + \sum_{i=0}^{n_5} \delta_{5i} \Delta \boldsymbol{LGDP}_{t-i} + \sum_{i=0}^{n_6} \delta_{6i} \Delta \boldsymbol{LIB}_{t-i} +$$

$$\varphi_1 \mathbf{R_{t-1}} + \varphi_2 \mathbf{BOP_{t-1}} + \varphi_3 \mathbf{INF_{t-1}} + \varphi_4 \mathbf{INT_{t-1}} + \varphi_5 \mathbf{LGDP_{t-1}} + \varphi_6 \mathbf{LIB_{t-1}} + \mu_t \quad (1)$$

Where δ_{ji} and φ_j are the respective short-run and long-run coefficients of the model variables for j=1, 2, 3, 4, 5, 6. The symbols μ_t and Δ respectively represent the white noise term and the difference operator such that $\Delta Z_i = Z_i - Z_{i-1}$. The variable n_j for j=1, 2, 3, 4, 5, 6 delineate the associated lags for the six variables.

R_t - The log real exchange rate at time t.

R_{t-1} - The log real exchange rate at time $t-1$.

BOP_t - The balance of payments at time t.

INF_t - The real inflation rate at time t.

INT_t - The real interest rate at time t.

$LGDP_t$ - The log of GDP at time t.

LIB_t - The liberalization index at time t.

4. Empirical results and analysis

The preceding chapters laid both the theoretical and analytical frameworks for examining the impact of financial liberalization on rand volatility. This section draws on that foundation by presenting the discussions and analyses of the results of the research. The findings from the econometric techniques are then contrasted back to the research motive and literature reviewed in earlier sections of this research. The table below presents a summary statistics of the data before any standardisation is applied to the data. It is observable from Table 1 that real exchange rate has a very low mean of 1.01 with a minimum value of -0.39 and a maximum value of 2.67. The standard deviation of the exchange rate is marginally low at 1.02. The exchange rate is negatively skewed at -0.08. It is observable from the result that exchange rate has a platykurtic kurtosis of 1.51 which is just below half that of normal kurtosis.

Liberalization index has the highest mean of 12.78 amongst all the other variables in the model with the highest standard deviation of 6.62. Similar to the exchange rate, liberalization index is skewed to the left with a kurtosis of 1.88 which is below that of a normal distribution of 3. Interest rate and inflation have averages of 3.05 and 8.98 respectively with some variability shown by the standard deviation of 4.59 for interest rate and 4.38 for inflation. Inflation and balance of payments are the only macro-variables which are skewed to the right which reflects their growth patterns over the period concerned. Interest rate and balance of payments are the only two variables of the model with leptokurtic distributions as reflected by the kurtosis of 5.09 and 3.69 respectively.

Table 1: Descriptive Statistics

	LRER	BOP	INF	INT	LGDP	LIB
Mean	1.01	1.00E+09	8.98	3.05	25.36	11.78
Median	1.03	2.75E+08	8.64	3.62	25.53	11.75
Maximum	2.69	6.32E+09	18.66	13.01	26.76	18.25
Minimum	-0.39	-1.76E+09	1.39	-12.32	23.35	0.00
Std. Dev.	1.02	1.95E+09	4.35	4.59	0.95	6.62
Skewness	-0.08	1.27	0.27	-0.80	-0.53	-0.53
Kurtosis	1.51	3.69	2.00	5.09	2.41	1.88
Jarque-Bera	4.69	14.48	2.70	14.43	3.02	5.00
Probability	0.10	0.00	0.26	0.00	0.22	0.08
Sum	50.26	5.01E+10	449.13	152.57	1268.01	588.75
SumSq. Dev.	50.92	1.86E+20	926.35	1033.75	44.06	2147.66
Observations	50	50	50	50	50	50

Notes: * represent kurtosis of less than three whilst ** represents kurtosis of more than three.

