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FOREIGN CAPITAL INFLOWS AND GROWTH OF REAL ESTATE MARKETS IN SELECTED AFRICAN COUNTRIES

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Supervisor:
Professor Kalu Ojah

A Dissertation Submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, Johannesburg, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy in Finance.

28th September 2015

DECLARATION

This dissertation is my original work, prepared and submitted for the degree of Doctor of Philosophy (PhD) in Finance, at the University of the Witwatersrand, Johannesburg. It has never been submitted to this university or any other university for any other degree or examination.

…….

Allan Simiyu Kundu

28th September 2015

DEDICATION

For my late grandmother, Ann Nakhumwa, and my late Mother, Rabecca Naswa.

APPRECIATION

My sincere appreciation goes to my supervisor, Professor Kalu Ojah, for his instrumental academic and professional guidance, encouragement and interest in my area of study. God grant you long and happy life. I wish to recognize and appreciate the distinguished and valued contribution of Professor Christopher Malikane for his invaluable advice on economic modelling and implementation of the estimation techniques.

I am also grateful to my fellow students and young researchers in the Centre for Studies in Financial Markets and Macroeconomics, for their time and moral support. I wish all of you, all of the best. To Guy Mcilroy for finding time to proofread my work and Kecia Rust and the entire Centre for Affordable Housing Finance in Africa; your reviews as practitioners and assistance in data collection were very important. I also want to thank all persons who assisted me with data and information from central banks and national bureau of statistics of Botswana, Kenya, Namibia and South Africa.

To my loving wife, Dr. Susan Simiyu, my son Kory and the entire family of Mzee Justus Kundu and Mayi Rabecca Naswa, thank you for your love and support during my absence in pursuit of the PhD project.

Most importantly, I thank my creator and my Lord for the gift of life, love and wisdom.

God bless you all.

ABSTRACT

National real estate markets are globally recognized as essential segments of an economy and major contributors to national aggregate outputs. However, Africa's national real estate markets are largely underdeveloped mainly because capital is in short supply. In this study, we examine the effects of foreign direct investment (FDI), foreign portfolio investments (FPI) and remittances on Africa's real estate markets. We also sought to establish the financial market channels of capital inflows that are especially important for the real estate markets.

In 1980s and 1990s, the widespread influence of the Bretton Woods institutions' policy prescriptions saw many African countries implement far-reaching financial liberalization reforms. These reforms were meant to address low domestic savings and investments by opening the capital accounts of nations as to enable inflow of foreign capital. In this study, we test the externalities of these inflows.

Specifically, we examine the effects of foreign capital inflows on African real estate markets by estimating a structural investment model using a pooled feasible generalized least square and general method of moment estimators in a panel set-up. We use data from Botswana, Kenya, Morocco, Namibia and South Africa for this test. Second, we examine causality relationships between real estate investments and foreign capital inflows using vector autoregressive (VAR) models and the Bai-Perron threshold test. Third, using the optimal general method of moment estimators and interactive term approach, we model the most important channel for foreign capital inflows' externalities on the real estate markets.

The panel results show that FDI and remittance do not have favourable associations with residential and non-residential real estate investments during their initial period of inflow, but in later periods, they correlate positively and significantly with real estate investments. The relation between FPI and the real estate investments is inconclusive. The VAR test suggests that the effects of foreign capital inflows on both residential and non-residential real estate investments vary across countries and markets. In some cases,

the effects are time-varying and size-dependent, but in the majority of the cases, the effects are contingent on the size of the inflows.

In respect of the most important channel(s) reflective of effects of cross-border flows on real estate markets, the results appear largely country-dependent: the credit market channel appears to stand out in reflecting most favourable externalities from cross-border flows. Further, evidence on the direct channel effect also varied from country to country. The indirect channel of the equity market is only important in South Africa, especially, when remittances are funnelled via the equity market channel.

Based on the forgoing, it appears clear that in order to fast-track growth in national real estate markets, we should recommend that African countries put policies in place to motivate direct foreign capital inflows, encourage channelling of foreign capital inflows, particularly remittances and FDIs through the financial markets, with emphasis on credit markets.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

In most countries, the disaggregation of Gross Domestic Product (GDP) reveals the great importance of the role that real estate markets play in economic and social development of a country. Empirical studies have established direct positive effects of the real estate market on output growth, with real estate being part of a nation's fixed capital stock (Kamps, 2006; van der Eng, 2010). Other studies have also shown that the growth of a real estate market can stimulate growth in construction, manufacturing, mining, energy, savings, consumer markets and employment in an economy (Harris and Arku, 2006; Wang, 2007).

Furthermore, it has also been established that real estate markets provide excellent diversification opportunities to financial assets investors and that real estate markets can generate equally attractive risk-adjusted returns relative to other investment asset classes (Barry and Rodriguez, 2004; Heaney and Srianantha kumar, 2012; Lin and Lin, 2011).

However, extant statistics indicate that despite these apparent benefits, in Africa, Central and South America, real estate markets are underdeveloped and less attractive to international investors as an investment asset class (Lay *et al.,* 2006; Ojah and Kodongo, 2014). Africa, in particular, has lagged behind due to factors such as weak property rights, political interferences with the markets' operations, economic mismanagement and inadequate capital (Cloete, 2002; Knight *et al.,* 2004; Matipa and Barham, 2007; Nyasulu and Cloete, 2007).

Nonetheless, recent changes in economic policies, legislations, structural reforms and political maturity, have improved investment climate and lessened the effects of many relevant obstacles. These have led to some growth in real estate markets in many African countries such as Nigeria, Uganda, Namibia, Kenya, Ghana and South Africa (Anim-

Odame *et al.*, 2009; Gulyani and Talukdar, 2008; Knight *et al.*, 2004; Mooya and Cloete, 2010a; Mooya, 2011)

Yet, access to real estate finance has persistently remained a stumbling block to the growth of real estate markets, which in turn, makes African markets less developed as they currently stand. According to available data, it is only South Africa, Namibia, Morocco and Tunisia that have mortgage to GDP ratio above 10% whereas countries elsewhere such as Denmark, Netherlands and UK have ratios more than 80% (World Bank, 2009; World Bank, 2011a). African countries are often characterized by low level of domestic savings, shallow penetration of financial services, and thin and illiquid national capital markets. Under such circumstances, it is unlikely to have improved access to finance.

The World Bank's World Development Indicators (2013) show that out of 54 African countries, only 19 countries have equity markets, of which only 6 have more than US$ 10 billion market capitalization and only 3 had more than 100 listed companies by the close of 2011. Furthermore, none of the 54 African countries had an average Gross Domestic Savings (GDS) exceeding 25% of their GDP during 2006-2010 compared to China which recorded 54% GDS to GDP ratio. In the same period, average lending interest rate (LIR) ranged from a low of 11.56% per annum (Namibia) and an unimaginably high of 534.54% per annum (Zimbabwe), compared to 1.19% per annum (UK) and 4.71% per annum (US).

These statistics suggest a thin, illiquid and under-developed credit and equity capital markets, very low savings and resultant very high cost of capital. Given these conditions, African countries should look to external sources (i.e., international capital markets) for additional finance in order to achieve high levels of investments and growth. In other words, African countries can attract additional investable funds by liberalizing their capital accounts.

In 1973, Edward Shaw and Ronald McKinnon proposed financial liberalization of developing countries as a way to enhance savings, investments and encourage efficient

allocation of credit. They also advocated for the removal of interest rate ceilings, foreign exchange rate distortions, foreign trade controls, foreign capital controls and reduction of reserve requirement (McKinnon, 1973; Shaw, 1973) . Their hypothesis was that such liberalization would lead to a higher real interest rate that would attract more savings than was prevalent. In addition to attracting more savings, the high deposit interest rate would force more efficient allocation of available credit to high-return investments and in turn attract more foreign capital and trade (Andrianaivo and Yartey, 2010; Arestis and Demetriades, 1999; Fry, 1989).

Studies by Levine and Zervos (1998), Obstfeld (2009), and Singh and Weisse (1998) in particular, demonstrated the effectiveness of eliminating foreign capital flow controls (i.e., support for capital account liberalization on savings and investments). These studies had the strong support of the IMF; consequently, most African countries have adopted the resultant models.

Since the elimination of capital account controls, international capital flows such as foreign direct investments (FDI), foreign portfolio investment (FPI) flows and Diaspora remittances into Africa have increased. According to World Development Indicators (WDI), FDI flows to Africa exploded in 1997 from US$ 5.61 billion in 1996 to US$ 9.98 billion in 1997 representing a 78% growth. This inflow of capital into Africa continued upwards to US$ 17.0 billion in 2001 and then to the highest ever amount of US$ 58.53 billion in 2008 but this fell to US$ 49.21 billion in 2009 as a result of the 2007 global financial crisis.

On the other hand, Foreign Portfolio Investment (FPI) flows, and particularly Equity Portfolio Investment (EPI) flows into Africa have been erratic. For example, EPI made a gigantic leap of 813% from US$ 804 million in 2003 to US$ 7.34 billion in 2004. Then it rose smoothly to US$ 8.89 billion in 2005 before making another leap of 92% to US$ 17.08 billion in 2006. However, the financial crisis of 2007 seems to have hit EPI severely when total inflows to Africa fell from US$ 6.91 billion in 2007 to US$ -6.26

billion in 2008 (a 191% decline). Nonetheless, it recovered fairly quickly than the FDI as it rose by 268% to US$ 10.51 billion in 2009 and later reached US$ 19.78 billion in 2010.

Surprisingly, remittances from Diaspora became the highest source of capital flow to Africa by 2010 after hitting US$ 39.31 billion against US$ 38.82 billion in FDI and US$ 19.79 billion in EPI. It also constituted the highest source of capital flows globally with 8.75% of global Diaspora remittance as a percentage of GDPs higher than global FDI (2.71%) and EPI (2.54%) in 2010. In particular, remittance exceeded other flows in 2010 in countries like Morocco (by US$ 5.18 billion), Nigeria (by US$ 4.0 billion), Kenya (by US$ 1.6 billion), Egypt (by US$ 1.34 billion) and Senegal (US$ 1.1 billion) as well as in Lesotho, Togo, Mali, Cameroon, Benin and Gambia among others. Interestingly, the financial crisis of 2007 affected remittance to Africa only by a small margin as remittances remained above the pre-crisis level of 2006.

Therefore, it appears that capital account liberalization has encouraged international capital flows into African states but few empirical studies have been conducted to establish whether these flows have affected the growth of important markets such as the equity markets, foreign exchange markets and real estate (mortgage debt) markets. The majority of existing studies about Africa focused on effects of global flows on economic growth and often arrive at interesting results or results inconsistent with theory such as Omoniyi and Omobitan (2011) and Sathye (2009). These studies report that FDI has a negative or insignificant relationship with GDP growth in Nigeria, South Africa and Botswana.

Very few studies have analysed the impact which any of the cross-border flows has on the real estate market, despite the fact that capital flows into an economy tend to largely flow to specific sectors or markets of the economy. According to household surveys in some African countries and experiences of countries in other regions, the real estate market is usually a major beneficiary of cross-border flows (Rodríguez and Bustillo, 2010; Ross, 2011; UNCTAD, 2011; World Bank, 2011b) . Therefore, an extensive

empirical study on the effect of cross-border capital flows on real estate markets in African countries is a worthwhile research endeavour.

1.2 Motivation

The real estate markets in Africa remain the least developed among national real estate markets of the world, often experiencing low investments, low transactional volumes, illiquidity and little attractiveness to investors (Lay *et al.*, 2006; Mooya and Cloete, 2007; Mooya and Cloete, 2010b). This is despite plenty evidence of real estate market contribution to capital formation, savings, consumption, household income, employment, growth of other markets, social welfare, diversification and performance of investments portfolios (Barry and Rodriguez, 2004; Catte *et al.*, 2004; DeVerteuil, 2006; Wang, 2007).

This underdevelopment still persists in a period when Africa is experiencing unprecedented levels of urbanisation, growing industrialization, and expanding service sector. These indicate a rising demand for residential, commercial and industrial real estates in addition to already unrivalled number of slum dwellers. The urban population in Africa has jumped from 134 million in 1980 to 401 million in 2010 and is projected to continue rising to 471 million by 2015 although 55% of this population still resides in slums (UN-HABITAT, 2008; United Nations, 2011).

Moreover, most African countries had a consistent positive expansion of industrial production and service sector as shown by positive industrial value-added and service value-added growth rates between 1996 and 2010. Thus, notwithstanding underdevelopment of the real estate markets, demand on all real estate submarkets is expected to continue growing.

Lack of availability and access to long term financing (i.e., capital) have been a major impediment to the growth of African real estate markets mainly because finance is needed to fund delivery (supply-side) and consumption (demand-side) of the market (Gough and Yankson, 2011; Kajimo-Shakantu and Evans, 2006; Nyasulu and Cloete, 2007). Given available few, thin and illiquid capital markets, low saving rates, high

lending interest rates, and low credit advances, African countries are inevitably left with foreign capital as an important source to finance their investments.

his has led to the opening of capital accounts via financial liberalization which has successfully pulled in capital from countries with a surplus to countries with a deficit but with higher marginal productivity of capital (Arestis and Demetriades, 1997; Korap, 2010; Obstfeld, 2009). These capital flows are expected to affect different markets in different ways.

In fact, previous theoritical and empirical studies confirm that international capital flows such as FDI, FPI and remittances have both a significant direct and indirect effects on growth of various markets. For instance, FDI is found to provide new capital, technology and management skills to recipient firms and therefore, increase growth of total factor productivity (TFP) in the firms as well as in other firms and markets through spillover effects, job creation and household income growth (Fernandes and Paunov, 2012; Gohou and Soumaré, 2012). Furthermore, household surveys and empirical studies have found that remittances from Diaspora have a direct influence on real estate markets. It is established that more than 50% of remittances in most recipient African countries are invested in real estate (World Bank (2011b).

The indirect effects of remitances are found to be conveyed through financial sector development, consumption smoothening, poverty reduction, household incomes and economic growth (Aggarwal et al., 2011; Nyamongo et al., 2012; World Bank, 2011b). Moreover, although FPIs are susceptible to information problems, reversible and have rational herding problems, recent studies have found significant evidence of co-movement between FPI flows and market liquidity, corporate governance and cost of equity; thus, they are likely to stimulate growth in various markets (Calvo and Mendoza, 2000; Poshakwale and Thapa, 2011; Stulz, 1999; Sula and Willett, 2009).

However, very few studies have analysed empirically effects of foreign capital on growth of micro-markets or sectors. Extant relevant studies focused on the effect of a component

of foreign capital on economic performance and macro-economic variables (Choong *et al.*, 2010; Nyamongo *et al.*, 2012).

The few available studies on sector or market level in Africa have concentrated primarily on the effects of capital flows on manufacturing and service sectors (Fernandes and Paunov, 2012; Waldkirch and Ofosu, 2010; and Bwalya, 2006). But none has focused on the real estate market. The recent exponential growths of Africa's inbound FDI of the tune of US$ 38.82 billion, remittance of US$ 39.31 billion and EPI of US$ 19.79 billion in 2010 indicate that various markets are likely to be affected differently by these flows.

Furthermore, some earlier studies highlight the need for well developed credit and equity markets, as prerequisites for significant international capital flows. Given that African markets are still thin and illiquid, there is the additional need to understand the conduits or repositories of these foreign capital inflows (Deléchat *et al.*, 2010; Giovanni, 2005). This study seeks to address these two gaps by empirically analysing the effect of FDI, FPI and remittances on the growth of real estate markets in selected African countries as well as ascertain whether equity and/or credit markets are conduits through which cross-border capital flows affect growth in the real estate market.

1.3 The Purpose Statement

The purpose of this study, therefore, is to analyse and establish empirically whether international capital flows namely, foreign direct investments, foreign portfolio investments, and remittances influence growth of real estate markets in five African countries: Botswana, Kenya, Morocco, Namibia and South Africa. These are the only countries with sufficiently detailed data on real estate investments. The study also evaluates important channels through which cross-border capital flows impact the real estate markets in these countries.

1.4 Research Questions

This study is therefore being guided by the following questions.

i) Do foreign direct investments, remittances, and foreign portfolio investment flows affect the growth of real estate markets in selected African countries?

ii) Do domestic equity markets and credit markets, respectively, serve as channels by which cross-border capital flows affect real estate markets in the selected African countries?

1.5 Significance of the Study

Africa still lags behind on reliability and distribution of information on real estate markets, and this has in no small ways discouraged investments in the market. Studies indicate that lack of sufficient information can be a major impediment to the growth of a market since investor's interest in the market, the market's efficiency and pricing of assets in the market, demand timely and sufficient information (Bhattacharya *et al.,* 2010; Gupta and Chander, 2011).

It is also important that information is correct, up-to-date and available to users. Bulloch and Sullivan (2010) posit that generation and dissemination of information are indispensable parts of real estate market's development. An inherent objective of this study is to bridge this gap by contributing to a systematic data collection and presentation on African-wide national real estate markets. Investors in these markets can make use of data and information collected on the real estate markets and from our findings for their benefit.

On top of the challenges of data availability and information gathering and processing, most stakeholders agree that real estate markets in Africa are underdeveloped and less attractive to investors than other asset classes (Lay *et al.*, 2006). This fact is confirmed by the prevalence of homelessness, proliferation of slum dwellings and other squalid living conditions. These depressing conditions present policymakers and stakeholders in these African countries with a challenge on what courses of action should be taken to prop up and grow real estate markets.

These policymakers and stakeholders include government agencies such as Ministries of Finance, Ministries of Housing and Urban Development, central banks and government advisors on housing and housing finance such as the World Bank, International Monetary Fund, Fin Mark Trust, UN-HABITAT and others. Our findings provide important support

and guide for their policies and decisions regarding investments and growth of residential and non-residential real estate markets in nuanced ways. Our findings address two main questions. We summarize these findings below in two corresponding paragraphs per the research questions.

First, the study seeks to find out whether foreign capital inflows affect the growth of real estate markets in Africa. To this end, we first formulate a structural investment model which we initially estimate using panel regression analysis, on data from Botswana, Kenya, Morocco, Namibia and South Africa. In our second estimation, we examine causality relationships using both the vector autoregressive (VAR) model and the Bai-Perron threshold test.

Our general and country-by-country results indicate that foreign capital inflows are statistically important for the growth of the residential and non-residential real estate markets. Further these findings vary across our sample countries and from real estate market types, which means that policymakers and stakeholders can use these findings, which also identify the time and size aspect of foreign capital inflows' effects, to formulate specific policies and plans on how to stimulate growth of their real estate markets.

Our second question looks at whether domestic equity and credit markets serve as channels by which foreign capital inflows affect real estate markets. In this regard, we use the interactive term model approach to examine both the direct and indirect channels' (credit's and equity's) effects of foreign capital inflows on the two real estate markets. Our findings indicate that the important channels of effects of cross-border flows on real estate markets, also varies across countries and markets.

We also find that some flows such as foreign direct investment and foreign portfolio investment have significant direct channel positive externalities, in addition to indirect channel positive externalities. However, for remittances, positive externalities are only possible when funnelled via financial markets (indirect effects). These findings are also

important to policymakers and stakeholders, especially when they need to understand what type of foreign investors to target and how to motivate them to invest appropriately.

To academia and research fraternity, data collected analysed in this study, gaps identified, and recommendations for further study areas made at the end of this report, are important for informing on-going and future research. These findings provide insights for further scholarly reasoned discourses on foreign capital inflows, real estate markets and domestic financial markets development at various levels (e.g., at the national level). Most scholars will find this study useful because only a few studies have so far been carried out in the field of real estate markets of Africa.

1.6 Organization of the Study

This study is organized in the following systematic way: As is already apparent, this chapter presents background information on Africa's real estate markets and international capital flows; and thus highlight the motivations for the study. It also outlines the research questions that guide the analyses that follow in latter chapters. Chapter two presents a critical analysis of existing theoretical and empirical literature on real estate finance, foreign direct investments, foreign portfolio investments and remittances in Africa and beyond. In addition, it highlights the link between the three international capital flows and real estate market growth as part of a country's economic growth calculus and/or architecture. Chapter three presents the data collection process and the econometric models and preliminary estimations results. Chapters four and five implement further empirical estimations and provide corresponding results and discussions. Chapter six summarises the report and provides conclusions in relation to tested hypotheses; and finally makes policy recommendations and points to areas for further research.

CHAPTER TWO

REAL ESTATE MARKET, FINANCE AND INTERNATIONAL CAPITAL FLOWS

2.1 The Nature of a Real Estate Market

As an economic sector, it is generally believed that real estate is not only an important component of a country's aggregate output but also an essential market whose products; which are principally dwellings and buildings; are competitively allocated to economic agents via the marketplace without direct government intervention (Marsh and Gibb, 2011; Ronald and Hirayama, 2006).

Being a market for parcels of land and any creation or improvement on it, it is common to segregate a country's real estate market along dichotomous halves of residential[1] and non-residential real estate markets – basically encompassing commercial and industrial real estate markets. Combined with the later, a real estate market is thought of by micro-economists, particularly, the industrial economists, as a market characterised by manifestation of imperfection on various dimensions.

For instance, the supply of real estate is often inelastic and hardly responds to price or demand changes. This is typical of imperfect markets, and it is often traced to high cost of information gathering, colossal capital requirement, limited availability of land and restrictions on land use (Ball, 2011; Coiacetto, 2009; Shapiro *et al.*, 2009). Some industrial economists speculate that the real estate market product is similarly a major source of the market imperfections. By and large, buildings attract not as much buyers and sellers as products in perfect markets for the reason that buildings are highly heterogeneous, restricted to a location, complex, durable, costly and immovable, (Bramley *et al.*, 2008; Min and Quigley, 2006; Pozo, 2009).

[1] The residential real estate market (also called the housing market) comprises of the market for dwellings such as single family residence property, duplex property, condominiums, townhouse property and manufactured home property. On the other hand, commercial real estate market encompasses buildings used for business such as office buildings and complexes, retail spaces, malls, healthcare property, and hotel properties while the industrial real estate market covers buildings used for industrial and manufacturing purposes like industrial complexes, warehouses, go-downs, automobile property.

2.1.1 Importance of a Real Estate Market

The importance of a real estate market in the social and economic development of a nation has been widely acknowledged. In fact, after the 2007 global financial crisis, many writers have come to deem prudent regulation of a real estate market as a precursor to a stable financial system and economy.

Wang (2007), for example, argues that the real estate market has both direct effects on the economy (given it is a sector of the economy) and indirect effects (via economic activities in industries such as construction, manufacturing, mining and energy). Others writers, such as Haila (2000), suggests that real estates, as local and immovable assets, constitute the bulk of both national wealth and fixed capital stocks; and so, its effect on economic growth must be significant. This argument is based on the overwhelming evidence, empirical and theoretical, indicating a significant positive relationship between national capital stocks and sustainable output growth (Kamimura *et al.*, 2004; Kamps, 2006; Önder *et al.*, 2010; van der Eng, 2010).

Apart from the economic importance, a vibrant real estate market is also vital to the social development of a society, particularly on the advancement of the quality of living. According to the proponents of this view, a vibrant real estate market helps to reduce the prevalence of homelessness, proliferation of slum dwellings and other squalid living conditions. The United Nations is a great advocate of this opinion which is embedded in its Millennium Development Goals (Gulyani and Talukdar, 2008). For this reason, a large number of social welfare response strategies, by a number of governments, recognise the significant role played by the real estate markets.