Table 2 below presents correlation coefficients between the variables of the volatility model in equation $\Delta\mathbf{R_t} = \beta_0 +$

$$\sum_{i=1}^{n_1} \delta_{1i}\Delta\boldsymbol{R}_{t-i} + \sum_{i=0}^{n_2} \delta_{2i}\Delta\boldsymbol{BOP}_{t-i} + \sum_{i=0}^{n_3} \delta_{3i}\Delta\boldsymbol{INF}_{t-i} + \sum_{i=0}^{n_4} \delta_{4i}\Delta\boldsymbol{INT}_{t-i} + \sum_{i=0}^{n_5} \delta_{5i}\Delta\boldsymbol{LGDP}_{t-i} + \sum_{i=0}^{n_6} \delta_{6i}\Delta\boldsymbol{LIB}_{t-i} +$$

$\varphi_1\mathbf{R_{t-1}} + \varphi_2\mathbf{BOP_{t-1}} + \varphi_3\mathbf{INF_{t-1}} + \varphi_4\mathbf{INT_{t-1}} + \varphi_5\mathbf{LGDP_{t-1}} + \varphi_6\mathbf{LIB_{t-1}} + \mu_t$ in section 3.3 of the research instrument above. The results show a significant and positive correlation between liberalization, gross domestic product, interest rate, and balance of payments with exchange rate volatility. It can be observed that liberalization has the highest correlation of 0.95 with the real exchange rate. Inflation shows a negative correlation with all the other

variables of the model. Negative correlation with inflation supports an economic theory about inflation that an increase in prices has a negative effect on macroeconomic fundamentals.

Table 2: Correlation coefficients

Correlation	LRER	BOP	INF	INT	LGDP	LIB
Probability						
LRER	1.00					

BOP	0.46	1.00				
	0.00	-----				
INF	-0.35	-0.37	1.00			
	0.01	0.01	-----			
INT	0.50	0.08	-0.33	1.00		
	0.00	0.57	0.02	-----		
LGDP	0.89	0.53	-0.10	0.34	1.00	
	0.00	0.00	0.48	0.02	-----	
LIB	0.95	0.48	-0.20	0.48	0.94	1.00
	0.00	0.00	0.16	0.00	0.00	-----

The unit root estimates below were all computed using the Schwartz information criterion (SIC) and were either stationary I(0) at level or required first order I(1) differencing to resolve non-stationarity. The null hypothesis of the augmented Dickey–Fuller (ADF) test asserts that there exists a unit root in the series. The test rejects the existence of a unit root when the estimated statistic is less than the critical values of -3.57 (1%), -2.92 (5%) and -2.60 (10%) for a given level of significance in brackets. The estimated t-statistic of 0.19 is greater than the critical values at all significant levels; hence we cannot reject the null hypothesis that the exchange rate is nonstationary at level data. At first level differencing, the t-statistic of -5.04 is smaller than the ADF critical values at all significance levels such that the exchange rate is stationary at first difference. Liberalization, gross domestic product, inflation and balance of payments all have unit roots at all confidence levels which are resolved with first

level differencing. The interest rate on the other hand only has unit root at 1% confidence level. The first level differencing also resolves nonstationary problems.

The null hypothesis of the KPSS test asserts that the time series variable is stationary, which implies the absence of unit root. The test results show the acceptance of the null hypothesis of variable's stationarity for estimated statistic less than the critical values of 0.74 (1%), 0.46 (5%) and 0.35 (10%) for a given level of significance in brackets. The LM statistic of 0.91 is greater than the critical values at all significant levels; hence we reject the null hypothesis that the exchange rate is stationary at level data with unit root concerns. At first level differencing, the LM statistic of 0.10 is smaller than the KPSS critical values such that the exchange rate is stationary at first difference. Liberalization and gross domestic product have LM statistic that is greater than the critical value statistics, thus rejecting the null hypothesis that they are both stationary. At first differencing both these two series are stationary. The interest rate is only stationary at 1% confidence level which is also resolvable with first order differencing. Inflation and balance of payments are stationary at 1% and 5% confidence levels respectively. At 10% they are both non-stationary with their unit root problems resolved at first differencing. The KPSS test reports that inflation does not have unit root problem, hence stationary at all three confidence levels.

The null hypothesis of the Phillips-Perron (PP) test asserts that there exists a unit root in the series. The test rejects the existence of a unit root when the estimated statistic is less than the critical values of -3.57 (1%), -2.92 (5%) and -2.60 (10%) for a given level of significance in brackets. The adjusted t-statistic of 0.06 is greater than the critical values at all significant levels; hence we cannot reject the null hypothesis that the exchange rate has unit roots, hence nonstationary at level data. At first level differencing, the adjusted t-stat of -4.85 is smaller than the PP critical values such that the exchange rate is stationary at first difference. PP does not report unit root concerns with the balance of payments, hence stationary. Liberalization,

GDP and inflation all report unit roots at their original levels which get resolved by first level differencing. Interest rate only signals unit root at 1% confidence level which also gets resolved by first-order differencing.