As a result of this recognition, new joint-endeavours have been designed in the name of public-private partnership (PPP) programmes (World Bank, 2009; Zhang and Zhou, 2011) to support market growth and increase delivery of affordable houses. The Co-operative Home Ownership Incentive Scheme (CHOIS) of Nigeria and the Kolkata PPP of India are the classic examples of PPPs (Adewole, 2012; Sengupta, 2006).

To investors, the importance of a vibrant real estate market lies in excellent returns and provision of exceptionally efficient diversification opportunities. These help investors to earn some good returns and mitigate systematic risks in stock and debt portfolios. For these reasons, real estate markets have become targets and destinations of enormous investments, which have, in turn, increased market efficiency and relative stability of returns (Andersen, 2008; Belsky, 2009; Plazzi *et al.*, 2010). Empirical evidence supports such diversification strategy in most countries.

For example, an analysis of the returns on direct investment in Australian commercial and residential real estate markets against returns on the stock market investment and an analysis of markets in China, Taiwan, Hong Kong and Singapore provide strong evidence that laud such diversification strategy (Heaney and Sriananthakumar, 2012; Lin and Lin, 2011). A study in the US by Sirmans and Worzala (2003) also arrived at a similar conclusion. In this study, Sirmans and Worzala found only negative or weak correlations at best, between stock returns and international real estate returns, upon accounting for currency risk.

In another study focusing on Egypt, Morocco and South Africa, Barry and Rodriguez (2004) used Capital Asset Pricing Model (CAPM) and arrived at the same results. Therefore, a diversification strategy involving real estate and stock markets' investment assets is likely to permit investors to minimize systematic risks on both markets while optimizing their overall returns.

2.1.2 Determinants of Real Estate Market Growth in Africa

The 2007 global financial crisis sparked off a stream of studies mainly focused on unravelling major drivers of the real estate market and the core linkages with other financial and economic aspects. Some of these studies have extended into understanding the determinants of real estate demand and supply while others simply focus on causes of real estate market instabilities.

In the midst of these studies, growth of urban population has repeatedly been documented in a set of empirical and field works as a fundamental driver of demand for *residential*

real estate. It is a common practice to project housing demand using anticipated change in urban population together with extrapolated household size (Belsky, 2009; Nygaard, 2011). On this account, given the estimation that the current massive population growth in Africa is likely to persist into the future, at least according to the United Nations' Department of Economic and Social Affairs (UNDESA), then it is sensible to argue that residential real estate demand will likely persit into the future.

The UNDESA report indicates that the African urban population shot up from 134 million in 1980 to 401 million in 2010 and projects it to reach 471 million by 2015. UNDESA also projects cities like Lagos, Cairo and Kinshasa to join the top 30 megacities in the world by 2050 in terms of population size (UN-HABITAT, 2008; United Nations, 2011).

Similarly, it is also an established convention that the demand of the *non-residential real estate* is governed by the growth of productive sectors in urban centres. Accordingly, growth of the manufacturing and service sectors closely reflect an increase in employment, which in turn signifies a growth of office space and industrial building needs, inherently driving up *non-residential real estate* market demand. Major proponents of this view includes Jayantha *et al.,* (2001) who used the Engle-Granger causality model to demonstrate statistically a significant causal relationship between the growth of non-residential real estate and service sectors in Hong Kong.

Intuitively, this suggests that documented expansions in the manufacturing and the service sectors of various African countries would result in an increase in non-residential real estate demand. According to World Development Indicators, majority of African countries have consistently recorded positive growth rates of value added by services to GDP since 1996 whereas the ratio of employment to the total population of sub-Sahara Africa has steadily risen since 2000 from 63.7% to 65.1% in 2009 against the backdrop of dwindling global levels (global employment ratio fell from 61.4% in 2000 to 60.7% in 2009).

Equally, land supply and use can also be a limiting factor on the growth of the real estate market. According to spatial economists, planning land use elicits restrictions on land supply and limits real estate supply, which in turn fosters speculative behaviours and price volatility of both assets. They view restrictive land supply as inflicting an additional set of costs on investors that results in higher land prices, which may in turn adversely diminish the supply of real estate (Meen and Nygaard, 2011; Monk and Whitehead, 1996). In the same line of thought, studies on how the land market interacts with housing supply assume that land, as a factor of production, has a limited supply and takes a non-linear demand curve. These authors argue that the dynamic relationship is highly sensitive to perturbations in the land market prices, so much so that a small change in land price would trigger a bigger negative shock on the housing supply (Ma and Mu, 2008; Spaans and Golland, 1996).

Another alternative view of major drivers of real estate market growth emanates from scholars focused on property rights and the law. They submit that since Africa is entrapped in discriminatory customary laws and poor political management that disrespects women and foreigners' right to property (Joireman, 2008; Kimani and Maina, 2010), investments in the real estate markets are likely to be constrained (Mooya and Cloete, 2010a).

Much more precisely, Ojah *et al.,* (2010) argue that property rights[2] have a strong impact on investment decisions in fixed capital and consequently on capital formation, of which real estate is part. In this regard, it will be right to contend that poor legal institutions would undermine protection of the properties of investors, which would significantly constrain growth of real estate markets.

However, recent legal and political reforms in many African countries such as the Land Act of 1998 in Uganda, constitutional reforms in Ghana, Kenya and South Africa, and the general political maturity seem to have improved property rights of some African states

[2] According to Joireman (2007) the term "property rights" is used to refer to the rights of control over an object, a piece of land, a resource or generally an asset.

(Joireman, 2007). Nevertheless, according to the world governance index, Africa still lags behind other states in the West on various governance dimensions.

A further important determinant of real estate market growth is the monetary policy, especially the level of lending interest rates. This is supported by empirical studies and theory that posit that real estate prices are likely to escalate during an expansionary monetary policy regime and plummet in a restrictive regime (Xu and Chen, 2012). A fundamental monetary instrument for constraining money supply has always been the lending interest rate (LIR). In their empirical investigation, Chen and Tzang (1988) found equity REITs and Mortgage REITs to be sensitive to changes in the interest rates, specifically, changes in the inflation rate and real rate components of nominal interest rates, whereas Devaney (2001) used the generalized autoregressive conditionally heteroscedasticity in the mean (GARCH-M) model to show how movements in the interest rates and their conditional volatilities affect equity and mortgage REITs' excess returns.

Moreover, direct real estate investors also take into cognizance the interest rate dynamics. For lenders with portfolio structures in favour of mortgage lending, high borrowing costs are inevitably passed over to primary mortgage borrowers. Eventually, this translates into small mortgage advances and real estate market growth retards. Bank of Ghana (2007) argues that the massive failure or exit of mortgage lenders from Ghanaian housing finance market in 1990s and early 2000s was partly due to high finance cost of long-term borrowing. In recent work of Guo and Huang (2010), employing a multivariate vector autoregressive (VAR) models, short term interest rate was found to lower house prices significantly in China. Therefore, inflation expectations and real interest rate; that is modelled into short and long-term interest rate term structures; tend to affect the demand for real estate via the cost of mortgages although it form an additional risk premium in listed REITs' returns.

Perhaps the most important driver of real estate market growth, according to Hott (2011), is availability of finance. Hott demonstrated the importance of finance in a real estate

market by illustrating the way mortgages drive housing supply and demand in a theoretical model. In the model, the banks' willingness to advance construction mortgages is dependent on expected housing price increase which is, in turn, reliant on housing demand that is a function of mortgages to home buyers. In essence, Hott shows that the viability and sustainability of a real estate market rests on the availability of mortgage finance without which a market can easily come to a halt.

Hwang *et al.,* (2011) support this assertion in their assessment of Korean mortgage policies in an integrated and dynamic model, as well as Liang and Cao (2007) who adopted an autoregressive distributed lag (ARDL) model to demonstrate an unidirectional causality from bank lending to real estate prices. The use of bank lending as a proxy for mortgage portfolio is supported by theory and practice since economic agents can use both non-mortgage and mortgage loans to fund construction or house purchases. In another study focusing on non-residential real estate markets, Davis and Zhu (2011), using a vector error correction model (VECM), found that credit given to private sector significantly affects prices of commercial properties.

However, little empirical research has been done in the African context to test the effect of finance availability on real estate markets. But many authors of exploratory studies often cite the lack of finance and poverty as a major detriment to real estate market growth in Africa (Gough and Yankson, 2011; Kajimo-Shakantu and Evans, 2006; Nyasulu and Cloete, 2007).

Based on the above views and review, the availability of finance, and its determinants such as interest rates, seems to stand out strongly as prerequisite conditions for the growth of a real estate market, although other factors seem sufficiently important only in the presence of finances. For instance, the growth of urban population may stimulate demand for housing but new units will only be put up when funds are available.

The availability of finance seems to affect both the demand-side and the supply-side of the market since house prices seem to change with the level of credit as seen in studies by Jinjarak and Sheffrin (2011) and Aizenman and Jinjarak (2009) but still, massive credit is

needed to support the activities of constructors. That being the case, it is now clear that the growth of a real estate market depends on availability and accessibility to real estate finance and it is therefore worthwhile to dwell more on real estate finance in a quest to understanding growth of African real estate markets.

2.2 Real Estate Finance in Africa

According to the World Bank (2009), real estate in developing economies, which are characterized by under-developed or developing financial systems, are either self-financed from many years of savings or funded by borrowing from financial institutions. However, self-financing and mortgages – or generally, any form of borrowing – are options that are sensitive to interest rates and often call for a high rate of savings to amass a substantial amount of capital funds for long-term investment projects such as real estate constructions (Halloran and Yawitz, 1979; Martins and Villanueva, 2006). The World Bank (2009) estimates that the proportion of total mortgage loans that is financed by deposit savings in developing countries – e.g., South Africa, Poland and Thailand – is in excess of 90%.

This unmistakeably highlights domestic savings as indispensable and central to investments; as such, expectations of substantial levels of fixed investment are only tenable in the presence of substantial amounts of savings. In other words, savings and investments are inextricably intertwined such that investments cannot subsist without adequate savings to foster and nature investment growth. Unfortunately, Africa, especially the sub-Sahara Africa, has always recorded among the lowest gross domestic savings (GDS) to GDP ratios compared to other regions around the globe year in year out.

For instance, according to the World Development Indicators (WDI) (2015), between 1980 and 2014, the GDS to GDP ratio for sub-Saharan Africa managed to reach 20% in only 9 out of the 35 years, with 5 of the nine years being in 1980s. The East Asia and Pacific region, Europe and Central Asia, as well as Latin America and Caribbean have sustained their GDS to GDP ratios above 20% in most cases. This set of ratios is

presented in Table 2.1 below, from which one can also read that the Sub-Saharan Africa region had relatively much more savings in 1980s than in the 2000s.

Table 2.1: GDS to GDP in selected regions of the world from 1980 to 2014

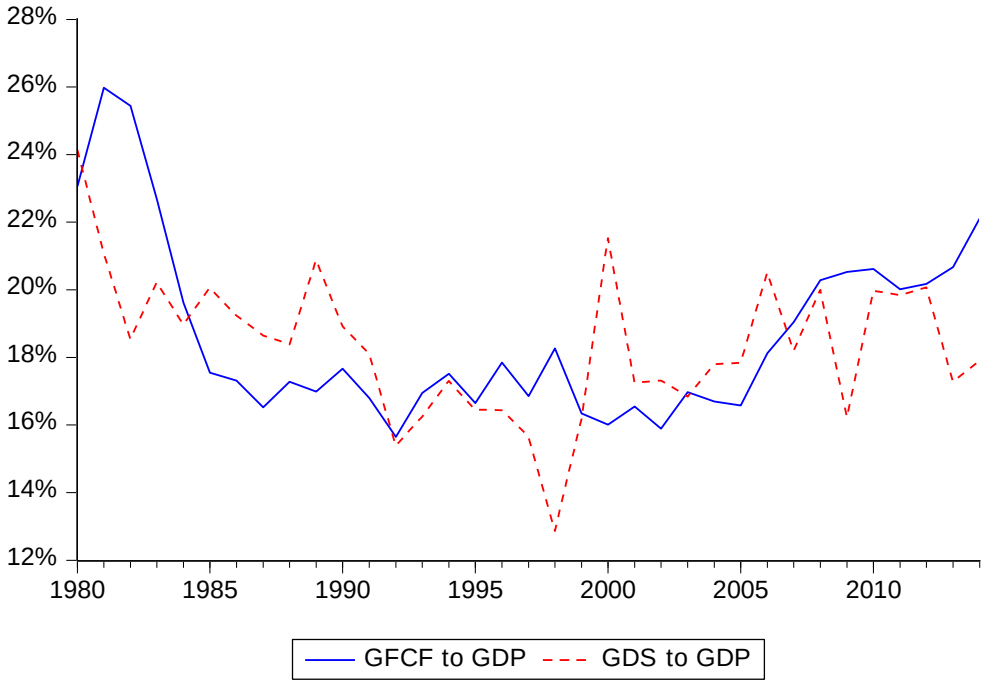
Country Name	Sub-Saharan Africa	Middle East & North Africa	East Asia & Pacific	Europe & Central Asia	Latin America & Caribbean
1980	**24.14**	33.97	31.00	23.26	23.45
1981	**21.10**	30.03	30.78	21.94	23.13
1982	18.54	24.46	30.41	21.76	23.10
1983	**20.22**	22.30	29.99	21.70	23.14
1984	18.98	21.20	30.81	22.22	23.15
1985	**20.05**	17.65	31.09	22.34	23.96
1986	19.24	13.72	31.76	22.67	21.47
1987	18.64	16.61	32.38	22.60	23.70
1988	18.38	15.13	33.23	23.51	24.40
1989	**20.88**	15.95	33.29	24.31	24.91
1990	18.92	19.56	33.66	24.30	21.65
1991	18.12	13.33	33.75	23.70	19.98
1992	15.39	20.69	33.14	23.33	19.03
1993	16.25	21.75	33.51	22.31	18.71
1994	17.30	23.37	33.01	22.79	19.46
1995	16.45	24.66	32.92	23.44	19.37
1996	16.43	26.70	32.16	23.14	19.22
1997	15.65	26.49	32.37	23.30	18.96
1998	12.86	21.95	31.65	23.43	18.96
1999	16.18	26.55	30.00	23.47	19.05
2000	**21.53**	32.30	30.16	24.04	19.75
2001	17.26	29.71	29.10	23.74	18.43
2002	17.31	29.90	28.93	23.32	19.47
2003	16.84	32.41	29.98	22.94	20.59
2004	17.79	33.94	30.80	23.29	21.93
2005	17.84	37.54	30.92	23.21	22.15
2006	**20.51**	38.59	31.73	23.88	23.06
2007	18.20	38.75	32.06	24.63	22.86
2008	**20.00**	40.64	31.40	24.07	22.66
2009	16.23	33.24	30.24	21.21	20.39
2010	19.97	35.75	30.84	21.91	21.48
2011	19.83	39.14	29.64	22.61	21.68
2012	**20.07**	38.96	29.47	22.27	20.82
2013	17.28	35.70	29.20	22.23	19.74
2014	17.91	..	..	21.56	19.42

Source: The World Development Indicators series (2015)

The importance of savings and investments in an economy cannot be under estimated. For this reason, economic literature is full of empirical evidence from recent studies that focused on transition economies and least developed countries (LDC). Evidently, growth of such economies is often investment-driven and a high rate of savings is frequently established as critical to investments; hence growth of their fundamental economic sectors (Singh, 1998; Stroutchenevski, 2002).

In addition to prior studies, data recorded on GDS and gross fixed capital formation (GFCF) in sub-Saharan Africa by WDI, presented in Figure 2.1 below, seem to uphold these observations, especially for the periods before 2003. If this is the case, then one would argue that the low levels of development of real estate markets in Africa can be partly explained by the low savings rates prevalent in most African economies.

Figure 2.1: GDS-to-GDP and GFCF ratios for Sub-Saharan Africa from 1980 – 2013



Source: World Development Indicators (2015). GDS stands for gross domestic savings, GDP stands for gross domestic product and GFCF denotes gross fixed capital formation.

Apparently, WDI indicate that sub-Sahara Africa only managed to lend an average of 62.39% of their GDPs as domestic credit to private sector (DCPS) during 2006-2010 under interest rate regimes of an average LIR ranging between a high of 534% per annum in Zimbabwe and a low of 11.56 per annum in Namibia (Table 2.2). On the contrary, according to Table 2.2 below, the UK recorded 195% DCPS to GDP ratio during the same period, whereas the US documented 202% DCPS to GDP ratio and a LIR of 1.19%

per annum and 4.71% per annum respectively. The low LIRs seem to permit high DCPS in the UK and the US but high LIRs are likely to undermine borrowing in Africa.

Away from the credit markets, the capital markets theories posit that equity markets possess mechanisms for raising long-term funds and can effectively mobilize savings, facilitate risk transfer and aid reduction of capital costs (Adjasi and Biekpe, 2006; Cooray, 2010). Naturally, equity markets are supposed to complement the inadequacies of the credit markets in supplying cheap long-term real estate finance via equity issues. But, equity markets in Africa are still underdeveloped, thin and illiquid with very low market capitalizations because of many years of financial repression, high political risks and low domestic savings (Andrianaivo and Yartey, 2010; Beck *et al.*, 2010).

Table 2.2: Size and Depth of Financial Markets in Africa

Country Name	MKT. CAP in 2011 (mn. US$)	TVST in 2011 (mn US$)	LISTEDCO.	Corp. Bonds Outst. In 2009 (mn US$)	LIR (%) 2006-2010	DCPS (%) 2006-2010
Botswana	4,107	145	23	608	14.58	21.43
Cote d'Ivoire	6,288	123	33	1051		16.30
Egypt, Arab Rep.	48,683	21,992	231	----	12.05	40.46
Ghana	3,097	136	36	4		14.22
Kenya	10,203	877	58	767	14.01	29.14
Malawi	1,384	53	13	----	26.76	11.85
Mauritius	6,540	522	86	----	12.48	80.56
Morocco	60,088	6,320	75	----		59.88
Namibia	1,152	14	7	243	11.56	46.78
Nigeria	39,270	4,152	196	847	17.00	24.24
South Africa	855,711	372,177	355	45201	11.94	151.34
Tanzania	1,539	34	17	103	15.24	14.94
Tunisia	9,662	1,116	57	----		60.92
Uganda	7,727		8	40	19.84	12.28
Zambia	4,009		20	6	20.68	11.78
Zimbabwe	10,903		75	----	534.54	44.48
Sub-Saharan Africa	951,930		932	48870		62.39
Other Countries						
Brazil	1,228,969	961,306	366		45.00	49.27
India	1,015,370	740,177	5112		11.28	46.72
China	3,389,098	7,671,364	2342		5.91	114.86
United Kingdom	1,202,031	2,971,840	2001		1.19	195.99
United States	15,640,707	30,750,596	4171		4.71	202.59

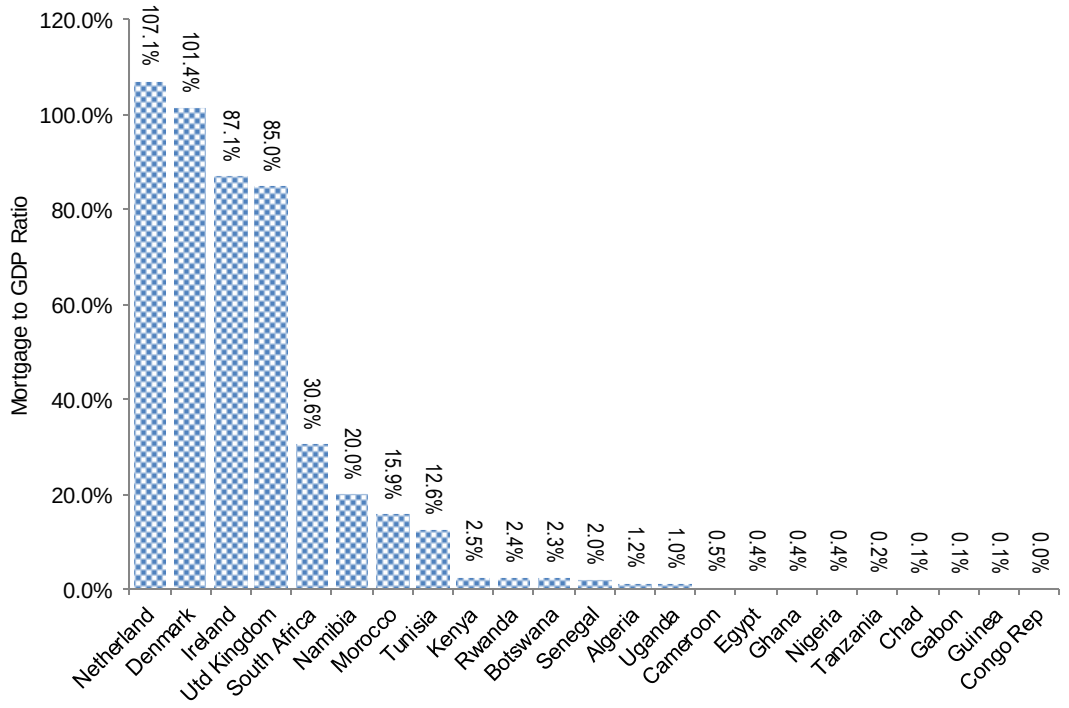
Source: World Development Indicators, Global Development Finance online database (2012), Osano (2011) and Author's calculations. MKT. CAP is Market capitalization of listed companies (current US$); TVST is Total value of stocks traded (current US$); Corp. Bonds Outst. is the amount of outstanding corporate bonds; LIR is Lending Interest Rate and DCPS is Domestic Credit to Private Sector.

WDI indicates very small markets in Table 2.2 above, only six markets recorded more than US$ 10,000 million capitalization while only three traded more than 10% of their

capitalization in 2011 compared to 137.9% for the UK, 187.6% for the US and 188.2% for China. The debt market is equally small and in most cases non-existent. There are only 10 corporate bond markets in sub-Saharan Africa in addition to Egypt, Morocco, Algeria and Tunisia but majority documented less than US$ 500 capitalization in 2009.

Clearly, African mortgage markets can hardly be large in these prevailing market conditions. As a result, African countries recorded the smallest size of mortgage markets in the world relative to their GDPs in 2010 as shown in Figure 2.2 below. As is shown, all African countries had mortgage-to-GDP ratio of below 31% and only South Africa, Namibia, Morocco and Tunisia recorded more than 10%. On the other hand, the European mortgage market was vibrant and managed to exceed their respective country's GDP in Netherland (107.1%) and Denmark (101.4%).

Figure 2.2: Mortgage to GDP Ratios in Selected Countries in 2010



Source: Rust (2012), World Bank Employees and European Mortgage Federation (2011)

2.2.1 Innovative Models of Real Estate Financing

The insufficiency of real estate finance is not exclusively an African problem; other countries addressed it by inventing ingenious models that often resulted into unlocking massive fund flows into real estate. The most outstanding of these strategies are the real estate investment trusts (REITs), securitization, national housing finance corporations and Limited Purpose Financial Entities. All these strategies are discussed in details below:

2.2.1.1 Real Estate Investment Trusts in the United States

Conceived in Boston about 1880 and considered, at the outset, as tax avoidance instruments, REITs have evolved into one of the leading machineries for mobilizing funds from small investors - normally with little knowledge of direct real estate investment but backed with a strong desire to participate in the real estate investment (Graham and Knight, 2000). The success of REITs is normally traced to the period between 1960 and 1986 when new legislations exempted them from double taxation, in the same way as close-ended mutual funds, but allowed them to issue shares hence turning REITs into outstanding and ostentatious capital marshalling instruments (Taylor and Bailey, 1963).

Currently, REITs are permitted to raise funds by either public listing or private placement. The capital raised is typically channelled into a real estate market as an equity-REIT (that holds stake in target real estate property); as a mortgage-REIT (that purchases mortgage debts from primary mortgage lenders (PMLs)) or as a hybrid-REIT (that holds equity in the assets and purchases mortgage debts from PMLs) (Graham and Knight, 2000; Hua, 2011). In principle, REITs enable real estate markets to tap into a pool of long-term funds from many small investors on equity markets in a manner similar to the way a mutual fund does. For example, in the US, equity-REITs alone marshalled roughly US$ 151.27 billion into real estate markets by 2002 from US$ 0.33 billion in 1971.

Following this remarkable success, countries like Australia, Canada, Japan, UK, UAE, Brazil, Singapore, Bulgaria, France and Germany emulated the US REITs model, successfully implemented it and the emulation resulted into mobilization of massive funds across the globe into real estate. According to Ernst and Young (2010), globally, equity-REITs had injected more than US$ 555.2 billion into real estate markets by 2009 and recorded considerable returns, incomparable to most stock market portfolios. In some countries such as Turkey, the return was as high as 151.3% per annum. Nonetheless, REITs are instruments that are meant to be easily transferable hence be traded on a stock market. Unfortunately, as discussed above, African countries are not sufficiently endowed with active and adequate stock markets; thus, the REITs approach is unlikely to salvage Africa from the challenges facing real estate financing.

2.2.1.2 Sociedad Financieras de Objecto Limitado (SOFOLs) in Mexico

Another successful housing finance model emerged in Mexico around 1993 after the North American Free Trade Agreement (NAFTA) with a key mission of granting mortgages and working capital advances to middle and lower income segments of the society (World Bank, 2009). The Sociedad Financieras de Objecto Limitado (SOFOLs) mainly targeted a clientele of Mexicans earning less than eight times the minimum wage. SOFOLs begun at a time when Mexico was facing financial turmoil and failing fiscal policy: the government had privatized eighteen commercial banks that controlled more than 70% of the banking market and immense foreign debts had triggered a hyperinflation.

In a quest to protect the economy, the government barred foreign banks from participating in privatization and effectively ejected them from the Mexican banking industry. The whole banking system crashed (this turmoil is often called the Peso crisis of 1994–1995), mortgages became too expensive, mortgage interest rates reached 74% in 1995 and the housing market almost collapsed (Haber, 2005). The SOFOLs salvaged the mortgage market by extending low cost mortgages to low income borrowers in the absence of documented income, at times. Despite the nature of its clientele, their default

rate was surprisingly less than 3.5% by 2006; they delivered over US$ 5 billion in mortgages and served more than 24% of the mortgage market.

Interestingly, their lending portfolio was funded via government loans, mortgage-backed bonds issued on domestic and international markets and through owner's savings - Mexico has a long history of self-help groups that partnered with both local and central governments and dominated the housing market since 1970's. (Haber, 2005; Papagni, 2009; World Bank, 2009). So, before being bought off by rejuvenating banks in 2006, it can be argued that SOFOLs had provided a unique model for profitable lending at a minimum risk in low-income segments. In fact, the most exceptional characteristic of the SOFOL is arguably its ability to rally massive savings from low-income earners through self-help groups and the innovative way of creating extra credit from the small deposits demanded before lending back the money to the same depositors under clear and firm rules thereby containing credit and interest rate risks.

In Africa, the Shack Dwellers Federation of Namibia (SDFN) is a leading case that is closely guided by the SOFOLs principles. Others include the Federation for the Urban Poor (FEDUP) in South Africa and Nigeria, Kenya's Muungano wa Wanavijiji, the Homeless People's Federation of Zimbabwe and Ghana, among others. Since inception in 1998, SDFN has developed a community network in excess of 700 savings groups; generally formed by low-income families; mobilized approximately N$5 million by 2008 with the support of several non-governmental organisations (NGOs) and the government's Namibia Housing Action Group (NHAG). Through the federation's fund called 'Twahangana' Fund that is under the administration of NHAG, the federation had successfully issued over 713 house loans and build more than 300 houses by 2008.

Evidently, self-help groups and federation fund are effective in mobilising low-income real estate market segment but clearly such movements take a great deal of time and financial support to deliver a significant number of houses. Furthermore, this initiative targets a specific market niche leaving out middle income segment, luxury segment and

non-residential real estate market. As such, this approach can be important but not sufficient to counteract the massive real estate needs in African countries.

2.2.1.3 National Housing Finance Systems

The immense urbanization of developing countries during the 1970s and 1980s exerted pressure on the existing residential real estate stocks, sparking off proliferation of squatter camps and slums, that demonstrated a failed housing policy (Jaycox, 1977). The World Bank, International Finance Corporation (IFC) and other donors took an intermediary approach to the weak housing finance systems in developing countries by advocating for the formation of national housing finance corporations and then facilitated them to raise capital from developed countries (Pugh, 1992). Most countries such as India, Ghana, Pakistan, Kenya and Sri Lanka, started primary mortgage lenders (PMLs) and secondary mortgage lenders (SMLs) as national housing finance corporations primarily financed through governments grants, equity issues, bond issues and other long-term loans from international finance corporations.

Of these, the Housing Development Finance Corporation (HDFC) of India is an exceptional housing finance corporation. Its financial power and customer base have maintained a persistent growth because of good management and product innovations such as securitization and internet-based loan approval. In fact, HDFC is tantamount to the Indian real estate market because it was the only resort, in 1990s, when the government forbade state banks from mortgage lending. Initially, HDFC started off as a private institution, wholly funded by donor's loans but subsequent capital needs necessitated that HDFC be listed, thereby becoming a public company. By 2005, HDFC had a portfolio of $3.1 billion in outstanding mortgages and single-handedly commanded a mortgage market share of 28% (World Bank, 2009).

In spite of African countries' struggle to equip and motivate better performance of their housing finance corporations, dismal growths of African real estate markets indicate that the housing finance corporations are still inadequate. Without donors support, the

housing corporations cannot raise any additional capital locally because the capital markets, in most African countries, are still small or non-existing.

2.2.1.4 Securitization in the United States

This is an innovative process that started in the US in 1970, aimed at transforming illiquid, long-term financial claims of financial institutions in the forms of residential mortgages, commercial mortgages, auto loans or credit-card advances into marketable securities either as mortgage-backed securities (MBO), asset-backed securities (ABS) or collaterized mortgage obligations (CMO) (Greenbaum and Thakor, 1987). Private and public conduits or special purpose vehicles (SPV) such as Government National Mortgage Association (GNMA or 'Ginnie Mae'), Federal National Mortgage Association (Fannie Mae) and Federal Home Loan Mortgage Corporation or 'Freddie Mac' often pooled the said assets from originators, mostly primary mortgage lenders, at a price while offering no recourse in case of default from borrowers.

Despite such interesting assurance to the originators, it is common for the conduit to give a third party surety to the buyers of the repackaged instruments. Far from the criticism on account of the recent subprime lending crisis in the US, securitization is an effective credit enhancement mechanism that multiplies liquidity and the lending capacity of banks. In addition, recent empirical studies suggest that securitization also lowers the cost of funding real estates through cash flow stripping and tranching, removes secondary security rating from the originator's risks, eliminates exposure of the bank to interest rate risk caused by maturity mismatch and reduces agency costs by narrowing the mortgage nominal and effective yield spreads (Hess and Smith, 1988; Liu and Skully, 2005; Schwarcz, 1994).

Although initial studies portrayed securitized real estate markets across countries as being integrated and therefore likely to cause contagion of shocks, a more recent study by Liow and Webb (2009) did not find common market factors and correlations that are indicative of integration. They used maximum likelihood factor analysis to extract canonical

correlations between factors in markets of the US, UK, Hong Kong and Singapore, this markets constitute 74% of the securitized real estate markets globally.

All the same, this approach is unlikely to succeed and stimulate real estate markets in Africa because securitization can only suffice in the presence of well-developed and active bond and equity markets. Lack of these markets in most African countries is a critical impediment to tapping into world's excess funds in the same way as other countries have done.

2.2.2 The Alternative Approach for Africa

The discussions above indicate that inability of African capital markets to marshal high real estate investments is caused by low levels of domestic savings. Although African countries can simply duplicate models that were effective elsewhere, the size of domestic savings and the absence or inefficiency of capital markets cannot sustain such models. Therefore, to achieve a quicker growth of real estate finance, African countries need to focus on mobilizing foreign savings that can augment real estate finance in less developed capital markets.

Odhiambo (2005) and Śliwiński (2009) provide evidence that corroborates the fact that foreign savings inflows into African countries have the potential to complement domestic savings in supporting domestic investments. Therefore, to address the problem of low investments in developing countries, it is imperative that African governments address the problem of low savings. In this quest, African countries can consider the financial liberalization theory which provides a framework that addresses low investments and low savings situations, common in developing economies with small and inefficient capital markets, through alleviation of barriers to foreign capital flows.

2.3 Financial Liberalization Theory

Both Edward Shaw and Ronald McKinnon considered financial repression policies to be responsible for low savings, low investments and credit rationing that were rampant in developing countries in 1960s and 1970s. They proposed the removal of interest rate ceilings, reduction of reserve requirements and abolishment of credit rationing to achieve

a higher equilibrium real interest rate, inspire savings and credit supply which would induce higher volumes and efficiencies of investments (McKinnon, 1973; Shaw, 1973).

The overwhelming empirical support and the influence of Bretton Woods in the 1980s and 1990s saw most African countries join with other developing economies in implementing far-reaching capital account liberalization reforms. For instance, most countries eliminated government interventions in the markets, liberated capital movements, initiated capital markets and fostered free competition among banks (Adjasi and Biekpe, 2006; Andrianaivo and Yartey, 2010; Ruwo and Makarudze, 2010). Champions of capital account liberalization regularly cite the allocative efficiency of the international capital markets in moving savings from countries with abundant capital to countries with paucity of financial resources (Fry, 1997; Obstfeld, 2009).

These authors generally agree that capital account openness increases market size, liquidity and volatility of stock markets (Arestis and Demetriades, 1997; Korap, 2010). Although this debate on whether to open the capital account or not is still raging on, studies such as Chinn and Ito (2008) refute this hypothesis and challenge proponents to produce empirical evidence. But evidence in support of liberalization has long been established, especially where empirical studies are guided by sound methodological approaches. For instance, Levine and Zervos (1998) and Obstfeld (2009) document a significant effect of liberalization on savings and investments. They affirm that discordant results are products of false methodology, weak assumptions, wrong variable proxies or estimations.

Therefore, the benefits of capital account liberalization to African countries cannot be overstated because such strategic action can provide a significant avenue out of suboptimal savings and hence relieves investment funding constraints.

2.3.1 Determinants of International Capital Flows in Africa

A main concern of policy-makers in African countries is whether international capital flows are sustainable in the long-run to warrant a specific policy agenda. Although theory suggests that financial liberalization is vital to eliciting international capital inflow, a

clear understanding of causes and determinants of capital inflows to developing countries is a noteworthy endeavour towards understanding their sustainability. Even though some authors adopt a classification of causes into country-specific or external factors, an individualistic approach is more appropriate when seeking a deeper insight into causes of capital inflows.

First of all, countries with highly developed financial markets tend to be more appealing to cross-border flows than ones with underdeveloped markets; indeed, Deléchat *et al.*, (2010) found deep and well-functioning foreign exchange, money, equity and derivative markets to be critical to attracting FDIs and FPIs in Africa. Equally, Giovanni (2005) used the gravity model, a popular empirical framework in trade studies, to illustrate a significant positive association between mergers and acquisitions (M&A) with the stock market capitalization and credit to private sector. Similarly, Younas (2011) utilized a *de facto*[3] measure of openness while IMF (2007) used a *de jure*[4] measure of financial openness to demonstrate that financial openness, also a component of financial liberalization, inevitably influences international capital flows into a country. It is therefore, apparent, that developed financial markets are key determinant of foreign capital flows into a country.

Furthermore, from the hypothesised nexus between law origin and finance, a stream of studies emerged in the late 1990s testifying to the fact that strong and developed legal and regulatory systems, that protect creditors and minority shareholders' rights, promote comprehensive and meaningful financial reporting and effectively enforce contracts, can determine the ability of domestic firms to access foreign capital (Levine, 1999; Ojah *et al.*, 2010; Pistor *et al.*, 2000; Porta *et al.*, 1997). In more specific terms, strong corporate governance structures in a country are likely to enhance private information gathering,

[3] According to Chinn and Ito (2008), *De facto* measures of financial openness are indices constructed using quantity or price differentials such as the uncovered or real interest rate parity. Alternatively, a quantity-based index can be computed as volume of a country's foreign assets minus foreign liabilities expressed as a percentage of the country's GDP.

[4] *De jure* measures are based on the IMF's Annual Report on Exchange Arrangements and Exchange Restriction (AREAER).

confidence in financial data and increase markets' informativeness which tend to attract foreign capital flows (Armstrong *et al.,* 2012; Johnson *et al.,* 2000; Klapper and Love, 2004). In summary, these authors support strong legal, regulatory and corporate governance systems as a way of encouraging foreign investors.

Other scholars submit that substantial international capital inflows are influenced by variations in interest rates because investors hunt for greater returns, which are frequently better predicted by interest rates differentials[5] (IRD). For example, Montiel and Reinhart (1999) found foreign interest rates in the US and Japan to significantly guide the volume and the composition of portfolio flows into Latin American countries, from this observation, they suggest that a short term capital flow sterilization[6] can be an efficient strategy for enhancing capital flows. Building on Montiel and Reinhart's (1999) findings, Herrera and Valdés (2001) used an optimal rule in a dynamic optimization model to point out the limit at which interest (yield) rate differentials prompt capital flows into Chile. In their model, interest rate is first treated as an exogenous factor so that the foreign exchange rate effects can be controlled. However, when this assumption is dropped, international financial arbitrage seems to eliminate non-zero returns and IRD appears to predict exchange rate movement indicative of significant influences on cross-border capital flows.

Another determinant of foreign capital flows is economic growth. According to Schertler and Tykvová (2012), most studies on economic growth and cross-border capital flows focus on understanding the effects of foreign capital flows on economic growth without giving attention to the co-integration or reverse causality. Schertler and Tykvová show that a high expectation of economic growth is associated with increased inflows of cross-

[5] Interest rate differential (IRD) measures the spread in the yield rate between two different interest-bearing instruments. In this study, Herrera and Valdés (2001) measured IRD as the difference between domestic and international yields, both denominated in the same currency to elimininate the effect of exchange rate.

[6] This is an open-market central bank's intervention tactic where government bonds are deliberately sold at high interest rates to increase capital inflows, inflation or real exchange rate.

border venture capital via expected return differentials or deal-flow and value-adding considerations.

In fact, the role of heterogeneous expectations or market beliefs in shaping investors' decisions is a strong foundation on which many financial theories and analysis are hinged; therefore, an abrupt favourable change can spark massive market shocks such as significant foreign capital flows (Kurz *et al.*, 2005). In another study, Tomura (2010) argues that in the case of uncertainty of high income growth period, an increase in international capital flows is important in attenuating and calming interest rate fluctuations by absorbing the domestic credit shortages. In other words, positive economic growth, or simply, an expectation of income growth can encourage foreign capital inflows as investors position themselves to reap from anticipated growth in consumption.

In another different way of establishing drivers of international capital flows, Brana and Lahet (2010) started by first categorizing the factors as external factors ('push' factors) or as country-specific factors ('pull' factors). They used sovereign rating to measure the composite country's level of economic fundamentals while excess global liquidity and carry-trade strategies and contagion[7] factors[8] were 'push' factor. In estimation, they used the feasible generalised least square (FGLS) method which is also called Parks-Kmenta and ordinary least square with panel-corrected standard errors (PCSE) models that enable estimation despite one period lag autocorrelation and heteroscedasticity within panel and

[7] The word 'contagion' originates from the field of medicine where it means transmission of a disease or pathogen by either direct or indirect contact via a medium. In finance and in this text, contagion denotes channels that transmit significant economic shocks, changes, crises or disturbances from one country to another.

[8] The contagion factors include monsoon effects, spillover effects and shift contagion factors. Basically, 'monsoon effect' is a common external disturbance or shock that affects all countries at almost the same time, for instance, a change in the US interest rates and oil prices. It takes the Monsoon winds analogue as they sweep through Asian countries, affecting their climatic conditions at once. The 'spillover effects' are the usual commercial and financial interlink channels of transmission of positive external shocks or crisis while the 'pure or shift contagion' are changes in investors' behaviors, ceteris paribus. A change in homogeneous preferences of a universal set of investors may transmit shocks from an economy into its neighboring countries.

cross-sectional series. A major finding of this study was that excess global liquidity in OECD countries is a significant cause of portfolio flows.

This seemingly supports early empirical investigations that regarded 'push' factors, for example, a decrease in global interest rates, conditions of the global capital markets and recession in industrial countries, to be more significant determinants in developing countries than 'pull factors' (Calvo *et al.*, 1993; Fernandez-Arias, 1996; Yoonbai, 2000). In short, we can state that over-accommodating monetary policies in developed economies can cause excess liquidity which triggers asset bubbles and instabilities that initiate a worldwide inflation, capital flows and financial crisis. According to Brana *et al.*, (2012), global liquidity escalated drastically in 2000-2007 despite the subprime lending crisis and liquidity shortage in the US financial institutions. At this time, the net private capital flows to developing economies also intensified from US$ 280 billion in 2003 to US$ 1,200 billion in 2007, suggesting a close link between global liquidity and cross-border flows.

The last determinant considered here sprouts from a common hypothesis in finance: that investors are generally rational such that extra risk should be rewarded by a reasonable risk premium. Basically, this assumption suggests a strong correlation between risk premium and risk appetite (Kanlı, 2008). In this sense, a growth in risk appetite implies that investors generally feel over-compensated at a given level of risk which may cause them to take on more risky assets and eventually increase their exposure (Baek, 2006).

Although the concept of 'risk appetite' has received little attention in empirical research, policy makers often cite it as a 'pure or shift contagion factor' that does not rely on shared fundamentals or commercial arrangements. According to Kumar and Persaud (2002), a shift in risk appetite might lead to contagion through the international portfolio capitals flows where a series of shocks in one country could lead to investors questioning their 'bounded rationality'[9] and thus cause massive divestment from risky markets.

[9] Bounded rationality means a common paradigm held by investors which fashions their view of a particular country or region (Kumar and Persaud, 2002). For example, safeness of US assets was brought into question during the financial crisis, which perhaps explains why most capital flew to other regions and

In summary, the determinants reviewed above show that international capital flows into Africa can get better with time. Positive and significant relationships were established between international capital flows and financial market development, legal institutional strengths, economic growth and per capita growth. These factors are currently considered as the leading pillars in most African states' development agendas and have consistently shown improvement. Other variables such as IRD, return differentials and global liquidity are monetary policy instruments which can be varied accordingly through setting of interest rates. Therefore, a strong long-term policy on international capital flows aimed at increasing the level of domestic investment is plausible.

2.4 Nature and Size of Foreign Investments in Africa

Historically, Africa has never been a leading recipient of international investments. Immediately after independence in 1960s, most states in Africa pursued import-substitution industrialisation policies by way of imposing trade restrictions and capital controls to protect their young domestic industries and conserve foreign reserves. This approach ended up impeding foreign investment inflows into Africa (Dupasquier and Osakwe, 2006).

Generally, the environment was unattractive to foreign investors and a deeply-rooted skeptism against foreign investments prevailed. These were caused by the ideological differences, colonial experiences and post-independence trauma of exploitation (Dupasquier and Osakwe, 2006; Moss *et al.,* 2004). However, on undertaking financial liberalization, later in their history, most countries started experiencing high capital flows from 1980s into 2000s (Gohou and Soumaré, 2012).

According to World Bank's World Development Indicators (WDI), FDI flows to Africa, increased from 2004 when they dramatically shot up from US$ 15.6 billion in 2004 to US$ 29.5 billion in 2005 (a 89.4% spurt). Although African inflows formed only 2.55% of global flows in 2007, according to Table 2.3, the nominal value was literally exploding: from US$ 18.2 billion in 2003 to record a total of US$ 52.4 billion in 2006

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not to the US, Canada and UK because they were viewed as sharing governance structures of their credit markets.

then to the highest ever of US$ 61.0 billion in 2007, before tumbling to US$ 51.3 billion in 2009.

Table 2.3: Net FDI flows into Selected African Countries (millions of US$)

Country Name	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Algeria	634	882	1,156	1,841	1,687	2,639	2,747	2,300	2,571	1,500	1,689
Angola	3,505	1,449	-1,304	-38	-893	1,679	2,205	-3,227	-3,024	-6,898	-7,120
Botswana	771	748	279	487	495	521	129	136	1,093	147	189
Cameroon	336	86	244	59	189	21	743	536	652	526	325
Chad	713	467	-99	-278	-322	466	376	313	282	343	538
Congo, Rep.	323	-9	801	1,488	2,638	2,526	1,862	2,211	3,056	2,758	2,038
Cote d'Ivoire	165	283	349	351	443	466	396	358	302	322	371
Egypt	237	1,253	5,376	10,043	11,578	9,495	6,712	6,386	-483	2,798	4,192
Eq. Guinea	690	341	769	470	1,243	-794	1,636	2,734	1,975	2,015	1,914
Ethiopia	465	545	265	545	222	109	221	288	627	279	953
Gabon	158	320	326	268	269	773	573	499	696	696	856
Ghana	137	139	145	636	1,383	2,715	2,373	2,527	3,222	3,295	3,227
Guinea	79	98	105	125	386	382	141	101	956	605	135
Mauritania	102	392	814	155	139	343	-3	131	589	1,386	1,126
Mauritius	63	14	42	107	341	378	257	430	433	589	259
Morocco	2,313	787	1,671	2,461	2,826	2,466	1,970	1,241	2,521	2,842	3,361
Mozambique	337	245	122	185	417	559	899	1,258	3,645	5,635	6,697
Namibia	33	88	393	610	670	750	497	767	744	1,098	904
Niger	15	26	50	40	99	282	631	796	1,061	836	631
Nigeria	2,005	1,874	4,983	4,854	6,035	8,197	8,555	6,049	8,842	7,101	5,609
South Africa	783	701	6,522	623	6,587	9,885	7,624	3,693	4,139	4,626	8,233
Sudan	1,349	1,511	1,562	1,842	1,504	1,653	1,726	2,064	2,314	2,208	1,688
Tanzania	364	227	936	403	582	1,383	953	1,840	1,229	1,800	1,872
Africa	**18,219**	**15,564**	**29,479**	**36,141**	**52,484**	**61,048**	**51,324**	**45,403**	**48,093**	**50,066**	**48,977**
Africa/World	**3.20%**	**2.17%**	**2.17%**	**1.72%**	**1.74%**	**2.55%**	**3.86%**	**2.36%**	**2.17%**	**2.73%**	**2.22%**

Source: World Development Indicators (2015). FDI stands for foreign direct investment.

On the other hand, foreign portfolio flows, particularly, equity portfolio investment (EPI) flows into Africa are erratic and inconsistent. For example, in Table 2.4 below, EPI dropped suddenly from US$ 6.9 billion in 2007 to US$ -6.2 billion in 2008 indicating that most investors pulled back from African portfolios. It recovered suddenly to US$ 11.1 billion in 2003, representing a massive growth of 278.5%.