Table 3: Unit Roots

	ADF *I(0)*	**ADF** *I(1)*	**KPSS** *I(0)*	**KPSS** *I(1)*	**PP** *I(0)*	**PP** *I(1)*
LRER	0.19	-5.04	0.92	0.10	0.06	-4.85
LIB	-1.56	-6.17	0.88	0.26	-1.73	-6.17
LGDP	-2.09	-4.76	0.88	0.37	-2.22	-4.65
INT	-3.41	-5.54	0.47	0.12	-3.36	-9.84
INF	-1.95	-6.34	0.30	N/A	-2.01	-6.03
BOP	-2.53	-11.61	0.55	0.15	-4.32	N/A

Notes: The first column represents the time series variables. LRER is the log of real exchange rate, LIB denotes financial liberalization index variable, LGDP corresponds to the log of gross domestic product, INT represent the interest rate; INF and BOP represent inflation and balance of payments respectively. ADF I (0) in the first column represents the augmented Dickey-Fuller at level with no differencing. The third column represents the augmented Dickey-Fuller with first differencing. The fourth to seventh columns correspond to Kwiatkowski, Phillips, Schmidt and Shin at level and first differencing and Phillips-Perron at level and first differencing. * denotes stationarity at level, implying no differencing required.

4.1 Long Run Bounds Test for Cointegration

The long-run bounds test for cointegration was used to corroborate the existence of a long-run equilibrating relationship between the model variables followed by the estimation of long-run and short-run coefficient parameters. The estimated F-statistic with unrestricted constant and no trend is 38.50 which lies above the upper critical bound of 3.94 at 5% significance level as shown in Table 4**Error! Reference source not found.**. Thus there is evidence of cointegration and the long-run relationship amongst the variables. In consequence, the null hypothesis of no long-run relationship between the variables is rejected.

Table 4: Bounds Test Results (Null Hypothesis: No levels relationship)

Test Statistic	**Value**	**Signif.**	***I(0)***	***I(1)***
F-statistic	38.49	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15

Notes: * indicates that the computed statistic exceeds the critical bounds. K indicates the degree of freedom.

The implication of this result is that BOP, INF, INT, LGDP and LIB jointly influence LRER in the long-run in South Africa. It can be observed that the model does not display any evidence of heteroscedasticity and no evidence of serial correlation thereby rejecting the null hypothesis of serial correlation; hence the model is correctly specified. The F-statistic for heteroscedasticity is 0.63 with the associated p-value in brackets of 0.78. Equivalently the F-statistic for serial correlation test is 0.53 with the corresponding p-value of 0.59 in brackets.

Heteroscedasticity Test (Breusch-Godfrey) = 0.63 (0.78)

Serial Correlation LM Test (Breusch-Godfrey) = 0.53 (0.59)

4.2 Estimated long run and short run coefficients

The long-run bounds test above established the presence of cointegration amongst the model variables, the subsequent step will be to estimate the long run and short run coefficients of the model. In addition to the estimated short-run coefficients, error correction model (ECM) has also been estimated using the ARDL strategy. Coefficient diagnostic tests have been conducted using Wald tests verification method. The significant impact of the LIB variable on LRER has also been tested using Wald coefficient diagnostic test.

The ARDL model estimated was ARDL (1, 0, 2, 0, 1, 1) through the Schwartz information criterion (SIC) that was established to determine the optimal lag structure. The estimated ARDL is shown below in Table 5. The model estimator has evaluated 3072 models with three lags for the regressors as shown in Table 5 below. BOP, INF, and LIB are the only variables which are statistically not significant at 5% level. LGDP and INT are statistically significant at their levels, whilst LRER, INF, and LIB are all statistically significant at first lag. The results from the table show that in the short-run financial liberalization has zero contribution to the volatility of the exchange rate whilst contributing 2% in the long-run. The contribution from financial liberalization is only statistically significant in the long-run as compared to its short-run equivalence. Gross domestic product contributes 79% to the instability of the exchange rate in South Africa in the short-run whilst contributing 2% in the long-run. The short-run GDP contribution is statistically significant than its corresponding long-run contribution. Inflation contributes less than 1% to the exchange rate volatility in the country in the short-run whilst in the long-run, the contribution is insignificant. Inflation is only significant in its lagged short-run estimate. The balance of payments does not seem to exert any influence on the volatility of the exchange rate in both long and short runs. BOP contribution is not significant in its combined lagged long-run and short-run estimates. The lagged exchange rate contributes about 10% to the exchange rate volatility and is statistically significant in the long-run.