Later on, EPI made another gain of 61.1% in 2010 to reach US$ 17.8 billion before recording a massive drop of 75.7% in 2011 to reach US$ 4.3 billion. Although fluctuations around 2007 to 2010 can be construed to be instigated by the 2007 financial crisis, EPI flows into Africa remained unstable past 2011, a period beyond the financial crisis. In 2012, EPI rose from a low of US$ 4.3 billion in 2011 to a high of US$ 8.8 billion in 2012 then dropped suddenly by 79.6% to record a paltry US$ 1.8 billion in 2013.

Table 2.4: Net EPI flows in Selected African Countries (millions of US$)

Country Name	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Botswana	10	1	27	36	9	-37	18	11	-17	-9	2
Burkina Faso	2	4	-4	1	-1	-2	0	3	---	---	---
Cameroon	0	-8	-4	-6	-14	-1	0	0	0	0	0
Cote d'Ivoire	16	-5	14	2	2	2	2	2	---	---	---
Egypt	37	26	729	502	-3,199	-674	393	1,724	-711	-983	-431
Kenya	1	3	3	2	0	5	3	22	20	26	260
Mali	1	-1	9	3	-6	-3	-3	1	2	-4	-1
Mauritius	8	19	36	35	50	34	206	7,821	5,916	522	706
Morocco	8	597	64	-298	-64	148	-4	132	166	-108	43
Namibia	4	5	5	5	5	4	4	4	4	4	12
Nigeria	---	---	751	1,769	1,447	-954	487	2,161	2,571	10,003	---
South Africa	685	6,661	7,230	14,959	8,670	-4,707	9,364	5,826	-3,769	-679	1,011
Togo	10	15	16	10	6	1	2	5	0	---	---
Tunisia	14	24	12	65	30	-39	-89	-26	-44	-15	80
Uganda	0	24	---	19	-23	13	131	-70	106	14	95
Zambia	2	0	5	2	4	-6	-13	101	25	-7	5
Africa	**804**	**7,341**	**8,967**	**17,079**	**6,933**	**-6,190**	**11,054**	**17,810**	**4,331**	**8,794**	**1,792**
Africa/World	**0.19%**	**1.44%**	**0.98%**	**1.85%**	**0.84%**	**3.45%**	**1.28%**	**2.19%**	**1.50%**	**1.09%**	**0.24%**

Source: World Development Indicators series (2015). EPI stands for equity portfolio investment.

On the other hand, only a few countries receive bond portfolio investment (BPI) flows in Africa. South Africa, leads in the magnitude and consistency, most likely as a result of the strong bond market, but other countries seem to record huge fluctuations. According to Table 2.5, Tunisia and Morocco are also favourite destinations of debt investments although persistent negative net flows suggest a reversal of such flows in some of the periods.

Table 2.5: Net BPI flows in Selected African Countries (millions of US$)

Country Name	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Egypt, Arab Rep.	0	-100	1,250	0	643	0	0	1,500	-383	0	3,100
Gabon	0	0	0	0	1,000	0	0	-23	0	-4	843
Ghana	-250	0	0	0	750	0	0	0	0	0	781
Morocco	416	-40	-41	0	0	-589	0	1,327	0	1,500	750
Seychelles	0	0	0	200	105	-2	0	0	0	0	0
South Africa	635	359	-1,091	486	6,795	-2,401	1,913	2,301	7,248	2,261	2,924
Tanzania	0	0	0	0	0	0	0	0	0	0	600
Tunisia	632	282	113	-50	5	0	-313	0	-814	648	-218

Source: World Development Indicators (2015)

Surprisingly, remittances from the Diaspora became the highest capital flow into Africa between 2004 and 2005 after reaching US$ 19.7 billion and US$ 31.4 billion, respectively, against the traditionally high FDIs that only recorded US$ 15.6 billion and US$ 29.5 billion, respectively. FPIs only managed US$ 509.3 million and US$ 911.4 million in EPI. Remittances surpassed FDI, once more, in 2010, 2011 and 2012, coincidentally constituting the highest African proportion of any individual global capital inflow in any given year; documenting 11.76%, 11.33% and 11.84%% for 2010, 2011 and 2012, respectively. During these three years, remittances also surpassed other inflows in most countries such as Morocco and Egypt, among others.

These figures show that remittances are emerging as a major source of foreign capital to most African countries and may be replacing other flows, such as FDI as a leading driver of investments in African countries. More interestingly is the fact that unlike other flows, remittances to Africa was not shaken during and after the financial crisis of 2007; in fact, it remained above the pre-crisis flow of 2006 and even recovered its steady upward trajectory as early as by 2010. This suggests that remittances are more reliable, resilient to global shocks and can effectively provide an alternative source of long-term finances.

Table 2.6: Remittances Received in Selected African Countries (millions of US$)

Country Name	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Algeria	1,750	2,460	170	189	99	104	150	197	203	215	210
Botswana	39	92	118	104	92	47	15	22	20	18	36
Cabo Verde	109	113	137	137	139	155	137	131	177	178	176
Cameroon	76	103	77	130	167	162	184	115	219	210	244
Egypt, Arab Rep.	2,961	3,341	5,017	5,330	7,656	8,694	7,150	12,453	14,324	19,236	17,833
Ghana	65	82	99	105	117	126	114	136	152	138	119
Kenya	538	620	425	570	645	667	631	686	934	1,211	1,304
Lesotho	557	627	599	614	638	576	548	610	649	554	462
Madagascar	16	12	115	175	301	375	338	547	398	397	427
Mali	154	155	177	212	344	431	454	473	784	827	895
Morocco	3,614	4,221	4,589	5,451	6,730	6,894	6,269	6,423	7,256	6,508	6,882
South Africa	434	523	614	692	792	784	862	1,070	1,158	1,085	971
Sudan	1,224	1,403	704	801	1,000	1,591	1,394	1,100	442	401	424
Tunisia	1,250	1,431	1,393	1,510	1,716	1,977	1,964	2,063	2,004	2,266	2,291
Africa	**15,821**	**19,759**	**31,355**	**35,872**	**42,112**	**46,214**	**42,795**	**50,472**	**54,378**	**57,789**	**34,449**
Africa/World	**7.62%**	**8.25%**	**11.91%**	**11.73%**	**11.45%**	**10.98%**	**10.74%**	**11.76%**	**11.33%**	**11.84%**	**7.18%**
World	**207,587**	**239,620**	**263,248**	**305,772**	**367,698**	**420,846**	**398,555**	**429,001**	**480,092**	**488,130**	**479,585**

Source: World Development Indicators (2015)

2.5 International Capital Flow and Real Estate Markets

The significant amounts of international capital flows received in Africa suggest that an impact on economic sectors and markets is very likely; after all, investments are often done in economic sectors or specific markets. Exploratory studies and the World Bank household surveys disclose that real estate markets are the major recipients of the cross-border flows into Africa (Adams and Cuecuecha, 2010; Osili, 2004; World Bank, 2011c) and these capital inflows end up stimulating growth via amplification of demand and/or supply of real estate.

Although some studies uphold the existence of a strong relationship between foreign capital flows and real estate markets, little has been done to show whether the association is unmitigated or mitigated and how it transpires in Africa. However, as with any other market, empirical studies anticipate that cross-border flows would influence real estate markets either directly or indirectly through TFP, spillover effects, competitiveness, poverty reduction, attenuation of capital cost, financial market expansions and the

diminution of credit repressions. Some of these avenues through which real estate market may be affected are discussed below.

2.5.1 Direct Investment

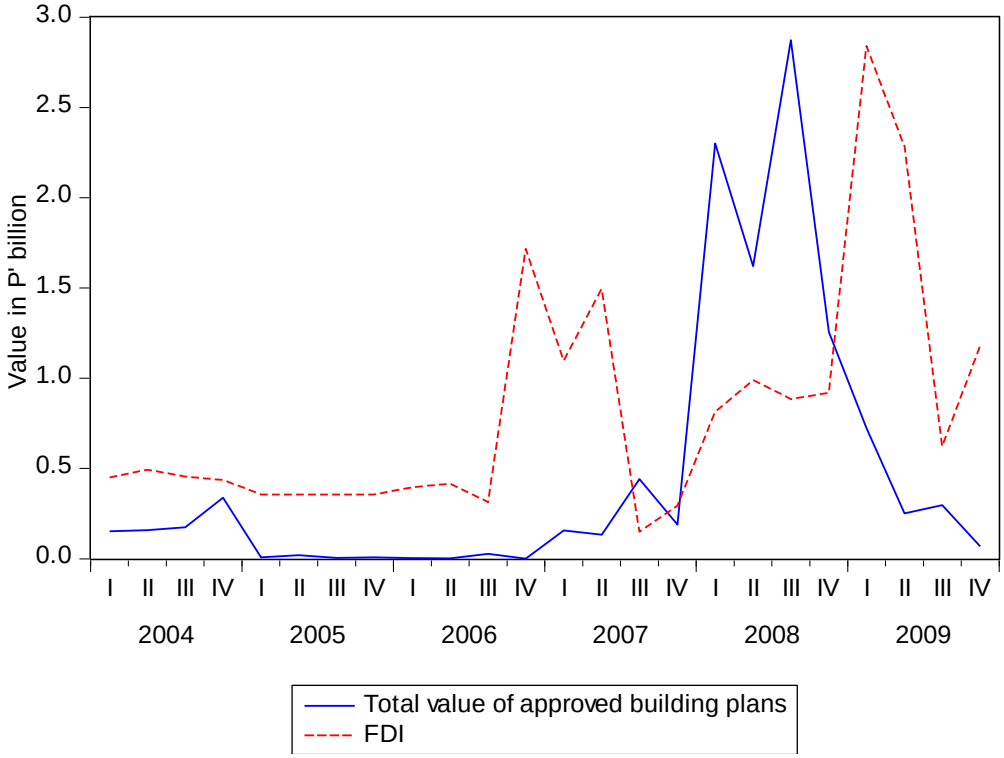
Ostensibly, cross-border capital flows into African economies end up in specific sectors or markets. For instance, remittances are predominantly postulated as informal credits used to fund housing amongst financial resource-constraint countries with sub-optimal savings like most African countries. It is not seen as a mere altruistic income; it is instead presented as a flow that is guided by the relativity of the rate of return (Quinn, 2005; Stark and Lucas, 1988). Recent studies by Osili (2004) in Nigeria, De Haas (2006) in Morocco and Obeng-Odoom (2010) in Ghana show plainly how the Diaspora has fuelled housing development through sending money directly for construction of houses.

The World Bank's household surveys of Kenya, Senegal, Nigeria, Uganda and Burkina Faso also disclose that Diaspora invests nearly 50% of its remittances straight into real estate markets (World Bank (2011b). Therefore, remittance is not just a transitory income to households, but a fungible income, akin to employment income, and has a significant impact on housing investments. This relationship is seemingly a direct driver of the supply side of the market, although the use of remittances for acquisition of completed units cannot be ruled out.

In the same way, Stephens (2003) and Ross (2011) observe that FDIs are increasingly flowing into real estate markets around the globe and trace the growth to the globalization and convergence theories. However, reliable data on foreign ownership of real estate companies is hard to come by in Africa, but growths in real estate sector output immediately after increases in FDI inflows can infer such connection. This is much evident in the case of Botswana where the Central Statistics Office provides a time series data on the value of real estate investments and FDI which seem to have a similarly or closely related trend. According to Figure 2.3, investments into the real estate market of Botswana seem to increase with a similar rate of increase in FDI in the previous five to

two quarters; in fact, the line graph for FDI will almost match the shape of the real estate investments graph when the investments graph is lagged for five quarters.

Figure 2.3: Value of real estate investments and FDI in Botswana



Source: World Development Indicators (2013) and Central Bureau Office of Botswana. FDI stands for foreign direct investment and P' denotes the Botswana Pula.

2.5. 2 Total Factor Productivity and Spill-over Effects

Away from the direct flow into a real estate market, foreign capital flow into the economy is found to improve service delivery systems and management agility which cause higher total factor productivity (TFP), not only in the recipient sector but in other sectors as well – through the process of spillover – and, eventually cause growth in several markets. In this domain of research, Kose *et al.*, (2009) used a dynamic panel regression framework at a macro-economic level to illustrate how FDI and equity portfolio flows amplify the TFP, At the sectorial level, Fernandes and Paunov (2012) used residuals of the Cobb-Douglas production function to account for TFP in service

sectors and by the aid of the Hick-Neural methodology found FDIs to significantly affect TFPs of service firms which eventually spills over to the manufacturing sector.

However, an effective causation level of TFP on market growth can be attained better in the presence of spillovers. The work of Waldkirch and Ofosu (2010) affirms this assertion because they found foreign firm presence to positively stimulate TFP of foreign-owned firms only because of the rigidity of Ghanian labour market that hampers spillover of TFP. In this study, they engaged both General Method of Moments (GMM) and OLS estimation techniques and controlled for heterogeneity on various dimensions.

Still, literature posit that FDI is a substantial conduit of modern technology, knowledge and management skills to developing countries. Labour mobility and linkages between Multi-National Companies (MNC) and domestic firms initiate spillovers that improve domestic firms' productivities, competitiveness and performances. Kemeny (2010) found evidence of significant international technological transfers through demonstration effects, labour mobilities and buyer-supplier networks with (MNC) among 36 African countries. In another study, Bwalya (2006) found significant inter-industry expertise spillover effects, competition effects and demonstration effects in Zambian firms using three-year, firm level data from 1993-1995.

Evidently, foreign ownership in real estate markets will increase TFPs which would in turn spill over to other real estate firms through competition or demonstration effects whereas foreign capital flows into other sectors would cause positive growth of real estate markets through spillovers of expertise and technologies through labour attrition.

2.5. 3 Trade, Competitiveness and Income

Caves (1974) posits that foreign capital flows have three conjectural but non-trivial benefits to domestic firms: they improve allocative efficiency since MNCs increase competition in the host-country; they induce technical efficiency since MNCs will demand higher technical efficiencies of domestic firms it interacts with as competitors, suppliers or buyers; and lastly, MNCs enable faster dissemination of technology,

innovation, non-proprietary discoveries, licensing patents and know-hows to domestic firms.

Tekin's work (2012) seems to support Caves' observations by performing a Granger causality analysis of FDI and real export in African countries. He found causality from FDI to real export in Benin, Chad, Mauritania, Niger, and Togo. If FDIs influence trade and competitiveness positively, then real estate markets can benefit indirectly as an investment destination for the enhanced trade income and wages.

Using a three-sector general equilibrium model in a small open dual economy, Chaudhuri and Banerjee (2010) show that where the unemployment of skilled and unskilled workforce prevailed, FDI flows into the agricultural sector and significantly diminish unemployment and improve welfare. This study, together with another research by Fortanier and van Wijk (2010) that found a positive impact of foreign firms in hotel and tourism industry in Mozambique, Tanzania and Ethiopia on employment creation and skills development, reveal that FDI can increase the household incomes through employment creation.

2.5.4 Market Efficiency, Liquidity and Cost of Capital

There seems to be a solid consensus that FPIs are not entirely beneficial to an asset market because they are prone to information problems and are highly reversible. Key adherents of this school of thought are Calvo and Mendoza (2000) who argued strongly that internationalization of portfolios promote contagion because it weakens the efficacy of costly information gathering and instead encourages imitation and mimicking of arbitrary market portfolios.

Such investors' conducts are typical aspects of rational herding[10] behaviour that causes investors to commit systematic errors every time they construct a portfolio; and

[10] Rational herding can be defined as a situation of an asset market where behavioural patterns of investors are highly correlated such that investors decide to mimic and imitate portfolio choices of key investors instead of expending money to gather information and make their own judgment. According to Devenow and Welch (1996), rational herding leads to market-wide erroneous decision-making and can cause bubbles, sun-spot's equilibriums and frenzies, amongst other problems.

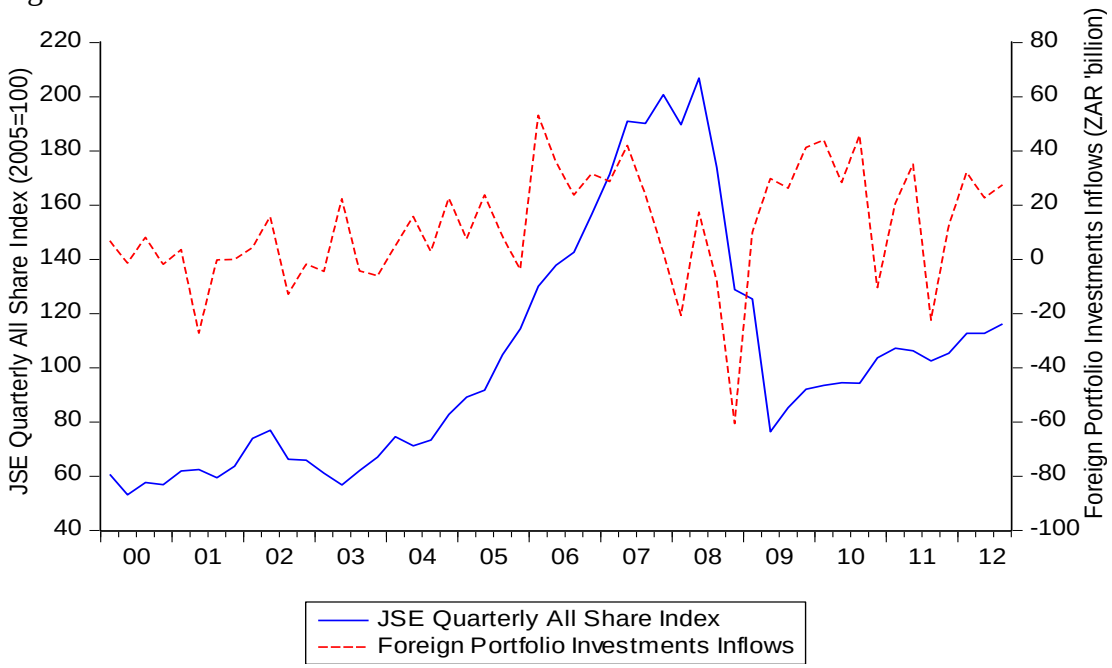
persistence of herding can eventually destroy the efficiency of a market (Devenow and Welch, 1996). On this account, scholars such as Sula and Willett (2009) warn that reversibility during normal and crises periods can be extremely disastrous in a small market hence FPIs should not be encouraged for such a market.

However, Bekaert and Harvey (2000) strongly differ with the above assertion; instead, they argue that increased foreign participation in an asset market enhances efficiency because speculation improves the information and allocative roles of markets. They postulate that foreign participation can address acute price manipulation, illiquidity and high cost of equity capital. This proposition is based on a supposition that the cost of equity in an integrated market depends on the covariance with world market returns and not the local market volatility and since LDC are less responsive to shocks from developed economies, such covariance would be very low.

In situation that such assumption prevails, one would expect the cost of capital to be lower in integrated African markets. However, in the absence of an empirical study about Africa, one cannot be confident to argue that foreign participation in stock markets reduces cost of equity. Either way, the Johannesburg Stock Exchange (JSE) in South Africa, which is undoubtedly the largest and perhaps most globally integrated equity market on the continent seems to move in tandem with the change in the level of foreign portfolio investments that flows into the country.

According to data from the South African Reserve Bank, intensification of FPIs from 2003 appear to have resembled upward surge in the JSE index around the same period until a similar fall from about 2007 till 2009. Although the direction of causality cannot be inferred directly, the nature of the co-movements is much more suggestive in Figure 2.4.

Figure 2.4: FPI and All Share Index in South Africa from 2000 to 2012



Source: World Development Indicators (2013) and South African Reserve Bank. FPI denotes foreign portfolio investment, JSE stands for Johannesburg Stock Exchange and ZAR stands for South African Rand

2.5.5 Financial Development and Alleviation of Credit Constraints

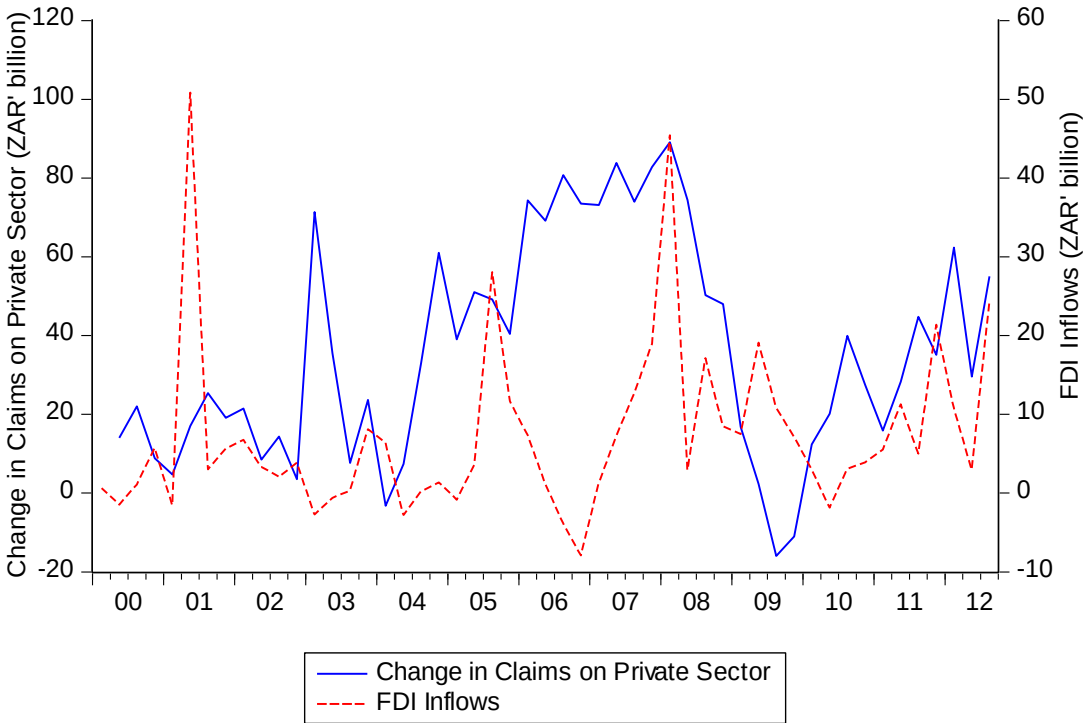
According to studies on financial development, international capital flows are likely to stimulate the growth of real estate markets by strengthening and widening the credit and equity markets. In most countries, remittances seem to have a significant positive effect on the level of deposits, the relative size of bank credit, money stocks, *de jure* financial openness, number of bank branches, number of bank accounts and stock market capitalization (Aggarwal *et al.*, 2011; Beine *et al.*, 2012; Billmeier and Massa, 2009; Chowdhury, 2011; Demirgüç-Kunt *et al.*, 2011).

In a comprehensive study of 36 African countries, Nyamongo *et al.*, (2012) used the OLS and the two-stage least square methods (2SLS) with lags as instrumental variables to explain the relationship between remittances, credit to private sector and broad money supply between 1980 and 2009. The findings revealed significant positive associations between remittances in African countries and the two proxies of financial development. Intuitively, growth in the financial development indicators immediately after an increase in remittances could mean that remittances may have increased the deposit base that

financial institutions utilize to create much more credit for investments into various markets.

Xu and Chen (2012) demonstrate this assumption by modelling real estate prices against money supply, credit policy and level of credit and found that real estate markets respond positively and significantly when financial development variables improved. Such direct impact of the level of credit may also be interpreted to signify lessening of credit constraints in an economy. The extensive empirical work of Harrison and McMillan (2003) and Harrison *et al.*, (2004), using augmented Euler equations and modified Tobin-q investment models, substantiate the view that FDIs also lessen financial constraints significantly at firm and national levels in Africa. According to Harrison and McMillan's work, the impact of FDIs on financial constraint was much greater in countries with more imperfect capital markets.

Figure 2.5: FDI and Claims on Private Sector of South Africa from 2000 to 2012



Source: South African Reserve Bank. FDI stands for foreign direct investment while ZAR stands for South African Rand

If this argument and statistical findings hold in the majority of African countries and not just in the sampled countries, then we would expect FDI inflows to be much related to the changes in the claims to private sector. This can be viewed, for example, through a graphical depiction of both FDI and change in the commercial bank's credit to private sector as presented in Figure 2.5 above for South Africa. Clearly, the two variables seem to portray a related pattern but between 2005 and 2008; a period that is historically known to reflect the financial crisis; the co-movement between them appeared to be distorted and unclear.

2.6 The Role of Financial Markets

The above expositions of the possible ways through which foreign capital inflows would affect a real estate market can be classified as either directly, as a component of primary capital utilised in a construction project or indirectly through TFP, spillover effects, trade, income, market efficiency, financial institutions liquidity or development, among other avenues. Whereas the direct channel is relatively clear, a disturbing question emerges about what would be the necessary conditions for significant effects on a real estate market through the indirect means?

Theoretically, well-functioning financial markets are a prerequisite to attracting foreign capital flows (Deléchat *et al.,* 2010; Giovanni, 2005) . The whys and wherefores are that credit and equity markets are not only necessary to facilitate flow of cross-border finance from one country to another but also indispensable means through which positive externalities of TFP and spillover effects can be realized. According to McKinnon (1973) financial markets are 'necessary and sufficient' condition to nurture the "adoption of best-practices, technologies and learning by doing." For that reason, financial markets are often referred to as part of the domestic 'absorptive capacity' necessary for positive externalities.

Empirical studies, centred on the effect of foreign capital inflows on economic growth, have since demonstrated that the above assumption is true, even for Africa (Alfaro *et al.,* 2004; Giuliano and Ruiz-Arranz, 2009; Nyamongo *et al.,* 2012). Apparently, foreign capital inflows may bring with it a bundle of advantages to the domestic economy, but

local conditions (absorptive capacity), such as the level of financial market development, can limit the possible positive externalities for the host country. Essentially, effective financial markets reduce the hurdles faced by local firms to imitate the new technologies and efficiencies of multi-national corporations (MNC), (Azman-Saini *et al.*, 2010a). In other words, financial market's capability to provide capital, either as credit or equity, is important for positive indirect effects of foreign capital inflows.

In the face of financing spillover effects, if the arguments in section 2.5.5 are to go by, foreign capital inflows also helps to expand the size and liquidity of domestic financial markets, thereby alleviating credit constraints of domestic investors and firms. In the finance literature, equity and credit markets are the known major conduits that intermediate funds flow from capital holders to borrowers. In support of these insights, empirical studies, suggest a strong positive association between domestic financial markets and the cross-border capital flows.

For example, Levine and Zervos (1998) engaged an international capital asset pricing model (ICAPM) and an international arbitrage pricing model (IAPM) to demonstrate that stock market size, liquidity, and volatility increases immensely after capital account liberalization, whereas, the credit market depth and stock market capitalizations exhibited a positive relationship with remittances, FDIs and FPIs in separate studies (Aggarwal *et al.*, 2011; Billmeier and Massa, 2009).

Therefore, the role of financial markets in actualizing indirect effects is by no means trivial. Whether it is financing the spillover-generated demand for credit or the ordinary demand for credit, financial markets help to direct foreign financial resources to more than one market, beyond the recipient sector. Thus, in the presence of effective financial markets, foreign capital inflows into African countries, irrespective of the recipient sector, can have positive externalities on real estate investments. This is to say that the credit markets and the equity markets form important indirect channels or conduits through which foreign capital inflows would exert favourable externalities on a real estate market.

But, African capital markets are small and one of the least efficient markets on account of their low liquidity, high transaction costs, low listing, and information asymmetry, all of which cast doubt on their adequacy to facilitate cross-border flows (Hearn *et al.*, 2010; Misati and Nyamongo, 2011). In most African countries, bank credit may be available but a vibrant corporate bond or equity markets exist in just a handful of countries, such as South Africa, Egypt, Morocco, Nigeria, Ghana, Kenya and Algeria (Ojah and Kodongo, 2014).

According to Table 2.2 on page 21 and the preceding review, Africa has only 14 corporate bond markets and 19 stock markets out of 54 states. This indicates that the majority of African countries have neither a corporate bond nor a stock exchange market. This complicates the understanding of the role of financial markets in the flow of foreign capital, given the few and thin equity and credit markets in Africa.

Under the backdrop of underdeveloped capital markets, one is left to wonder what channels do foreign capital inflows into Africa use to stimulate and/or support the real estate investments. Are some financial markets more important to a particular flow than the other markets? It is therefore important that an examination of significant indirect channels is explored for the disparate foreign capital inflow to African countries.

2.7 Prior Empirical Evidence

Although ascertaining the precise amount of international capital that streams into African real estate markets is almost impracticable, it is not impossible to establish the nature and size of the effects that such flows impose on the real estate markets. In fact, many investigations have already proceeded along this line of investigation in other regions especially after the 2007 financial crisis in the US. Whereas, one would argue that these studies were basically reactive, meant to comprehend the origin of the 2006 consumption boom and asset price bubbles, the novelty of the findings to understanding the link between real estate markets and capital flows, cannot be disregarded.

In a nutshell, most authors revealed that the global savings glut triggered off massive capital flows into countries experiencing current account deficits in anticipation of better

returns, but in its place, the huge flows and increased liquidity set financial institutions into a lending spree, mostly at sub-prime rates. One such study is the work of Agnello and Schuknecht (2011) who sampled eighteen developed economies over 1980-2007 and used a multinomial probit model and another study by In't Veld *et al.*, (2011) applied dynamic stochastic general equilibrium (DSGE) to model the friction between the US and the rest of the world so as to understand the boom-bust cycle. Surprisingly, both authors found international capital flows to be a significant explanatory variable, though, not origin of the booms in the real estate markets.

These studies sought to describe economic behaviours from a macroeconomic point of view by using growth or production models but did not focus specifically on the real estate markets or the international capital flows. As a result of this omission, foreign capital flows were measured by weak proxies, such as international liquidity or savings glut; hence their results cannot serve as an appropriate analysis of the international capital flows and real estate market relationships.

Jinjarak and Sheffrin (2011), using the recursive structural equation models of US-Western region and England national market, examined causality between current account deficits and real estate prices. They found a causality path from current account deficits to real estate prices and mortgage interest rates. They interpreted the direct causality as displaying how capital flows drive real estate prices but interpreted the impact on mortgage interest rates as pointing towards credit markets as an indirect channel that capital flows use to affect the real estate markets. In fact, this study uses totals of current account deficits with insufficient control variables because the theoretical context was a graph theory, unrelated to real estate markets.

Guo and Huang (2010) used high frequency data from January 1997 to October 2008 to unravel the fluctuations of 'hot money' and expose their impacts on real estate prices of China. 'Hot money' was strictly defined as (foreign exchange reserves) minus (trade and services balance) minus (foreign direct investment), which closely resembles foreign portfolio investments. They formulated a seven factor multivariate vector autoregressive

(VAR) model encompassing housing price, 'hot money,' stock price index, disposable income, short term interest rate, price-to-earnings ratio and housing completion as the key variables.

They found housing prices and housing completion, which proxied housing sale, to respond strongly and significantly to perturbations in 'hot money' supply, but a simulation of the results showed the response to be a short-lived two months reaction before converging back to the baseline within a year. Although these results gave significant insight into how the FPI can impact real estate markets, Guo and Huang (2010) aggreed that they used multivariate VAR to avoid a reliance on any theory but cautioned that interpretation of the results should only be in qualitative terms. Definitely, an omitted variable bias was committed but the strength of VAR do not lie in the reliance on theory rather it lies in the ability to expose multiple causality relationships (Sims, 1980).

Another interesting study by Aizenman and Jinjarak (2009), where they analysed the effects of current account deficits on real estate prices of 43 countries, specified a 'fixed effect' dynamic panel regression and pooled OLS models, and estimated them using GMM and OLS methods, respectively. In the models, they controlled for annual urban population growth, annual real GDP per capita growth, GDP deflator inflation rate, GDP-deflated domestic credit to proxy for financial depth, and the international country risk guide (ICRG) score to proxy quality of institutions. The results were interesting; real estate price appreciations were strong, positive and significantly associated with the first three lags of current account deficits and seemed to persist in statistical significance for five years.

However, both the financial depth and the lagged institutional strength were insignificant, but when interacted with lagged current account deficit variables, they seemed to increase the effect of current account deficits on real estate prices. This remarkable study clearly demonstrated the impact of international capital flows on real estate markets and the role played by the credit market but failed to segregate the capital flows. Furthermore, the

only African country included was South Africa which may not be a sufficient representative of African real estate markets and foreign capital flows into Africa because it has the most developed markets and receives among the highest inflows into Africa.

Taking everything into account, few studies appear to comprehensively analyse constituents of international capital flows in relation to the real estate markets. For some reasons, most studies either used aggregates or concentrated on only one type of the international flows. In addition, few attempts have been made to study African real estate markets and how they respond to each one of the foreign capital flows, yet, as shown in Figures 2.6 to 2.9 below, the movements in the key real estate market variables and international capital flows appear to be congruent in several African countries.

In Figure 2.6, for example, house prices in Morocco seem to mimic the changes in the remittance all through the covered period while the Egyptian construction permit index in Figure 2.7, appears to rise and fall in unison with FDI but the construction index seems to delay for about four to five quarters. Similarly, fixed investment in the Kenyan real estate appears to trend in tandem with the amount of remittance from diaspora, as shown in figure 2.8, whereas figure 2.9 unravels a relationship between value of building plans completed and FDI in Namibia that is very close in resemblance.

Figure 2.6: Remittance and price in Morocco

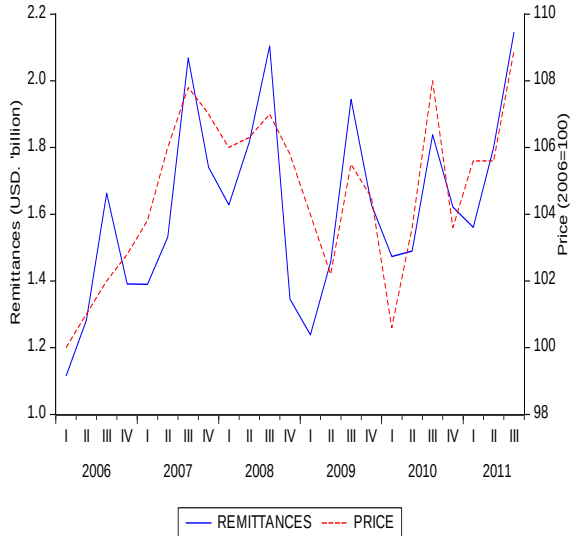


Figure 2.7 Construction index and FDI in Egypt

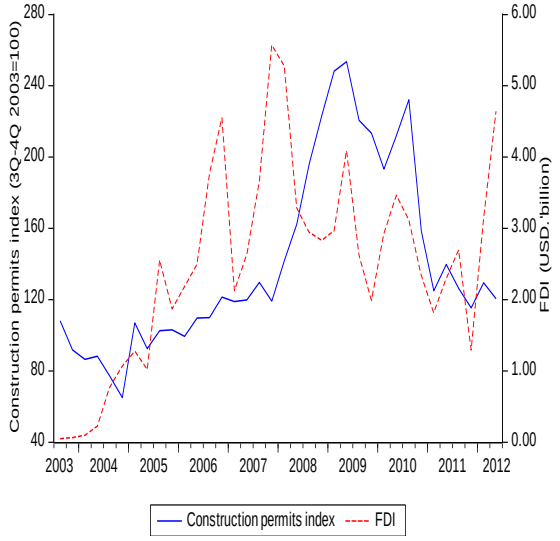


Figure 2.8: Remittance and investment in Kenya

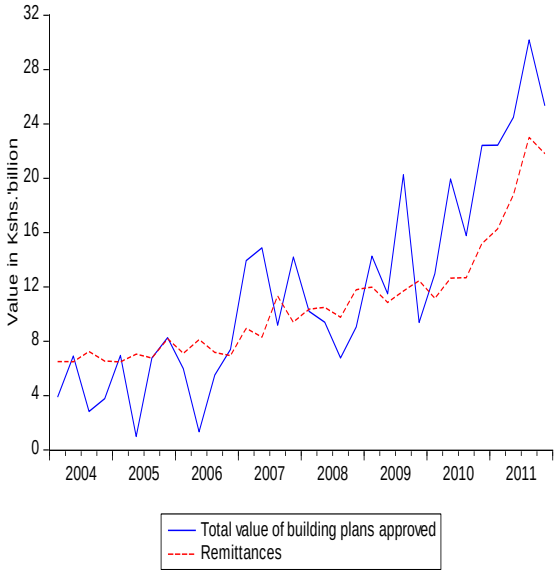
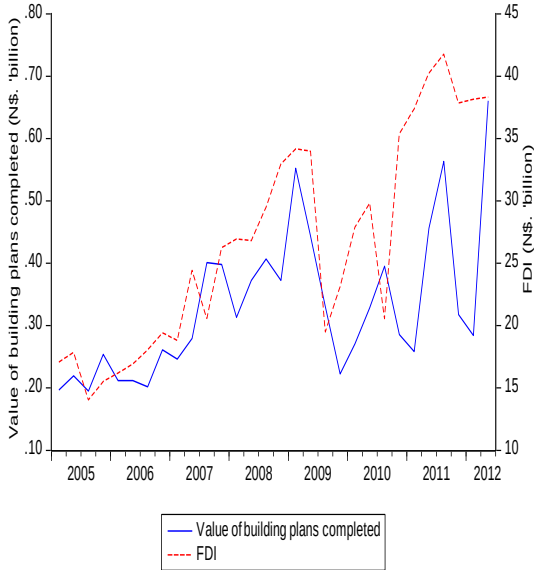


Figure 2.9: Building plans and FDI in Namibia



Sources: Euromoney Institutional Investor (EII) databank, Central Bank of Kenya, Bank of Namibia, Central Statistical Agency of Namibia

2.8 The Way Forward

The literature and descriptive statistics deliberated upon in this chapter paint a picture of an imperfect market where supply responds sluggishly to a building demand for all types of real estates in Africa. The unprecedented slum-dwellings and proliferation of squalid

living conditions coupled with government pronouncements about housing backlogs and deficits indicate a strong need to stir up the market. In addition, statistics on economic growth, urban population growth, among others, point to an enormous prospective demand in the near future; yet long-term real estate finances are not sufficiently forthcoming.

The lack of satisfactory savings has completely handicapped domestic credit and equity markets' capacity to provide sufficient long-term finance at a low cost for the noble purposes of funding constructions and purchases of real estates. Further, only a few countries have promising bond and equity markets, which are necessary for capital funding necessary for playing meaningfully in effective real estate markets.

Clearly, African countries cannot bank on domestic savings alone for salvation; instead, they should inspire and marshal foreign savings to complement the sub-optimal domestic savings. Fortunately, WDIs confirm that foreign capital flows into African countries have been expanding persistently and surprisingly against the backdrop of small and inefficient bond and credit markets characterized by high transaction costs. These call for a detailed understanding of whether foreign capital flows can foster growth of real estate markets in Africa, followed by an exposé of the channels used by foreign capital to impact the real estate markets.

This study seeks to fill these identified two main gaps by empirically analysing the effect of international capital flows on the growth of the real estate markets and the roles of credit and equity markets as conduits through which the said foreign capital inflows affect real estate markets in Botswana, Kenya, Morocco, Namibia, and South Africa.

CHAPTER THREE

THE RESEARCH PHILOSOPHY, STRUCTURAL MODELS AND THEIR ESTIMATION

3.1 Introduction

In this chapter, the underpinning research paradigm, justifications that support the choice of the paradigm, alongside structural and empirical models, are presented. The research paradigm indicates assumptions underlying the pursuit of reality as adopted in this study; the structural model provides a theoretical foundation on which all tests in the study are based. The tests in this chapter address the first research question of this study, which seeks to establish the effects of foreign capital inflows on real estate markets. This question has been addressed in two chapters.

In this chapter, we concentrate on tests of associations meant to reveal the nature and magnitude of the relations between international capital flows and real estate investments in selected African countries. In the next chapter, a more focused analysis is carried out on country-by-country basis to establish direction of existing causalities. The chapter starts with a discussion on the research paradigm, followed by construction of empirical estimation models and the last part focuses on the design and implementation of empirical tests and discussion of attendant results.

3.2 Research Philosophy and Design

The term 'paradigm' was adopted by Thomas Kuhn in his book *'The Structure of Scientific Revolutions'* to mean accepted examples of scientific practices or traditions that provide models from which a particular coherent tradition of scientific research is founded (see Kuhn (1970b), Kuhn (1970a) and Kuhn (1974)). According to Kuhn, both qualitative and quantitative methods of research are grounded in a research paradigm that upholds unique assumptions about the social world, the conduct of science and, above all, on what constitutes legitimate social challenges, remedies and criteria of proof.

This view has resulted into a spirited debate between advocates of both quantitative and qualitative research, giving rise to strong adherents, commonly referred to as 'purists[11]' on both sides (Johnson and Onwuegbuzie, 2004). Accordingly, qualitative purists (also called 'constructivists' and 'interpretivists' contend that multiple-constructed realities exist and that research is value-bound such that distinguishing between cause and effect is impossible and unnecessary. To them, constructivism, idealism, relativism, humanism, hermeneutics, and postmodernism are superior ways of seeking reality (Firestone, 1987; Johnson and Onwuegbuzie, 2004).

On the contrary, quantitative purists believe that reality, or justified true belief, should be pursued in an objective manner. Their assumptions on research are consistent with what is popularly referred to as positivist research philosophy. According to Schrag (1992), the positivist paradigm is defined as objectionable in the way it conceptualizes 'treatments' as causes, in simplistic ways of accounting for rich and unpredictable complexity of human interactions. This is achieved by using few isolable variables; in the way of utilizing 'instrumental reasoning'; such that the usefulness of the 'treatment' or cause lies in its consequences or effects; and whether the state of affairs is desirable or not.

Positivist philosophy assumes that reality is objective; that is, it is formed by time, and makes content-free generalizations, separate from human beliefs, and therefore, beliefs about the world cannot be justified by reason or metaphysics alone, instead science should be 'value-free'; that is, free from non-experientially proven beliefs (Ryan *et al.*, 2002). Therefore, a positivist's search for understanding reality is a process characterized by constructing amicable and economic theories that seek to explain the causes of changes in social facts by objectively and quantitatively measuring and statistically validating the theories using well-designed, replicable tests without interference or dilution of the reality by the researcher (Firestone, 1987; Ryan *et al.*, 2002).

[11] Each group of quantitative and qualitative research paradigm advocates appear to push for incompatibility of their paradigm together with the associated methods with the alternative philosophy. They insist that accommodation between paradigms is impossible. However, recent writers consistently argue that research paradigms should be visualized as a continuum with the two rivalling philosophies, one at each end. They insist that a mix between the two could form what is now called mixed method research paradigm.

To this end, positivists hold that objective and value-free scientific theories can be assessed by reference to empirical evidence and the researcher has no role within the phenomenon they study and that this can yield true explanatory and predictive knowledge of the reality (Ardalan, 2003).

According to Bettner *et al.*, (1994) most mainstream academic studies in finance, especially on capital market research, are firmly entrenched in specific positivist's characteristics. The first of these characteristics relates to the ontological premise of financial studies. In most of the studies, there is an assumption that a cause-effect mechanism underlies all nature and individual's activities. The second characteristic that emerges from their epistemological premise that knowledge acquisition is made possible through an understanding of a set of nomological connections between the initial state of equilibrium and final state of equilibrium.

Thirdly, financial studies assume that the human nature is defined by the interactions between humans themselves and with the society. Finally, these studies often assume that information on natural as well as on human activities can be accumulated by observations and measurements without the influence of individual's perception; this is why it is often referred to as 'value-free' science.

This study hypothesizes that there is a causal relationship between foreign capital inflows and real estate markets, which is subjected to rigorous scientific tests to examine the existing reality. In this regard and consistent with related studies in the field of finance, the philosophical premise upon which this scientific inquiry is based should be regarded as a positivist paradigm.

Since its emergence from microeconomics, the field of financial economics which is popularly and currently referred to as 'Finance' has been predominantly guided by theories located within the bounds of the positivist paradigm (Ardalan, 2003; Findlay and Williams, 1980; Findlay and Williams, 1985; Ryan *et al.*, 2002). Therefore, this study, which utilizes the quantitative approach to test the hypothesized causal relationships

between international capital flows and the real estate markets, is located within the realm of the positivist paradigm.

Similarly, the underlying epistemological assumption is that an understanding of the above causal relationships can be obtained by studying changes in the flow of international capital flows and the real estate markets. Such information can be measured objectively, without subjective interruptions from the researcher. Moreover, causal relationships between the flows and the real estate markets can be revealed by subjecting the collected data and information to rigorous empirical modelling, analysis and testing. This is purely a positivist philosophy.

3.3 Modelling Investments in a Liberalized Economy

One of the major purposes of this study is to explain the effect of foreign capital inflows, namely, foreign direct investments, foreign portfolio investments and remittances on the growth of real estate markets in Africa. The empirical models and tests adopted in this study are developed along the McKinnon's *complementarity hypothesis* and the Shaw's *debt intermediation view*, for financially repressed economies, developed by McKinnon (1973) and Shaw (1973), respectively.

Prior to McKinnon's (1973) and Shaw's (1973) frameworks, much of the empirical investment models were mainly based on the neoclassical theory of investment behaviours and other frameworks put forward by authors such as Tobin (1969), Jorgenson and Siebert (1968), Grunfeld (1958), Kuh (1963) and Koyck (1954), among others.

A major part of these theories, however, adopt the 'flexible accelerator mechanism' but only differ on the specifications of the 'replacement capital model' and desired level of capital (see Jorgenson (1963) for a detailed comparison), and therefore, they provide frameworks for explaining a change and not the gross investments. Equally, the Tobin-q model, developed by Tobin (1969) and extended by Hayashi (1982), is still widely used but because it needs market valuation of the firms and an assumption of efficient stock markets, its applicability in examining investments in emerging markets is doubtful.

According to McKinnon and Shaw, an economy is repressed when savings rate, interest rate, credit and mobility of capital are controlled. McKinnon's view is that a repressed economy has fragmented capital markets, self-financed households, imperfectly-financed corporate sector, resulting in misleading or distorted rates of return on financial assets and extremely limited opportunities of financing enterprises from external resources. He believes that liberalizing capital markets enables enterprises to supplement individual capital endowments with resources from outside the enterprise and this in turn encourages entrepreneurs to invest in ventures with high productivity. In other words, money and investment are complementary of each other.

McKinnon is of the view that it is an increase in the real deposit rate that stimulates investment and encourages efficient capital allocation. On the other hand, Shaw believes that investment is a decreasing function of real interest rate. Therefore, Shaw posits that it is high interest rates that attract savings which increase the supply of credit. Essentially, financial intermediation promotes investment because entrepreneurs are able to borrow and invest in the most productive ventures. Therefore, raising funds externally as debt is important for investment and growth. Based on the McKinnon's *complementarity hypothesis* and the Shaw's *debt intermediation view*, Kapur (1992) and Mathieson (1980) developed very impressive formal empirical models.