Table 5: Estimated Long Run Coefficients using the ARDL Approach

Dependent Variable: **D(LRER)**

Long Run Coefficient Results ARDL(1, 0, 2, 0, 1, 1)

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.43	0.60	0.72	0.48
LRER(-1)*	-0.10	0.03	-3.62	0.00
BOP**	-9.51E-12	4.86E-12	-1.96	0.06
INF(-1)	0.00	0.00	0.12	0.91
INT**	-0.01	0.00	-2.41	0.02
LGDP(-1)	-0.02	0.03	-0.65	0.52
LIB(-1)	0.02	0.01	3.75	0.00
D(INF)	0.01	0.00	2.00	0.05
D(INF(-1))	-0.01	0.00	-2.16	0.04
D(LGDP)	-0.79	0.08	-10.36	0.00
D(LIB)	0.00	0.01	0.08	0.94

* p-value incompatible with t-Bounds distribution. ** Variable interpreted as Z = Z (-1) + D (Z).

ECM = LRER + 0.00*BOP + 0.01*INF + 0.01*INT - 0.17*LGDP - 0.12*LIB +3.62C (2)

Equation 2 above shows that balance of payments has no contribution to the error correction model whilst inflation only contributes less than 1% to the model convergence towards equilibrium. Interest rate contributes about 1% to the speed of adjustment towards long-run equilibrium. Gross domestic product and financial liberalization contribute a significance of 17% and 12% respectively towards long-run equilibrium.

Wald Test **(**Null Hypothesis: C(2)=C(3)=C(4)=C(5)=C(6)=C(7)=0) = 2.94 (0.02)

Wald Test **(**Null Hypothesis: C (7) =0) = 107.25 (0.00)

The Wald test F-statistic results above with their corresponding p-values in brackets show that we reject the null hypothesis that the model estimates jointly have no impact on the exchange rate in South Africa in the short-run. Coefficient diagnostics conducted using the Wald tests show that financial liberalization has a long-run impact on the South African exchange rate. The error correction term (ECM) in Table 6 denoted by CointEq (-1)* is statistically significant with the expected negative value of -0.098364 and thus exhibiting the desired convergence behaviour towards long-run equilibrium. The speed of adjustment towards long-run equilibrium is 9.84%≅10% with evidence of long-run equilibrium relationship amongst the variables. The ECM further strengthens that the deviation from long-run equilibrium is correct by approximately 10% in the next year.

Table 6: Estimated short-run error correction model (ECM)

Dependent Variable: **D(LRER)**				
Long Run Coefficient Results ARDL(1, 0, 2, 0, 1, 1)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(INF)	0.01	0.00	2.65	0.01
D(INF(-1))	-0.01	0.00	-2.60	0.01
D(LGDP)	-0.79	0.05	-16.21	0.00
D(LIB)	0.00	0.01	0.09	0.93
CointEq(-1)*	-0.10	0.01	-17.70	0.00
R-squared	0.90	Mean dependent var		0.06
Adjusted R-squared	0.89	S.D. dependent var		0.12
S.E. of regression	0.04	Akaike info criterion		-3.44
Sum squared resid	0.07	Schwarz criterion		-3.25
Log likelihood	87.63	Hannan-Quinn criter.		-3.37
Durbin-Watson stat	2.28			

Notes: * p-value incompatible with t-Bounds distribution.

4.3 Stability tests

The procedure followed is based on the work of (Brown, Durbin, & Evans, 1975) which established method of detecting departures from constancy of regression relationships amongst time series variables. Brown et al. (1975) proposed the cumulative sum of residuals and cumulative sum of squares at 5% significance conveniently known as CUSUM and CUSUMSQ respectively. Both CUSUM and CUSUMSQ tests are constructed on the premise that the calculated statistic lie between two straight line boundaries for a given time period and that stability is rejected when the graphical statistical representation crosses the boundary lines. The model is stable as CUSUM and CUSUMSQ lie within their respective boundary lines. Figure 1 and Figure 2 show the graphical representations of CUSUM and CUSUMSQ

correspondingly which show the blue line bounded above and below by the red dotted line and green line respectively. The observed behaviour of the model along the path is correctly specified and stable over time.