These models allow financial liberalization to affect the volume of output, which extend into the open economy, where foreign capital inflows are unrestricted by including exchange rates. However, they do not permit the effect of foreign capital inflows to be explicitly examined. On the contrary, recent studies have focused on financial constraints and the role of foreign capital inflows, such as Laeven (2003), Love (2003) and Harrison *et al.,* (2004) who modified the Euler Investment Model (EIM) by Abel (1980) and extended by Bond and Meghir (1994) to incorporate foreign capital inflows.

The Euler investment model describes an optimal investment path for a firm using first order conditions to eliminate the shadow value of capital. Accordingly, the strengths of the EIM over the Tobin-q are that it avoids the use of market valuations and relaxes the

assumption of linear homogeneity, and does not require parameterization of expectations formation process (Laeven, 2003). That having been said, to examine the relationships between foreign capital inflows and real estate investments, we use an empirical model similar to the EIM by Bond and Meghir (1994) modelled along the financial liberalization propositions of McKinnon and Shaw to allow foreign capital inflows. This is achieved by explicitly introducing a credit constraint in the EIM in the same way as Love (2003) and Harrison *et al.,* (2004).

Although the inclusion of the credit constraints does not provide any additional information, it allowed us to model investments in a realistic financial environment, similar to African economies. The difference with Love (2003) and Harrison *et al.,* (2004) models however, is that instead of looking for empirical proxies for the credit constraint as done by Love (2003) and Harrison (*et al.,* 2004) so as to introduce foreign capital inflows, we bring in foreign capital inflows by incorporating the foreign sector as a source of funding the domestic investments in economic sectors. This approach is more realistic than the path followed by Love (2003) and Harrison *et al.,* (2004), and it is easy to conceptualize when modelling a sector rather than a firm. This framework is explained in more detail in the next section.

3.3.1 The Structural Investment Model

To model investment decisions in an African real estate market, we first hypothesize a closed economy with several productive sectors including a real estate sector[12] whose outputs are buildings used for residential purposes or commerce. Now, we assume that the overall objective of the real estate sector is to maximize the present value of future net cash flows (also called dividends) subject to available capital stocks and credit

[12] Our assumption that the economic agent is a sector that is slightly different from the assumption that the decision-making unit is a firm, as used by Bond and Meghir (1994). These assumptions are essentially the same since a sector implies a collection of all firms in the market. In other words, we assume that all firms in the real estate sector have similar objectives and are affected by financial markets in a similar manner. It is necessary to use a sector rather than a firm since the objectives of this study focus on the real estate market and the foreign capital inflows. A sector represents a market better in an economic modeling sense than the way a firm does. In addition, we allow foreign inflows in the later stage of this model to interact with the real estate market by simply incorporating the foreign sector, but using the firm would make this development hard to conceptualize.

(borrowing constraints). The real estate sector is constrained financially; it relies on borrowings and retained earnings as the only source of long-term funds, therefore, it has to generate positive revenues and, as with a firm, it accrues costs that are contingent mostly on the volume of output[13] and financial costs.

Suppose at time t an amount B_t is loaned to the sector from financial markets at a gross interest rate i_t. At the same time, suppose the sector utilizes its capital stock of K_t and other production inputs L_t priced at w_t to construct I_t value of buildings costing p_t^I per unit and selling at p_t per unit (assume it is a sector average price). If the output of the sector is $F_t = F(K_t, L_t)$ and the adjustment cost function[14] is $G_t = G(K_t, L_t)$, the sector's optimization problem becomes:

$$\max E_t \left[\sum_{j=0}^{\infty} \beta_{t+j}^t R(K_{t+j}, L_{t+j}, I_{t+j}) \right], \tag{1}$$

subject to:

$$K_t = (1-\delta)K_{t-1} + I_t \tag{2.1}$$

$$B_t \leq B_t^* \tag{2.2}$$

$$B_t \geq 0 \tag{2.3}$$

$$R_t = p_t F(K_t, L_t) - p_t G(K_t, I_t) - w_t L_t - p_t^I I_t - i_t B_{t-1} + B_t - (1-\pi_{t-1})B_{t-1} \tag{2.4}$$

$$R_t \geq 0 \tag{2.5}$$

Where E_t is the expectations operator, t is the time subscript, R is the sector's net cash flows and β_{t+j}^t is the nominal discounting factor given by $\prod_{s=1}^{j}(1+\mathit{r}_{t+s-1})^{-1}$, for $j \geq 1$ and $\beta_t^t = 1$, where r is the average required rate of return (IRR) of the sector. In addition, δ is the capital stock depreciation rate, B_t^* is the loan ceiling and π is the inflation rate. Note that constraints 2.2 and 2.3 describe the financial constraint of the

[13] Since we assume that the sector is a real estate market, the unit of output is generally the number of buildings completed.

[14] According to Bond and Meghir (1994), the adjustment cost function is a symmetric function linearly homogenous in investment and capital, while the output function is a constant return production function.

sector and is shown in the investment decision as either a non-negative constraint in the constraint 2.3 (see Campbell (2010)) or as credit capacity limit in the constraint 2.2 (see Harrison and McMillan (2003)). Therefore, constraints 2.2, 2.3 and 2.4 capture the interactions between the real estate sector and the other sectors of the economy by incorporating loan ceiling, inflation rate and the interest rate.

To allow for imperfect competition, we allow the price of output p_t, to depend on the level of output (see Bond and Meghir (1994)). Even so, if we permit η_t to denote the Lagrangian multiplier for the non-negative dividends constraint in equation (2.5), γ_t to be the shadow value (Lagrangian multiplier) for credit limit constraint in equation (2.2) and φ_t to stand for the multiplier of the constraint on the continuous reliance on debt as expressed in equation (2.3), the first order conditions can be obtained (detailed listing of all first order conditions and the value functions are presented under appendix 1) as:

$$\frac{\partial V_t}{\partial I_t} = (1 + \eta_t)\frac{\partial R_t}{\partial I_t} + \lambda_t = 0 \tag{3.1}$$

$$\frac{\partial V_t}{\partial K_t} = (1 + \eta_t)\frac{\partial R_t}{\partial K_t} + \beta_{t+1}^{t}\frac{\partial R_{t+1}}{\partial K_t} - \lambda_t = 0 \tag{3.2}$$

$$\frac{\partial V_t}{\partial K_{t-1}} = \lambda_t(1-\delta) = 0 \tag{3.3a}$$

Where V_t denotes the value function in the optimization language, equation 3.1 is the shadow value of investment and therefore equation 3.3 is the shadow value of capital. We rearrange equation (3.2) to obtain the capital accumulation multiplier λ_t, then we can remove this unknown multiplier from equation (3.3a). Similarly, we can plug equation (3.1a) into equation (3.3a) and obtain the Euler equation characterizing the optimal path of investment as:

$$\frac{\partial V_t}{\partial K_{t-1}} = (1-\delta)(1 + \eta_t)\frac{\partial R_t}{\partial K_t} + (1-\delta)\beta_{t+1}^{t}\frac{\partial R_{t+1}}{\partial K_t} = 0 \tag{3.3b}$$

and the first order condition for investment as:

$$(1-\delta)(1+\ \eta_t)\frac{\partial R_t}{\partial I_t}+\frac{\partial V_t}{\partial K_{t-1}}=0 \qquad (3.4)$$

Several approaches can be used at this point to obtain the empirical investment models. For instance, we can follow Abel and Blanchard (1986), solve forward the stochastic difference equation (3.3b) but this would mean that we estimate $\frac{\partial V_t}{\partial K_{t-1}}$ using marginal revenue product of capital forecasts and additional assumptions on expectations formation. Alternatively, Bond and Meghir (1994) suggest that one could just eliminate $\frac{\partial V_t}{\partial K_{t-1}}$ by combining equation (3.3b) and (3.4)[15] to obtain the Euler's equation for the sector's optimal path of investment in terms of observables (a detailed derivation is provided in the appendix 1) as:

$$\left(\frac{\partial R}{\partial I}\right)_t+\left(\frac{\partial R}{\partial K}\right)_t=(1-\delta)(1-(\gamma_t-\varphi_t)\beta_{t+j}^{t}E_t\left[\left(\frac{\partial R}{\partial I}\right)_{t+1}\left(\frac{1+\eta_{t+1}}{1+\eta_t}\right)\right] \qquad (4)$$

The envelop equation[16] states that the present value of the marginal adjustment cost of investing tomorrow (right hand-side) is equivalent to the current marginal cost of investment net of the marginal revenue product of capital (MRPC)[17] today (left hand-side). Note that $\left(\frac{\partial R}{\partial K}\right)_t$ denotes the current MRPC, and therefore, $\left(\frac{\partial R}{\partial I}\right)_t$ signifies the current marginal cost of investment.

The equation (4) can be subjected to empirical estimations by making little adjustments to the expectation and introducing an error term, however, if the objective is to understand the investment behaviours, then several developments can be undertaken from here to introduce the desired variables. For example, Love (2003) and Harrison *et al.*,

[15] For more about optimization, read on the mathematical methods called the envelope theorem.

[16] The intuition in the envelop equation rests on the assumption that investment becomes productive immediately, and therefore, the current cost is equivalent to the discounted future costs. In other words, postponing the investment decision involves no future loss in output.

[17] Marginal revenue product of capital is defined here as additional benefit in terms of total cash flows (which is similar to total revenues in an ordinary microeconomic theory of production) resulting from a unit change in capital input.

(2004) model credit constraints by combining $(1+\eta_{t+1})/1+\eta_t$ to form a combined relative shadow cost of debt and proceed to model it in a way to introduce a combined debt and dividend constraint which they describe as a credit constraint.

But, suppose $\vartheta_t = (1+\eta_{t+1})/1+\eta_t$ and $\Omega_t = 1-(\gamma_t-\varphi_t)\vartheta_t$ then equation (4) can collapse to:

$$\left(\frac{\partial R}{\partial I}\right)_t + \left(\frac{\partial R}{\partial K}\right)_t = (1-\delta)\Omega_t \beta_{t+j}^t E_t\left[\left(\frac{\partial R}{\partial I}\right)_{t+1}\right] \qquad (4')$$

Now, recall equation (2.4). Based on the equation for the net cash flows R_t, we could obtain the first order conditions with respect to I_t and K_t and plug them into equation $(4')$ above. But first, we need to adopt a function for the adjustment cost. According to Bond and Meghir (1994), a variant of an adjustment cost function that can be described as linearly homogeneous in terms of investment and capital, can be expressed as:

$$G(K_t, I_t) = \frac{1}{2} b K_t \left[\left(\frac{I_t}{K_t}\right) - c\right]^2 \qquad (5)$$

According to Bond and Meghir, if $F(K_t, L_t)$ is a constant returns to scale Cobb-Douglas production function and if we can allow for imperfect competition[18] by allowing price of output p_t to depend on output, with price elasticity of $\epsilon > 1$, we can then denote the net output as $Q_t = F(K_t, L_t) - G(K_t, I_t)$ and $\alpha = 1 - 1/\epsilon$, and the first order conditions of equation (2.4) can then be specified as:

$$\left(\frac{\partial R}{\partial I}\right)_t = -b\alpha p_t \left(\frac{I}{K}\right)_t + bc\alpha p_t - p_t^I \qquad (6.1)$$

$$\left(\frac{\partial R}{\partial K}\right)_t = \alpha p_t \left(\frac{Q}{K}\right)_t - \alpha p_t \left(\frac{\partial F}{\partial L}\frac{L}{K}\right)_t + b\alpha p_t \left(\frac{I}{K}\right)_t^2 - bc\alpha p_t \left(\frac{I}{K}\right)_t \qquad (6.2)$$

[18] This implies a monopolistic competition where a market is characterized by many producers highly differentiated by quality and branding of their products (heterogeneous product), no entry and exit costs, and non-price competition (price takers). If so, demand is highly elastic such that a small price change is followed by a greater demand change, hence $1 < \epsilon > \infty$.

If we assume that the expectations are realized with an error term (orthogonal to the information set available at the time of making investment decisions), then equation (6.1) and (6.2) can be plugged into equation $(4')$ to form:

$$\left(\frac{I}{K}\right)_{t+1} = \theta_0 + \theta_1\left(\frac{I}{K}\right)_t - \theta_2\left(\frac{I}{K}\right)_t^2 + \theta_3\left(\frac{Q}{K}\right)_t - \theta_4\left(\frac{CF}{K}\right)_t + \theta_5 J_t + \varepsilon_{t+1} \quad (7)$$

Where, $CF = (p_t Q_t - w_t L_t)$ and denotes the cash flows, $\theta_0 = c(1-\phi_{t+1})$, $\theta_1 = \phi_{t+1}(c+1)$, $\theta_2 = \phi_{t+1}$, $\theta_3 = \frac{\phi_{t+1}}{b(\epsilon-1)}$, $\theta_4 = \frac{\phi_{t+1}}{b\alpha}$, $\theta_5 = \frac{\phi_{t+1}}{b\alpha}$, $\phi_{t+1} = (1-\delta)\Omega_t\beta_{t+j}^t(\frac{p_{t+1}}{p_t})$, $J_t = \frac{p_t^I(1-p_{t+1}^I(1-\delta)\Omega_t\beta_{t+j}^t)}{p_{t+1}}$ is equivalent to the user-cost of capital. This model shows that expected future investment, in this case, real estate investment, is positively associated with current investment, current user cost and net output-capital ratio because of expectations and delivery lag (Campbell, 2010; Mohapatra and Ratha, 2011). However, internal cash flows and the squared current investment are negatively related to the future investment because of the negative effect of high internal cash flows on expected future net marginal costs (Harrison and McMillan, 2003).

3.3.2 The External Sector

Nevertheless, equation (7) above assumes that investments in the sector are financed by domestic savings alone; as a result, in the absence of government sector and taxes, the value of investments in the equation (7) will be equivalent to the amount of the domestic savings in the national income account. Conversely, in an open economy where the capital account has been liberalized, investments would generally be financed using both the domestic and foreign savings. Normally, in the absence of the government sector and taxes, the value of output from a given economy is equivalent to the disposable income. As such, the savings identity for an open economy, where access to and by the international capital markets is liberated, can be expressed as:

$$Y_{Dt} - C_t = INV_t + [X_t - M_t] \quad (8)$$

Where, Y_D is the disposable income, C is consumption, INV is the gross investment, X is the value of exports while M is the value of imports. Normally, $[X_t - M_t]$ represents the external sector and $Y_{Dt} - C_t \equiv$ Savings. Therefore, we can restate equation (8) as:

$$S_t = INV_t + [X_t - M_t] \tag{8'}$$

The balance of payments statement $[X_t - M_t]$ is the trade account balance, which together with the service and income account as well as the current transfers account constitute the current account balance, which is basically financed by the net capital flows.

In summary:

$$[X_t - M_t] + SI_t + CT_t = -CA_t \tag{9}$$

Hence,

$$X_t - M_t = -CA_t - SI_t - CT_t \tag{10}$$

Where SI denotes the service and income account balance, CT represents the current transfer account balance, while CA is the net capital account balance. At this juncture, we pulled out the foreign direct investment inflows (FDI), the foreign portfolio inflows (FPI) from the net capital account and the workers' remittances received from abroad (REM) out of the current transfers account; then we lumped the remaining values together. Thus:

$$X_t - M_t = -FDI_t - FPI_t - REM_t - U_t \tag{11}$$

Where, U_t denotes the part of the trade account that is not financed by FDI, FPI and remittances. Inserting equation (11) into the savings function in equation $(8')$ gave:

$$INV_t = S_t + [FDI_t + FPI_t + REM_t + U_t] \tag{12}$$

Equation (12) above says that in an open economy, in the absence of government and taxes, investments are financed using domestic savings and the international capital inflows. Assuming an economy where only the external sector and the real estate sectors exists, equation (12) above would be stating that the real estate investments are financed by the domestic savings and the international capital flows. However, in any country, the real estate investment forms only a component of the total investment. Therefore, not all

domestic savings, FDI, FPI and REM end up in the real estate market. If the proportions of domestic savings, FDI, FPI and REM that fund real estate investments are known, then we can state that:

$$I_t = \omega_1 S_t + \omega_2 FDI_t + \omega_3 FPI_t + \omega_4 REM_t + \omega_5 U_t \quad (13)$$

Where I, as in equation (1) – (7), is the real estate gross investment in a given country and $\omega_1, \omega_2, \omega_3, \omega_4$ and ω_5 are the proportion of domestic savings, foreign direct investments inflows, foreign portfolio investments inflows, *diaspora* remittances and other capital flows, that fund real estate investments. These proportions are temporarily assumed to be constant across the period of estimation. Nevertheless, equation (13) can only be regarded as a funding identity and does not divulge satisfactory information on how responsive real estate investments are to foreign capital inflows and domestic savings. Therefore, we modified the Euler equation (7) above by replacing current investment with equation (13), to give:

$$\begin{aligned}\left(\frac{I}{K}\right)_{t+1} = {} & \theta_0 + \theta_1\omega_1\left(\frac{S}{K}\right)_t + \theta_1\omega_2\left(\frac{FDI}{K}\right)_t + \theta_1\omega_3\left(\frac{FPI}{K}\right)_t + \theta_1\omega_4\left(\frac{REM}{K}\right)_t + \theta_1\omega_5\left(\frac{U}{K}\right)_t - \\ & \theta_2\omega_1\left(\frac{S}{K}\right)_t^2 - \theta_2\omega_2\left(\frac{FDI}{K}\right)_t^2 - \theta_2\omega_3\left(\frac{FPI}{K}\right)_t^2 - \theta_2\omega_4\left(\frac{REM}{K}\right)_t^2 - \theta_2\omega_5\left(\frac{U}{K}\right)_t^2 + \\ & \theta_3\left(\frac{Q}{K}\right)_t - \theta_4\left(\frac{CF}{K}\right)_t + \theta_5 J_t + \varepsilon_{t+1} \quad (14)\end{aligned}$$

Equation (14) says that future investments depend on the current level of domestic savings and foreign capital inflows; however, the relationship is linear in the parameters but non-linear in the explanatory variables. According to Gujarati (2003), a regression model should always be regarded as linear as long as it does not have non-linearity in parameters, therefore, equation (14) is plausible to a linear regression analysis that is conditional on the given values of the explanatory variables.

3.4 Estimation Issues

Abiding by the principle of parsimony and given that some variables in equation (14) are either non-observable or lack data at the sectorial level, we therefore follow the parameterization in Ahmad *et al.,* (2004), Harrison *et al.,* (2004), Campbell (2010) and

Fedderke and Romm (2006), but we also make additional changes and introduce a different means of instrumentation. Basically, in the first stage, we assume that the user-cost of capital (J_t), domestic savings-capital ratio and its square, the net output-capital ratio ($\frac{Q}{K}$), the ratio of real cash flows to capital ($\frac{CF}{K}$), the ratio other capital flows to capital ($\frac{U}{K}$), and its square $\left(\frac{U}{K}\right)^2$ are captured by time-country-specific effects in a multi-country panel data analysis (a further explanation of country-specific effects is provided under the panel regression in appendix I).

This allows us to capture the role of foreign capital flows in a parsimonious model. To estimate the resulting model, we replace the expectations values with realized values; however, we temporarily represent the country-specific effects within one composite error term (decomposition of this error term is clarified under the one-way error component model section under panel regression in appendix I). Specifically, our parameterized model becomes:

$$\left(\frac{I}{K}\right)_{it} = \alpha_0 + \beta_1\left(\frac{FDI}{K}\right)_{t-1} + \beta_2\left(\frac{FPI}{K}\right)_{t-1} + \beta_3\left(\frac{REM}{K}\right)_{t-1} + \beta_4\left(\frac{FDI}{K}\right)^2_{t-1} + \beta_5\left(\frac{FPI}{K}\right)^2_{t-1} + \beta_6\left(\frac{REM}{K}\right)^2_{t-1} + \mathrm{C}_t \quad (15)$$

C_t is the composite error term which may lack orthogonality properties because it represents the orthogonal errors and missing variables (see Baltagi (2005) and Woodridge (2002) on error term decomposition) that were left out based on the above discussion, $\beta_1 = \theta_1\omega_2$, $\beta_2 = \theta_1\omega_3$, $\beta_3 = \theta_1\omega_4$, $\beta_4 = \theta_2\omega_2$, $\beta_5 = \theta_2\omega_3$ and $\beta_6 = \theta_2\omega_4$. Here, $\beta_1, \beta_2, \beta_3 \ldots \beta_6$ are the regression coefficients that measure a change in real estate investments given a unit change in the specific explanatory variable, keeping other explanatory variables constant. Intuitively, the coefficients above (e.g.$\beta_1 = \theta_1\omega_2$) indicate that the overall responsiveness of real estate investments to the foreign capital depends on direct inflows into the real estate markets (i.e. $\omega_2, \omega_3,$ and ω_4) and indirect inflows (θ_1 and θ_2).

Therefore, in a multi-country analysis, we can adopt panel regression which allows one to capture some of the variables as country-specific or time-specific effects and provide approaches of eliminating the two effects without affecting the efficiency, consistency and unbiasedness of the coefficient estimates. In this chapter, only the panel estimation is implemented, therefore we only modify equation (15).

The last term on the right hand side of the equation above (C_t) can be described as the composite error term that accounts for all omitted variables. It is unlikely for this error term to meet the requirements of the orthogonality principle; nevertheless, extant econometric literature provides ingenious ways of dealing with this weakness, and these are discussed under the panel regression model specification (appendix I).

In other chapters where we implement time series models, controlling for country-specific or time-specific effects is a greater challenge than in a panel set-up; yet one fundamental assumption of classical linear regression model is that of a correctly-specified model (Clarke, 2005). Omission of relevant explanatory variables inevitably result into a misspecification called the omitted variable bias (Woodridge, 2002).

In a time-series or single-country set-up, Asteriou and Hall (2011) advise that the best way to deal with omitted variable bias is to include a proxy variable for each omitted variable. Woodridge (2002) provides two *formal* conditions for a good proxy variable. First, it should be redundant or simply ignorable in the structural equation, that is, it is irrelevant for explaining the dependent variable in the conditional mean sense once the variable it proxies for has been controlled for. The second condition requires that the correlation between the omitted variable and other variables in the structural equation should be zero once we *partial out* the proxy variable.

The user cost of capital, which according to equation (7) encompasses relative prices (input-to-output ratio), depreciation, and firm's required rate of return, is unobservable, and therefore, omitted. In previous studies, the user-cost of capital is often constructed from the corporate bond yield or real interest rate (Chirinko *et al.,* 1999; Dwenger, 2010;

and Gilchrist and Zakrajsek, 2007). In line with these studies, we use the nominal interest rate as a plausible market-wide acceptable proxy for user-cost of capital.

Likewise, the net output-to-capital ratio, where the net output is defined in the same way as in equations (4) to equation (7) as the difference between output and adjustment costs ($Q_t = F(K_t, L_t) - G(K_t, I_t)$), can be proxied neatly by real gross value added by the construction sector. In most countries, apart from construction of public utilities, the output of the construction sector is primarily the value of buildings developed by real estate developers.

In addition to the above, the 'other capital flows-to-capital stock ratio' is also unobservable in most countries. In itself, other capital flows include more than one capital inflow and have been investigated separately or collectively as capital account or current account balances. Most studies on capital account openness acknowledge that substantial international capital flows are generated by variations in marginal capital productivity between the country of origin and the country of application of capital (Obstfeld, 2009). Leading from this line of argument, Schertler and Tykvová (2012) found a higher expectation of economic growth to be associated with increased inflows of cross-border venture capital.