Figure 1: CUSUM at 5% Significance

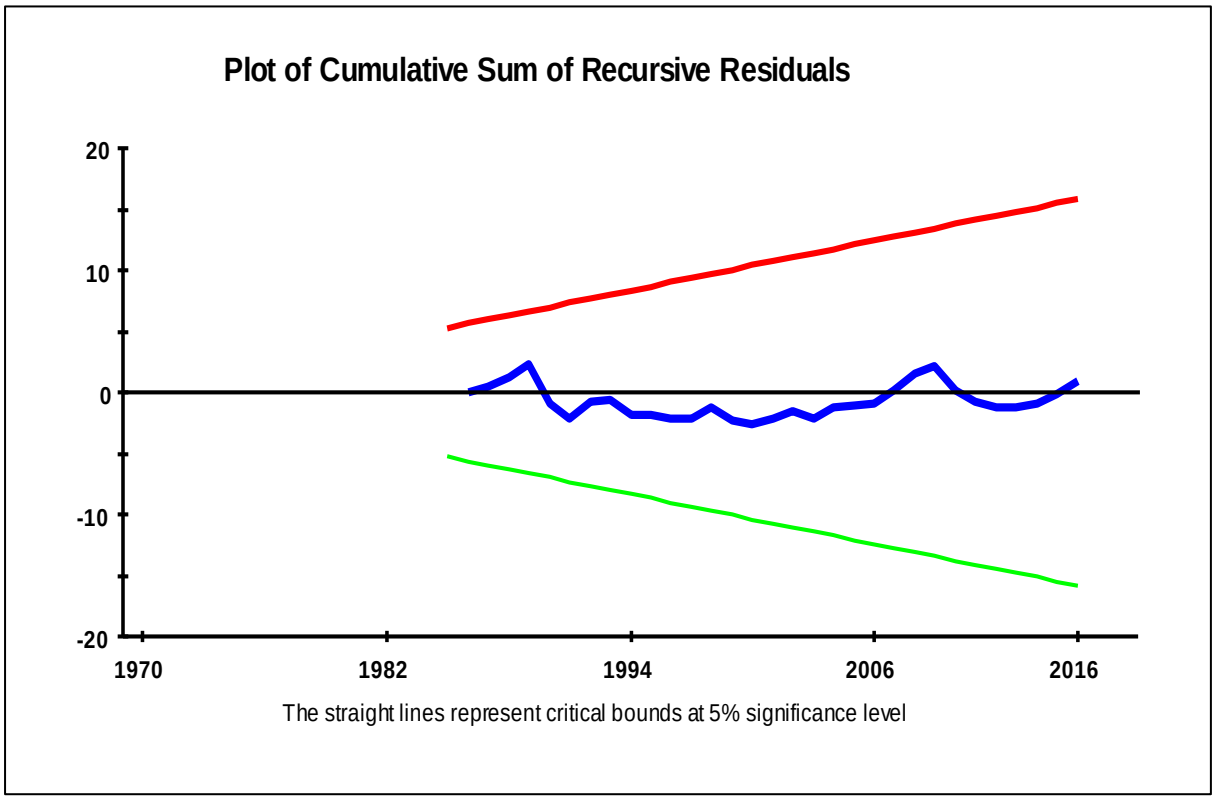
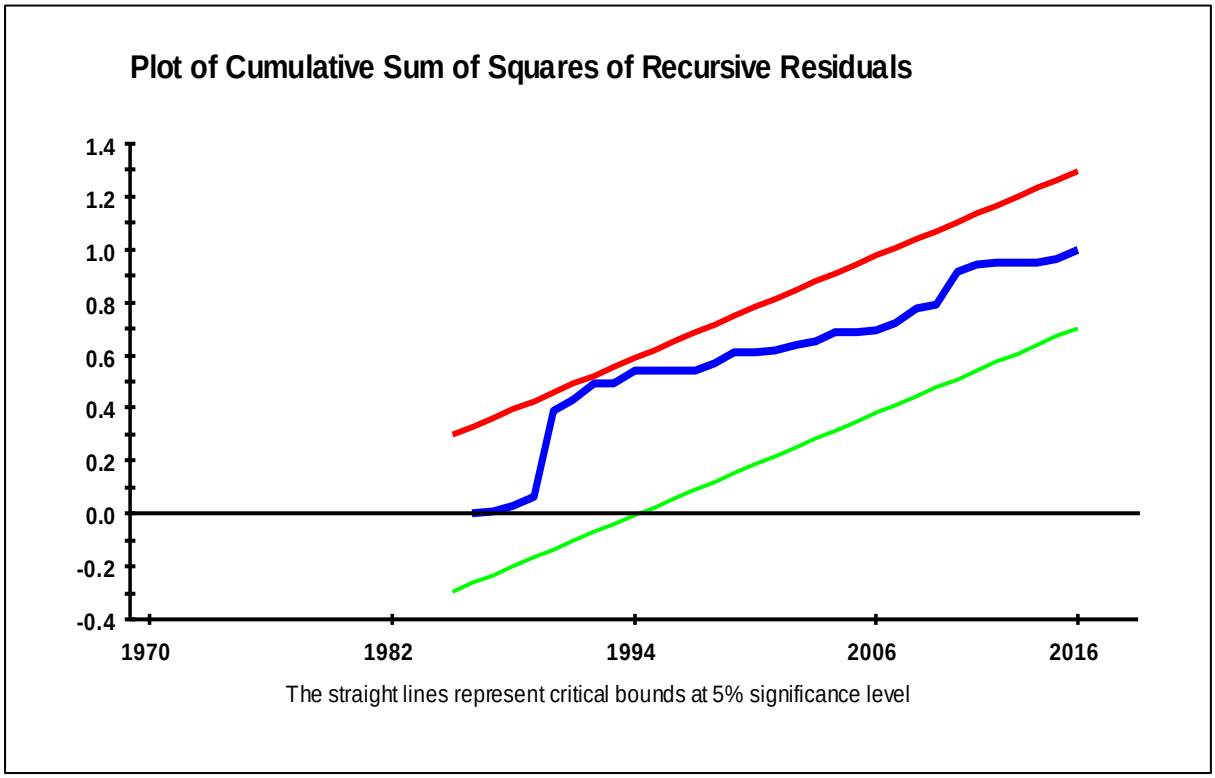


Figure 2: CUSUMSQ at 5% Significance



5. Conclusion and policy implications

This study investigated the impact of financial liberalization on the South African exchange rate. Contrasting arguments have been drawn between the impacts on the peg currency systems with floating counterpart. The estimated results show evidence that the floating exchange rate regimes do not severely suffer from speculative attacks as much as the pegged systems do. The common behaviour between emerging economies that went through currency crisis was the pegging of the exchange rate and their use of foreign reserves to defend their currencies and the erosion of their monetary value through accelerated inflation. The study also investigated the combined impact of balance of payments, interest rate, inflation, gross domestic product and financial liberalization on the exchange rate. The tools used in this report include checking the standard properties of the variables through descriptive statistics which showed that none of the variables were normally distributed with a mean of zero. The variables indicated the presence of platykurtic and leptokurtic distributions around their corresponding mean values. The study further investigated the correlations between the variables which showed a level of positive correlation between financial liberalization, gross domestic product, interest rate and balance of payments. These findings signal to the policymaker that macroeconomic variables cannot be treated exclusively from one another. There will always be direct and indirect influence between macroeconomic fundamental variables. The research also highlighted that financial liberalization is not an event but a coordinated sequence of reformatory steps as indicated by (Edwards, 1984; McKinnon, 1993).

The tests for stationarity were conducted using augmented Dickey-Fuller (ADF), Kwiatkowski, Phillips, Schmidt and Shin (KPSS) and Phillips-Perron (PP) techniques. The associated unit roots test displayed a mix of integration between the six variables. It was found that some variables were I (0) integrated and some were I (1) integrated but none were

found to be I (2) and above. Thus the conclusion reached was that the exchange rate, financial liberalization, gross domestic product, inflation and balance of payments were only stationary after the first differencing using the ADF and PP tests. Inflation was found to be stationary at level through the KPSS test which motivated the need to use autoregressive distributed lad technique to detect any cointegrated relationships between the variables without the need to run through the Johansen cointegration test.

The autoregressive distributed lag technique was used to establish the existence of cointegration relationship amongst the selected variables to bypass the limitations imposed by the standard Johansen cointegration testing procedure. The variables were found to be cointegrated and exhibiting a statistically significant tendency to converge towards long-run equilibrium. The long-run coefficients went through diagnostic checks using the Wald test procedure to determine their significant influence on the exchange rate which was found to be significant. The model was then tested for stability using the cumulative sum of residuals and the cumulative sum of squared residuals. The stability tests displayed a correctly specified and stable model, hence the significance of the findings. The policy implications for South Africa enhances the narrative that capital outflows contribute to the instability of the rand and other macroeconomic variables such as gross domestic product, poverty, and unemployment levels notwithstanding the positive impact on economic growth and financial integration with the rest of the world.

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