In recent studies, such expectation can be represented well by using the GDP gap, which is the difference between actual real GDP and the potential real GDP. Potential real GDP was obtained using Hodrick and Prescott (1997) filter with a smoothing parameter set to 1600. This is a smoothing approach that fits an unobserved stochastic trend through all observations of real GDP, irrespective of structural breaks, to be obtained using weighted moving average calculated over time (Giorno *et al.*, 1995; Kuttner, 1994).

This approach has been widely used in empirical studies and in practice to estimate potential real GDP before calculating deviations to indicate the output gap (see Anand *et al.*, (2014), Krupkina *et al.*, (2014) and Furceri and Mourougane (2012), among others) Therefore, in order to proxy for all components incorporated in the 'other capital flows' we use the realised output gap and GDP growth rate.

Our time series estimation is therefore informed by the following equation:

$$\left(\frac{I}{K}\right)_t = \alpha_0 + \beta_1\left(\frac{FDI}{K}\right)_{t-1} + \beta_2\left(\frac{FPI}{K}\right)_{t-1} + \beta_3\left(\frac{REM}{K}\right)_{t-1} + \beta_4\left(\frac{FDI}{K}\right)^2_{t-1} + \beta_5\left(\frac{FPI}{K}\right)^2_{t-1} + \beta_6\left(\frac{REM}{K}\right)^2_{t-1} + \beta_9\left(\frac{GVA}{K}\right)_t + \beta_{10}INT_t + \beta_{11}GDPGAP_t + \beta_{12}GDPGROWTH_t + \in_t \quad (16)$$

Where t denotes the time subscript, GVA is the gross value added by the construction sector, INT denotes the real interest rate, $GDPGAP$ is the output gap, $GDPGROWTH$ is the GDP growth rate.

3.5 Data Sources and Description

In this study, both quarterly and annual data were collected for the country-based real estate investments, foreign capital flows and several other macroeconomic variables, because the unit of analysis is practically the same as the unit of observation. However, only a handful of the 54 African countries have had an effective central statistics office with records that stretch for more than five years. This means that data on some of the variables of the study is just not available. For this reason, our sample size dropped to only five (5) countries, namely, Botswana, Kenya, Morocco, Namibia, and South Africa.

Where several alternative sources of data were available, such as data for foreign capital inflows, a major emphasis was placed on accuracy, quality and integrity of the data and of the source. Wang and Strong (1996) caution that data should not only be accurate but must be fit for use; that is, it should have intrinsic, contextual, representational and accessibility qualities.

To meet these requirements, we obtained quarterly data-series on the international capital inflows from each country's Central Bank; and data on the other variables were solicited from publications of the country's Central Bureau of Statistics. However, for South Africa, all variables of interest were obtained through the South African Reserve Bank (SARB). This panel stretched from 2000 Quarter One through to 2012 Quarter Three.

Since data for real estate investments are often reported in monthly frequencies, we obtained quarterly series by summation of values for three months: January, February and March to create data for the first quarter; April, May and June for the second quarter; July, August and September for the third quarter and October, November and December for the fourth quarter. This series is customarily reported in two sets: the value of residential and non-residential buildings plans approved in a month.

These real estate investment series were also found for only five countries: Botswana, Kenya, Morocco, Namibia, and South Africa. Even for these five countries, the available data did not cover all periods of interest with an exception of South Africa. The available observations for all variables of interest varied from country to another resulting into an unbalanced panel.

Time-series literature suggests that most quarterly and monthly time series are subject to short-term fluctuations, also called seasonal variations. It is desirable that seasonal variations be removed from a series because they obscure effects of 'real' movements (Akkoyun *et al.,* 2011). Drawing from the works of Shiskin *et al.,* (1967), among others, the United States Census Bureau developed methodologies that help to remove seasonality from a series. These methods are generally based on the autoregressive integrated moving average (ARIMA). The earliest was the X-11, described as an *ad-hoc* tool, which can decompose a time series into trend; seasonal; cyclical and irregular components by using the Henderson moving average approach (Hylleberg *et al.,* 1990; Zhang and Qi, 2005).

However, because the X-11 method is based on moving-averages, a loss of observation on both ends of the series (the start and the end) often cause seasonal effects to be underestimated. Later, they incorporated Box-Jenkins ARIMA approach to form the Census X-12. The X-12, as it is commonly called, can identify and adjust for outliers, trading day effects and can be extended to forecast and back cast to avoid loss of observations at both extremes (see the explanation by Box and Jenkins (1976)) .

It selects an appropriate ARIMA model based on the average percentage of standard errors, the significance of Ljung Box Q autocorrelation statistics and the user-defined seasonal differencing (Atuk and Ural, 2002). In this study, all quarterly series are tested for significance of seasonal factors and Census X-12 is used to obtain seasonally adjusted series before being subjected to any analysis.

Time series data on the value of real estate capital stock, to the best of our knowledge, is not maintained in any of the sampled African countries yet investments and foreign capital inflows are supposed to be scaled by their respective capital stock (see equation (16)). Since this is a common problem in macro-economic analysis, earlier researchers have long designed three strategies of estimating a series of capital stock: the steady-state approach that assumes a constant capital-output ratio, perpetual inventory method where the initial capital is set to zero and the last method which is a mix of the first two methods. It uses the perpetual inventory approach but instead of setting the initial capital stock to zero, it uses steady-state method to estimate the initial capital stock (King and Levine, 1994).

It is worthwhile to note that the choice of capital stock estimation method may not have a significant effect on the regression results, as Benhabib and Spiegel (1994) had earlier established that estimates of these various approaches are highly correlated. The weakness with the first approach is the inherent assumption that a country is on the same production frontier at all times, whereas the second approach is hinged on an unrealistic assumption that initial stock is zero, especially in real estate markets where housing stock, for instance, as a basic need, can never be zero. In this study, as with most recent researchers before us, such as Muhanji and Ojah (2011) and Berlemann and Wesselhöft (2012), we use the perpetual inventory method but we approximate the initial capital in the following way:

Firstly, we make an assumption that, if capital-output ratio is constant in a given period, then the rate of growth of capital and output during the period must be equal. That is, given the investment identity:

$$K_t = (1-\delta)K_{t-1} + I_t \quad (17)$$

Then

$$\frac{K_t - K_{t-1}}{K_{t-1}} = -\delta + \left(\frac{I_t}{K_{t-1}}\right) \quad (18)$$

Therefore, the left side represents rate of growth of capital stock which shall be equal to output growth g , we can rewrite equation (18) above as:

$$K_{t-1} = \frac{I_t}{(g+\delta)} \quad (19)$$

Secondly, we make an assumption on the initial output growth rate and investments. Nehru and Dhareshwar (1993) advise that a three-period average of growth rate of output and a corresponding three-period average of investment level can be used. However, the output growth rates are extremely unstable for our sample, so, instead of using three-period average, we use a sample-wide average and a three-period investment average to estimate the initial capital stock.

Finally, we set the rate of depreciation (denoted as δ) to be seven percent. In early studies, the choice of the depreciation rate δ, has no significant effect on the results (Nehru and Dhareshwar, 1993). The reason is that the errors in the initial capital stock estimation are dampened rather quickly with time and since the rate of depreciation is a constant, all other values of capital stock estimated using different values of δ will still be highly correlated. After obtaining the initial capital stock, rate of growth and rate of depreciation, the rest of the series are generated using equation (17).

3.6 The results

3.6.1 The Level of Real Estate Investments and Foreign Capital Inflows

To show the level of real estate investments and foreign capital flows in each country, we computed the arithmetic mean (average), which is often used as a representative value of its respective series. The mean is a single value within a range of data that is used to represent all of the values in the series. In other words, the mean helps us to state that for

each of the sample periods, a certain variable was about or around a certain value (the mean). This helped us in making comparisons with other variables (for instance, we can state that a given country received more FDI than FPI) or in making comparison between countries in reference to a specific variable (for example, it shows that one country received more FDI than the other). In finance, it is a popular practice to use averages such as average stock price and average return as an indicative, representative or predictive measure of the price or return of an asset (Anson *et al.*, 2010), then on the basis of such averages, one can argue that price or returns of an asset has gone up or down.

Examining the mean of the values in levels[19] may be less informative considering that each country has its own unique residential and non-residential markets of diverse sizes. In fact, if we compare inflows based on the mean of foreign inflows in levels (absolute value) a misleading conclusion can easily be made. For instance, a small country with a relatively small residential market is obviously expected to receive lesser inflows and investments than countries with large markets. But when the variables are scaled by capital stock, it will not be surprising that even the small market performs equally with big markets.

We also disaggregate the real estate market of each country into residential and non-residential markets because these markets are likely to respond and relate differently with foreign capital inflows. Therefore, we examined the mean of investment and all foreign capital inflows relative to the size of residential market and non-residential market in each country. Basically, we divided or obtained the ratio of each of the series values to the corresponding capital stock of that market. The results of this computation are provided in Table 3.1 below.

Table 3.1 provides very pertinent information as to the level of investments and foreign capital inflows from the prism of the real estate market size. Evidently, Kenya does more residential investments than any of the other countries in our sample relative to the market size followed by Namibia, South Africa, Botswana and Morocco, in that order.

[19] The term 'level' is used here to mean values of observations before any transformation.

However, it appears that Botswana takes a lead in non-residential investments and Morocco ranks lowest out of the five countries. In terms of foreign capital inflows, it appears that Botswana and Namibia receive the highest FDI relative to the residential and non-residential markets sizes, while Kenya and South Africa lead in FPI received whereas Morocco and Kenya seem to receive the highest remittances relative to their market sizes out of the five countries sampled.

Table 3.1: The Level of International Capital Flows and Real Estate Investments

	Residential Market				Non-Residential Market				
	RRES	RFDI	RPI	RREM	NNRES	NFDI	NPI	NREM	Obs
Botswana	0.082	0.470	0.003	0.021	0.125	0.823	0.008	0.040	24
Kenya	0.119	0.026	0.327	0.211	0.118	0.037	0.451	0.290	32
Morocco	0.070	0.073	0.002	0.202	0.075	0.583	0.020	1.597	35
Namibia	0.092	0.352	0.003	0.023	0.088	1.154	0.010	0.080	19
South Africa	0.086	0.089	0.121	0.090	0.087	0.082	0.117	0.082	51

All values in the table are mean values of the ratio abridged in the column titles. RRES stands for residential real estate investments-to-residential capital stock, RFDI implies foreign direct investments-to-residential capital stock, RFPI means foreign portfolio investments flows-to-residential capital stock, and RREM indicates diaspora remittances-to-residential capital stock. Similarly, in the non-residential panel, NNRES stands for non-residential real estate investments-to-non-residential capital stock, NFDI implies foreign direct investments-to-non-residential capital stock, NFPI means foreign portfolio investments flows-to- non-residential capital stock, and NREM indicates diaspora remittances-to-non-residential capital stock.

One cannot draw clear conclusions from the above statistics alone, but some patterns appear to emerge. For instance, Kenya appears to have high investments in the residential market (relative to its market size) and at the same time, it receives high remittances, while Botswana seems to make significant non-residential investments (relative to its market size) and also receives the highest FDI. This suggests that a further analysis could yield some useful associations between foreign capital inflows and real estate investments.

3.6.2 Descriptive Statistics and Normality Tests

Before examining possible co-movements between real estate variables and foreign capital inflow variables, it is important to examine more descriptive statistics of the series for the whole panel rather than for individual countries. Analysing the series for the whole panel allows us to understand the underlying distribution of each variable relative

to the normal distribution. Normally, a univariate probability distribution is said to be close to the normal distribution if it possesses characteristics similar to the standard normal distribution.

Accordingly, in the central limit theorem and the theoretical probability distribution theory, a normal distribution has the mean equal to the mode and media and is Mesokurtic (Kurtosis≈3.0) and symmetrical around the mean (Skewedness coefficient = 0). According to Aggarwal and Kyaw (2005) a test for normality of the variables is important because it gives a prior warning of possible unit roots and serial correlation in the model. Clearly, from Table 3.2 below, none of the variables demonstrate the features similar to a normal distribution. For instance, central tendency measures point to a huge difference, relative to the standard deviation, between the mean and the median of all variables.

Table 3.2: Descriptive Statistics

	Residential Market				Non-Residential Market			
	RRES	RFDI	RPI	RREM	NNRES	NFDI	NPI	NREM
Mean	0.089	0.161	0.105	0.120	0.096	0.419	0.133	0.446
Median	0.082	0.076	0.023	0.095	0.084	0.179	0.044	0.088
Std. Dev.	0.048	0.242	0.180	0.083	0.097	0.614	0.221	0.626
Skewness	2.327	2.908	-0.036	0.255	7.292	1.901	0.577	1.394
Kurtosis	15.090	15.333	4.920	1.952	73.076	9.507	3.434	3.235
Jarque-Bera	1125.817***	1247.367***	24.768***	9.113***	34368.742***	380.968***	10.188***	52.477***
Probability	0.000	0.000	0.000	0.010	0.000	0.000	0.006	0.000
Observations	161	161	161	161	161	161	161	161

The values in the table refer to descriptive statistics of the ratio of investments and foreign capital flows to their respective market capital stocks (residential and non-residential capital stock) for a panel of five countries. The countries are Botswana, Kenya, Morocco, Namibia and South Africa and the observations are made of quarterly frequency for varied periods between 2000 and 2012 which formed unbalanced panel of 161 observations. RRES, RFDI, RFPI and RREM stand for residential real estate investments, foreign direct investments, foreign portfolio investments flows and diaspora remittances all scaled by residential capital stock, respectively. Similarly, NNRES, NFDI, NFPI and NREM stand for non-residential real estate investments, foreign direct investments, foreign portfolio investments flows and diaspora remittances all scaled by non-residential capital stock. The asterisks (***), indicate highly significant test statistics at the 99% level of confidence. The statistics on 'probability' indicates the probability distribution of the Jarque-Bera statistics.

The quickest indications of deviation from normality are the measures for Skewedness and Kurtosis because they help in explaining the tail behaviours of the distribution. As noted by Balakrishnan and Scarpa (2012) and Bai and Ng (2005), skewness and kurtosis measures aberrations from symmetry or the leanness and *peakedness* of the distribution.

Aggarwal and Kyaw (2005) argue that it is common for financial series with unit root, and serial correlation to exhibit high skewness and kurtosis. However, assertion on serial correlation can only be upheld after formal tests for the same, although some measures of normality, for instance the Kolmogorov-Smirnov (KS) statistics, do depend on a 'nuisance parameter' that is associated with serial correlation (Bai and Ng, 2005). These tests are explored further in the next chapter.

Still, most financial series, such as: investment, capital flows and savings normally exhibit serial correlation which makes these distributions different from normal because of the investment delivery and implementation lag (Mohapatra and Ratha, 2011; Sarkar and Zhang, 2013). One popular formal test for normality was developed by Jarque and Bera (1980) and demonstrated by Bera and Jarque (1981).

They provided a joint null hypotheses test of zero skewness and zero excess kurtosis whose test statistics assume a chi-square distribution with two degrees of freedom. The results of this test are also provided in Table 3.2 above. As expected, the results showed that all series were substantially far from a normal distribution because the null for Jarque-Bera tests was rejected for all series at the 99% level of confidence.

3.6.3 Results of Correlation Analysis

To strengthen the results of the descriptive analysis above, we perform the Pearson correlation analysis according to the correlation method by Karl Pearson (Pearson, 1920). The results are presented in Table 3.3 below. Generally, the Pearson correlation coefficient analyses appear to suggest that very few statistically significant correlations exit between real estate investments (residential and non-residential) and foreign capital inflows. Non-residential investment seems to correlate significantly with none of the foreign capital inflows but appear to correlate only with residential investments.

Table 3.3: Correlation Analysis

Series Name	RRES	RFDI	RPI	RREM	NNRES	NFDI	NPI	NREM
RRES	1.000							
RFDI	-0.052	1.000						
RPI	0.220***	-0.390***	1.000					
RREM	0.021	-0.506***	0.331***	1.000				
NNRES	0.492***	0.019	0.039	-0.063	1.000			
NFDI	-0.153**	0.800***	-0.377***	-0.283***	-0.078	1.000		
NPI	0.256***	-0.359***	0.948***	0.408***	0.057	-0.363***	1.000	
NREM	-0.189**	-0.238***	-0.208***	0.665***	-0.127	0.105	-0.168**	1.000

RRES, RFDI, RFPI and RREM stand for residential real estate investments, foreign direct investments, foreign portfolio investments flows and diaspora remittances all scaled by residential capital stock, respectively. Similarly, NNRES, NFDI, NFPI and NREM stand for non-residential real estate investments, foreign direct investments, foreign portfolio investments flows and diaspora remittances all scaled by non-residential capital stock. *** and ** indicates significant test statistics at 99% and 95% level of confidence, respectively. The test for correlation is called the Pearson product moment correlation coefficient (PPMCC) developed by Karl Pearson (Pearson, 1920). Therefore, the values in the table represent the PPMCC values which, as usual, do not have a unit of measurement.

Specifically, Table 3.3 indicates that residential investment tends to correlate highly with foreign portfolio investments (FPI) in the residential market but with foreign direct investment and remittances, the PPMC are not significant. However, the foreign capital inflows in the residential market appear to correlate significantly with each other. Investments into the non-residential market do not appear to move in tandem with any of the foreign capital inflows, but, just as in the residential market, foreign capital inflows appear to be highly correlated with each other.

These findings on correlation indicate that current level of real estate investment may not have a significant relationship with the current levels of foreign capital inflows. In fact this suggestion can be derived directly from the structural model which appears to match current investment with foreign capital inflows of the previous period (lagged ones). For a clear understanding of the level of associations, we implement the DLM regression analysis in our next section and report the findings therein.

3.6.4 Regression Analysis, Results and Discussions

To understand the nature of the relationship between real estate investments and foreign capital inflows, we implement the panel regression analysis (a detailed discussion of panel data analysis is provided in the appendix I). Since residential and non-residential

real estate markets can relate differently with foreign capital inflows, we implement the panel regression analysis separately by running the same set of estimations using residential investment divided by residential capital stock, and then re-ran them using non-residential investment scaled by non-residential capital stock.

Basically, the dependent variables are different in each set-up but the regressors only differ in terms of the scaling capital stock used. When estimating the residential models, we scale all foreign capital inflows using residential capital stock and scale by non-residential capital stock when estimating non-residential models.

We stack up our data as a pooled model, then transform data to form a polynomial distributed lag (PDL) to address possible multicollinearity in the DLM (a detailed description of PDLs and the DLM is provided in the appendix I). After the transformation using the PDL approach, we implement a pooled feasible generalized least square (GLS) estimation. After pooling, we set up our PDL series again and estimate a fixed-effect (FE) model and then a random-effect (RE) model using general moment method (GMM) estimators. This means that for every market, we estimate three equations: pooled feasible GLS, fixed effect model and random effect model. The three models are necessary for robustness check but we provided a discussion of the best-fitting model and results for a formal test using Hausman specification test.

Further, before implementation of regression analysis, we perform panel unit root tests by implementing Levin *et al.,* (2002), Im *et al.,* (2003), and Breitung (2001) unit root tests. The results for these tests are not reported here but they generally indicated absence of a significant unit root; or rather, the series were stationary (a detailed discussion of unit root and stationarity test is provided in the next chapter and in appendix I).

3.6.4.1 Implementation of the Pooled Feasible GLS

Implementation of the pooled feasible GLS is carefully executed because (1) finite sample properties of feasible GLS are not well documented and haphazard implementation can end up inducing serial correlation in the errors (Cameroon and Trivedi, 2005; Gujarati, 2003), (2) pooling of cross-sectional and time series can diminish

independence of errors leading to deflation of standard errors; and therefore, inflation of t-statistics (Denis *et al.*, 2002). It is worth noting that in the presence of serial correlation and heteroscedasticity, only the efficiency property of estimates is lost, the ordinary least square (OLS) estimates are still unbiased, consistent and asymptotically normally distributed (Cameroon and Trivedi, 2005, Gujarati, 2003.

Therefore, instead of implementing pooled OLS, we execute a pooled feasible GLS using period weights that are robust to heteroscedasticity across periods (Beck and Katz, 1995), then use heteroscedasticity- and autocorrelation-consistent (HAC) covariance estimator to compute panel-robust standard errors (Cameroon and Trivedi, 2005). In other words, we address heteroscedasticity by using feasible GLS weights and correct the effect of serial correlation on standard errors by using robust standard errors computed by the HAC technique called the White period (that corrects for degrees of freedom). This is a robust coefficient covariance method that assumes errors for a cross-section are heteroscedastic and serially correlated (i.e. cross-section clustered) and are thus robust to any arbitrary heteroscedasticity and within cross-section serial correlation (Petersen, 2009).

3.6.4.2 Endogeneity and Instrumentation

Although a regression model can be properly specified and parameterized, when it comes to its implementation, it is possible to realise that the error term has considerable correlation with one or more of the regressors. This phenomenon is called endogeneity bias. Estimation with endogenous regressors result in inconsistent estimates (Cameroon and Trivedi, 2005) and is caused by including variables whose course is determined by movements in a variable(s) included in the same model (Johnson and Dinardo, 1984). Literature and practice in econometric analysis contend that the most plausible way of addressing endogeneity is to use instrumental variables (Baum *et al.*, 2003, 2011; Sovey and Green, 2011; Staiger and Stock, 1994).

Previous studies and theory suggest that reverse causalities exist between investments and foreign capital inflows (Baldé, 2011; Feldstein and Horioka, 1980; Sun, 2011) and that foreign capital inflows can also stimulate or trigger each other (Javorcik *et al.*, 2011).

For example, the presence of migrants can facilitate information flow and sharing across national borders which, in turn, stimulate FDI from the host country. That being the case, there is a high possibility that foreign capital flows are endogenous in our set-up and need to be instrumented (a more detailed explanation on endogeneity and instrumentation is provided in Chapter five, Section 5.3.1). We use first differences and lags at different orders as instruments of endogenous variables in this chapter along the same lines as Arellano and Bover (1995).

3.6.4.3 Implementation of the Fixed Effect and Random Effect Models

Aside from pooled models, the fixed effect (FE) and the random effect (RE) models are also implemented for individual real estate markets with caution. The presence of individual specific effects in these two models appear to reduce serial correlation greatly as theorized by Cameroon and Trivedi (2005), but heteroscedasticity seems to be persistent; hence the need for a proper method to address this.

Therefore, in the implementation of the FE and RE models, we seek an efficient GMM estimator by specifying period weights instrument weighting matrix that is robust to heteroscedasticity across periods (Beck and Katz, 1995). Similarly, instead of using the unrestricted, unconditional robust coefficient covariance method used in the pooled model, we use the panel corrected standard error (PCSE) approach that corrects for heteroscedasticity across periods called 'period weights' PCSE estimator, corrected for degrees of freedom (Beck and Katz, 1995; Stock and Watson, 2008). To address possible finite sample biasedness, we follow the advice of Cameroon and Trivedi (2005) and ensure a careful selection of valid instruments and a consistent weighting matrix as opposed to using the theoretical optimal weighting matrix as explained above.

To obtain consistent optimal GMM weighting matrix, we iterate the initial robust weight, as well as the coefficients, and sequentially update them until convergence. The maximum iteration control is set to 1000 and convergence iteration control is set to 0.0001. In the random effect model, we use the feasible GLS to deal with random effects,

and specifically, we use the quadratic unbiased estimator by Wansbeek and Kapteyn (1989) to estimate the composite error's covariance matrix.

The use of 'dummy variables' to account for business cycles, etc., exclude estimators that use between estimations such as Swamy-Arora estimator and, in addition, Wansbeek-Kapteyn estimator provides an extra trick for dealing with incomplete or unbalanced panel, heteroscedasticity and autocorrelation (Baltagi, 2005; Wansbeek and Kapteyn, 1989).

3.6.4.4 Residential Real Estate Market Results

The results of the pooled feasible GLS, the fixed effect (FE) and the random effect (RE) models implemented for the residential market panel are presented in Table 3.4, below. Considering that each of the three estimators' assumptions imply unique specifications, we implement the Hausman specification test to determine the most consistent and efficient model between the FE and the RE models.

However, because the use of the robust standard errors (PCSE) is not consistent with the assumptions on which the Hausman test is built, we perform the Hausman test before correcting the standard errors. The test show a chi-square statistics for cross-section random effects of 3.091 and a probability of 0.9995 when 15 degrees of freedom are used.

The null hypothesis of the Hausman test upholds that the unobserved cross-sectional effects are uncorrelated with the regressors, which in effect indicate that the RE model is fully efficient. From the test statistics, it appears that the RE model is the most appropriate model for the residential markets' data. After the Hausman test, we implement the PCSE and obtain heteroscedasticity and autocorrelation robust estimates that are reported in Table 3.4 below.

Furthermore, instead of relying solely on RE for interpretation of the results, we use the findings of all models and identify evidence that are robust on the entire three models.

But first, we interpret the Sargan statistics, also called the *J*-statistics, and the associated probability distribution reported in the bottom of the FE and RE models.

According to Wang (2009), the validity of instrumentation can be tested by using the Sargan test for over-identification as developed by Sargan (1958) by simply computing the value of the GMM objective function. The intuition is that a high value of the objective function implies a successful over-identification. The null hypothesis states that over-identification is valid and the test statistics obey a chi-square distribution with degrees of freedom equal to the number of instruments minus the number of parameters. In this estimation, there is insufficient evidence to reject the null hypotheses, and therefore, over-identifications used in the FE and the RE models are valid.

On the other hand, the individual coefficient estimates by the three models reveal evidence of substantial associations between residential investments and foreign capital inflows in the selected countries. A significant part of these are robust across all the three models, suggesting a high degree of reliability. Still, some inconsistence is noted. Following the robust results, there is enough evidence to suggest that the associations between FDI and residential investments are positive and significant after three and four quarter from the quarter of receipt.

On the contrary, the results for FPI are totally inconsistent and not robust across the three models. Regarding remittances, the entire three models seem to agree that remittances inflows are highly associated with residential investments after two and three quarters from the quarter of receipt. In all other periods, results for all inflows are either inconsistent or statistically insignificant.

Table 3.4: Results for the Residential Real Estate Market

	Pooled Feasible GLS		Fixed Effect Model		Random Effect Model	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
Constant	0.059***	(0.010)	0.044***	(0.009)	0.028	(0.020)
RFDI	0	(0.011)	0.016*	(0.008)	0.008	(0.008)
RFDI (-1)	-0.009*	(0.005)	0.021***	(0.008)	0.016**	(0.008)
RFDI (-2)	-0.003	(0.008)	0.031***	(0.008)	0.028***	(0.008)
RFDI (-3)	0.018***	(0.006)	0.045***	(0.007)	0.043***	(0.007)
RFDI (-4)	0.054***	(0.010)	0.063***	(0.009)	0.06***	(0.009)
RFPI	0.026***	(0.008)	-0.001	(0.015)	-0.002	(0.016)
RFPI (-1)	0.006	(0.004)	-0.012	(0.017)	-0.014	(0.017)
RFPI (-2)	0.005	(0.004)	-0.018	(0.021)	-0.02	(0.021)
RFPI (-3)	0.024***	(0.005)	-0.017	(0.021)	-0.02	(0.020)
RFPI (-4)	0.063***	(0.010)	-0.011	(0.024)	-0.015	(0.022)
RREM	-0.288**	(0.129)	-0.389	(0.158)	-0.371**	(0.160)
RREM (-1)	0.055	(0.062)	0.115	(0.070)	0.113	(0.072)
RREM (-2)	0.204**	(0.103)	0.332***	(0.095)	0.32***	(0.099)
RREM (-3)	0.158**	(0.073)	0.261***	(0.079)	0.251***	(0.080)
RREM (-4)	-0.082	(0.108)	-0.098	(0.130)	-0.096	(0.134)
$RFDI^2$(-1)	-0.014	(0.015)	-0.017*	(0.010)	-0.012	(0.010)
$RFPI^2$(-1)	0.058	(0.026)	0.069	(0.044)	0.102**	(0.046)
$RREM^2$(-1)	0.015	(0.405)	0.083	(0.314)	0.218	(0.330)
Adjusted R-squared		0.426		0.485		0.400
Instrument rank				26		22
J-statistic				9.613		8.483
Prob(J-statistic)				0.142		0.205

The asterisks ***, ** and * indicate significant test statistics at the 99%, 95% and the 90% levels of confidence, respectively. After necessary adjustments, 141 observations from 5 countries were used to compute the coefficient estimates and related standard errors shown in the table. Standard errors were computed using panel–robust HAC estimator that utilises period weights and corrects for the degrees of freedom to obtain panel corrected standard errors. The GLS weight under pooled model and the GMM weighting matrices under the FE and RE models were similarly computed using period weight HAC estimator. In addition, the Wansbeek and Kapteyn estimator was used to estimate the component variances under the random effect model. In all models, coefficients were iterated to convergence. Once again, RRES stands for residential real estate investments-to- residential capital stock, RFDI implies foreign direct investments-to- residential capital stock, RFPI means foreign portfolio investments flows-to-residential capital stock, and RREM indicates diaspora remittances-to-residential capital stock

It is worth noting here that none of the estimates of the initial effects of any of the foreign capital inflow are robust. As such, we are not able to ascertain any associations in the early periods/quarters after the period in which the inflow is received. In other words, the instantanous effects, also called the 'impact multipliers', are not well established from these results. It is important to understand that inconsistent results do not suggest that there are missing or insignificant associations between the two sets of variables.

Instead, they suggest that a further analysis, perhaps by incorporating a new set of information would be worthwhile to reveal the true underlying relationship. It is also important to perform a additional inquiry to clarify the association between FPI and residential investments, which is also not clear in the results above. In view of these inconsistencies, we introduce a way of controlling for economic upturns in the models and re-estimate all three again in section 3.6.5, below

3.6.4.5 Non-Residential Real Estate Market Results

The pooled feasible GLS, fixed effect and random effect models are parameterized and estimated using data from non-residential real estate markets of the selected five countries. The procedure for tests and estimations is basically similar to the one above when residential markets are examined. Once more, we run the Hausman specification test to examine whether the principles of consistency and efficiency are satisfied better by the RE model or the FE model. Unlike in the previous estimation above, where the unobserved cross-sectional effects were found to be uncorrelated with the regressors, under non-residential market, the null hypothesis of the Hausman test is rejected (at the 99% confidence level).

The chi-square test statistics for the cross-section random effects are a massive 53.862 with a probability of 0.000, considering 15 degrees of freedom. In the context of this test, rejection of the null hypothesis indicate that the random effect model is less efficient; and therefore, the fixed effect model is more efficient and consistent (Woodridge, 2002). Our interpretations, however, are once more based on robust results across the three models and not just the consistent FE model.

In contrast, a test for orthogonality of instruments using the Sargan test shows that over-identifications adopted in the FE and the RE models are valid. The J-statistics values are relatively high and their attendant probabilities indicate that the null hypotheses should be accepted. From effective instrumentation and parameterization, the explanatory power indicated by the adjusted R^2 is not very different from each other and indicate a good fit. However, individual variable coefficient estimates appear to suggest that very few

statistically significant associations exist between non-residential investments and foreign capital inflows in the panel countries.

Table 3.5: Results for the Non-Residential Real Estate Market

	Pooled Feasible GLS		Fixed Effect Model		Random Effect Model	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
Constant	0.071***	(0.002)	-0.078	(0.167)	-0.03	(0.035)
NFDI	-0.025***	(0.003)	-0.046	(0.038)	-0.075***	(0.029)
NFDI (-1)	-0.005	(0.004)	-0.007	(0.020)	-0.012	(0.017)
NFDI (-2)	0.007	(0.005)	0.033	(0.025)	0.039	(0.019)
NFDI (-3)	0.013***	(0.003)	0.074*	(0.039)	0.078***	(0.022)
NFDI (-4)	0.013	(0.009)	0.116**	(0.058)	0.105***	(0.030)
NFPI	0.004	(0.006)	-0.03	(0.048)	-0.116**	(0.053)
NFPI (-1)	0.003	(0.004)	-0.013	(0.022)	-0.073**	(0.036)
NFPI (-2)	0.005	(0.004)	0.006	(0.026)	-0.043	(0.039)
NFPI (-3)	0.008*	(0.004)	0.028	(0.027)	-0.025	(0.037)
NFPI (-4)	0.015	(0.009)	0.054	(0.044)	-0.021	(0.060)
NREM	-0.047	(0.048)	0.329	(0.699)	0.584	(0.435)
NREM (-1)	0.016	(0.024)	0.307	(0.482)	0.357*	(0.216)
NREM (-2)	0.044	(0.041)	0.332	(0.458)	0.213	(0.253)
NREM (-3)	0.036	(0.024)	0.402	(0.446)	0.152	(0.158)
NREM (-4)	-0.008	(0.046)	0.517	(0.659)	0.175	(0.339)
$NFDI^2$(-1)	0.006**	(0.002)	0.005	(0.005)	0.004	(0.006)
$NFPI^2$(-1)	0.049***	(0.011)	-0.023	(0.102)	-0.118	(0.120)
$NREM^2$(-1)	-0.029	(0.018)	-0.189	(0.233)	-0.102***	(0.037)
Adjusted R-squared		0.455		0.487		0.432
Instrument rank				22		18
J-statistic				2.86		1.596
Prob(J-statistic)				0.239		0.45

The asterisks ***, ** and * indicate significant test statistics at the 99%, 95% and the 90% level of confidence, respectively. After necessary adjustments, 141 observations from 5 countries were used to compute the coefficient estimates and related standard errors shown in the table. Standard errors were computed using a panel–robust HAC estimator that utilises period weights and corrects for the degrees of freedom to obtain panel corrected standard errors. The GLS weight under the pooled model and the GMM weighting matrices under the FE and RE models were similarly computed using a period weight HAC estimator. In addition, the Wansbeek and Kapteyn estimator was used to estimate the component variances under the random effect model. In all models, coefficients were iterated to convergence. Here, NNRES stands for non-residential real estate investments-to-non-residential capital stock, NFDI implies foreign direct investments-to-non-residential capital stock, NFPI means foreign portfolio investments flows-to-non-residential capital stock, and NREM indicates diaspora remittances-to-non-residential capital stock.

We find that FDI appears to have more important associations than all other inflows, suggesting that perhaps non-residential real estate markets interact more with FDI than with other inflows considered in the study. However, these robust results indicate that FDI has a statistically significant positive association with non-residential investments in the third quarter from the quarter of the inflow only. None of the results for the associations between FPI and non-residential investment are robust while the results for

the association between remittances and non-residential investments are mainly insignificant in statistical terms, despite being inconsistent.

Therefore, results for all inflows are mainly inconsistent which limit the making of important statistical inferences. For instance, it is not clear whether any positive association of either remittances or FPI exists relative to the non-residential investments. This being the case, a different approach that provides more reliable results should be explored. We assume that the global financial crisis of 2007 could have affected the underlying associations examined here in a significant manner. That being said, we now look for a means of controlling for the period of the crisis in these models in the next section.

3.6.5 Incorporating the Business Cycle

Business cycles are simply defined as aggregate economic fluctuations which are too rapid to be accounted for by demographic and technological factors or changes in the capital stock (Hodrick and Prescott, 1997). Literature on what causes business cycles is far from a consensus (Justiniano *et al.,* 2010) but scholars are generally unanimous that business cycles cause significant changes in output, consumption, investment and hours worked (Schmitt-Grohé and Uribe, 2012).

According to Jagannathan *et al.,* (2013), the United States (US) underwent a great recession, precipitated by the financial crisis of December 2007 through to June 2009. On the other hand, Shahrokhi (2011) believes that the financial crisis might have persisted all the way into 2010 but agrees with Jagannathan *et al.,* (2013) that during the crisis the household income dropped, unemployment grew and investment dropped as global credit markets slumped. With the drop in wages and household income in developed countries that form major sources of FDI, FPI and diaspora remittances, such as the US, it is possible that the volume and quality of the foreign capital inflows into African countries also changed considerably. Schmitt-Grohé and Uribe (2012) called this behavioural change an 'internal habit formation'.

In terms of our analysis, this significant change in the flows and habits of investors can easily dampen, or alter in some ways the exact relationship between foreign capital flows and real estate investments. There are several methods of controlling for the effects of the business cycle. For instance, one can apply structural breaks tests on each country or use time dummies for each quarter to pick out seasonal breaks. In this study, we incorporate the business cycle effects into our above analysis by introducing a dummy variable to control for the recession period. The recession period in each market is assumed to be common to all countries.

3.6.5.1 Residential Market Results: Controlling for the Business Cycle Effects

Obviously, the timing and effect of the recession period differed from country to country, from region to region and from market to market. This means that making the assumption of a common recession period for the residential and the non-residential markets of the sampled countries cannot be entirely accurate. Therefore, we use a trial-and-error method on the random effect model to establish a common recession period in the residential markets of the sampled countries. We establish that there would be a significant change in the relationships between the first quarter of 2006 and the last quarter of 2010. And so, we define a recession dummy variable as:

$$RECESS_1 = \begin{cases} 1 \ \ if \ \ quarter \ is \ between \ 2006 \ Q1 \ and \ 2010 \ Q4 \\ 0 \ otherwise \end{cases} \qquad (20)$$

This set-up simply states that the dummy variable takes on the value of 1 (one) for all observations between the first quarter of 2006 and the last quarter of 2010, and takes on the value of 0 (zero) for all other periods. In effect, this variable split our sample into two distinct periods: 'during the recession' and 'none recession'.

The entire residential real estate market models are then re-estimated, but this time incorporating a recession dummy as specified above. Generally, with the introduction of the recess dummy, the fit appear to improve but very marginally with the exception of the RE model, which did not seem to change at all. The Hausman test still supports the RE model by returning chi-square statistics of 3.160 and a probability of 0.9998 using 16

degrees of freedom. The Sargan test also accepts the null hypotheses thus suggesting that using the 27 instruments for the FE model and 23 instruments for the RE model is fittingly over-identified at a probability level of 0.11 and 0.18, respectively. Clearly, controlling for the business cycle using the recession dummy appear to have removed the effects of breaks in the series caused by the financial crisis of 2007 thereby revealing initially masked associations since the results below have more robust associations than in the previous estimation.

Table 3.6: Results for the Residential Real Estate Market

	Pooled Feasible GLS		Fixed Effect Model		Random Effect Model	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
Constant			0.045***	(0.009)	0.028	(0.020)
RECESS DUMMY	-0.005	(0.005)	-0.005	(0.007)	-0.002	(0.007)
RFDI	0.049***	(0.013)	0.018**	(0.008)	0.009	(0.008)
RFDI (-1)	0.008	(0.006)	0.023***	(0.008)	0.018**	(0.007)
RFDI (-2)	0.001	(0.009)	0.032***	(0.008)	0.029***	(0.008)
RFDI (-3)	0.028***	(0.006)	0.046***	(0.007)	0.043***	(0.007)
RFDI (-4)	0.087***	(0.010)	0.064***	(0.010)	0.06***	(0.009)
RFPI	0.057***	(0.016)	-0.002	(0.014)	-0.002	(0.016)
RFPI (-1)	0.004	(0.004)	-0.014	(0.017)	-0.014	(0.017)
RFPI (-2)	-0.01	(0.006)	-0.019	(0.021)	-0.02	(0.021)
RFPI (-3)	0.015**	(0.006)	-0.019	(0.021)	-0.021	(0.020)
RFPI (-4)	0.079***	(0.011)	-0.013	(0.024)	-0.016	(0.022)
RREM	-0.266**	(0.128)	-0.392**	(0.158)	-0.378**	(0.161)
RREM (-1)	0.274***	(0.063)	0.107	(0.073)	0.108	(0.074)
RREM (-2)	0.473***	(0.096)	0.324***	(0.096)	0.318***	(0.100)
RREM (-3)	0.33***	(0.066)	0.26***	(0.079)	0.252***	(0.081)
RREM (-4)	-0.155	(0.126)	-0.086	(0.131)	-0.088	(0.135)
$RFDI^2$(-1)	-0.031**	(0.015)	-0.018*	(0.010)	-0.013	(0.010)
$RFPI^2$(-1)	0.075**	(0.030)	0.071	(0.045)	0.101**	(0.046)
$RREM^2$(-1)	-1.654***	(0.251)	0.098	(0.312)	0.223	(0.331)
Adjusted R-squared		0.659		0.482		0.396
Instrument rank				27		23
J-statistic				10.379		8.893
Prob(J-statistic)				0.11		0.18

RRES, RFDI, RFPI and RREM stand for residential real estate investments, foreign direct investments, foreign portfolio investments flows and diaspora remittances all scaled by residential capital stock, respectively. The asterisks ***, ** and * indicate significant test statistics at the 99%, 95% and the 90% level of confidence, respectively.. The standard errors and the weighting matrices were computed using period weight HAC estimator as explained above. The RECESSION DUMMY denotes a dummy variable that stands for the recess period.

Basically, this robust evidence suggests that the association between FDI and residential investments is positive in the third and fourth quarter after the quarter of inflow. Before

then, the results are inconsistent. For FPI, the entire set of results is inconsistent and therefore still unclear. However, for remittances, the recession dummy seems to have helped a lot. Accordingly, the association between remittances and residential investments are negative in the quarter of inflow but positive in the second and third quarter from the quarter of inflow.

In summary, these results shows that FDI has positive associations in the later periods after receipt, the impact multiplier or asociations in the earlier periods are not clear. Statistical evidence on foreign capital inflows into Africa tends to agree in large part with these findings but there is little emprical evidence that link housing investments and foreign capital inflows. For instance, when FDI inflows into Africa are disaggregated relative to recipient sectors, statistics for most African countries indicate that FDI has been flowing directly into residential real estate markets, at an increasing rate (Ross, 2011; Stephens, 2003).

However, empirical studies centring specifically on housing investments and foreign capital inflows into Africa are hard to come by, but then again studies such as Fedderke and Romm (2006) that focused on economic growth and FDI can be considered to be similarly motivated as well. According to this study, long-run FDI effects are positive in South Africa, although the short-run effects are negative which is similar to our findings above.

For remittances, the initial association is negative but it becomes positive after a lapse of two and three quarters. Beyond three quarters from quarter of inflow, the association is statistically insignificant. The initial negative effect of remittance could be a result of the channel utilized by remittances to impact the residential market. Alfaro *et al.,* (2010) argue that the spillover effects of a foreign capital inflow may not necessarily be positive unless the domestic entrepreneurs, or perhaps investors, are able to access these foreign capital inflows through the financial markets. Where financial markets are underdeveloped, as is the general situation in most African countries, the externalities of foreign capital inflows are likely to be insignificant or negative. A focused analysis of the

channels used by foreign capital inflows to impact real estate markets is pursued later in this study.

Nevertheless, it seems that the positive associations between remittances and residential investments are still short-lived although statistically important. This piece of evidence is in line with previous findings of several surveys and studies on remittances in Africa. For example, the World Bank commisioned a survey that examined how remittances are spent in several African countries (World Bank (2011b). According to the findings of this survey, more than half (50%) of remittances received in Africa are spent on some aspect of housing.

Similarly, surveys by Osili (2004) in Nigeria, De Haas (2006) in Morocco and Obeng-Odoom (2010) in Ghana pointed out a related pattern of spending. Another set of evidence is provided by the empirical work of Kagochi and Kiambigi (2012) in Kenya, Panin *et al.,* (1993) in Botswana, and Lartey (2011) in Namibia. These studies support the findings above and showed that remittances from diaspora are important sources of capital in the residential markets of Africa.

However, despite the support of statistics and empirical studies, it is important that the persistent inconsistency around the impact multiplier effect of FDI and the general association between residential investments and FPI are fully understood. We pursue a more specific analysis of the causality relationship for every country, separately, in the next chapter. It is possible that pooling data as implemented under this panel estimation could have masked important robust associations that might exist in some of the countries. If this veil is lifted, perhaps country-specific effects and association between FPI or FDI and residential investments could be established.

3.6.5.2 Non-Residential Market Results: Controlling for the Business Cycle Effects

As mentioned above, the timing and effect of the recession period differed considerably between the non-residential and residential real estate markets. It is worthwhile to note that the non-residential real estate market is primarily focused on commercial and

industrial buildings and their construction may be driven by factors that could not necessarily be similar to the residential real estate market. As such, one would be right to assume that changes in this market could be mimicking the expansion of the manufacturing and service sectors or otherwise, and therefore, the response to the financial crisis could have been significantly different.

To start with, the period of recession is found to have run between the first quarter of 2007 and the last quarter of 2009. When we control for this period, a significant change is witnessed on the size and nature of the associations between foreign capital inflows and non-residential real estate investments. These results are presented in Table 3.6 below for the three models. The recession period dummy that controlled for the global financial crisis appear to have a positive effect on the level of non-residential real estate investments in the selected African countries.

This is indeed not surprising if one considers the statistics on foreign capital inflows into Africa. Apparently, the level of foreign interest in Africa appeared to grow at the onset of the crisis and only dwindled towards the end, with some inflows, such as FDI and remittances, recording their highest magnitudes during the crises (see statistics in section 2.4, World Development Indicators (2011) and Mohapatra and Ratha (2011), among others). All of the three models indicate a positive effect of the recession period for the non-residential investments. Furthermore, the RE and pooled models found the association to be significant.

Another interesting outcome is the sudden change of the Hausman specification test results. Whereas the previous non-residential models, without the recess dummy, had rejected the null hypothesis, when the recession dummy is included, the test returned chi-square statistics for the random cross-section effect equivalent to 3.100 and a probability of 0.9995, which indicate that the evidence for the rejection of the null hypothesis is inadequate. Consequently, the RE model is appropriately specified and therefore efficient. Similarly, the Sargan test also accepts the null hypotheses. Apparently, the over-identification condition appears to satisfy the required orthogonality conditions; hence, the instruments are valid.

Correspondingly, the explanatory powers of the three models seem to have increased significantly from the previous specification, without the recession dummy, by gaining about 30% over the previous goodness-of-fit measure. The individual association with foreign capital inflows, however, have not changed much but the number of consistent and robust results increased, meaning that the recession dummy has helped significantly in clearing inconsistencies.

The results for FDI, for instance, are generally robust across the three models. This robust evidence suggests that FDI has significant positive associations with non-residential investments after three and four quarters from the time of the inflow; before then, the association is either negative or immaterial. On the other hand, the results for the association between FPI and non-residential investments remain unclear.

Table 3.7: Results for the Non-Residential Real Estate Market

	Pooled Feasible GLS		Fixed Effect Model		Random Effect Model	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
Constant			0.055***	(0.020)	0.036	(0.026)
RECESS DUMMY	0.034***	(0.007)	0.016	(0.010)	0.018*	(0.011)
NFDI	-0.006	(0.006)	0.01	(0.017)	-0.005	(0.019)
NFDI (-1)	-0.003	(0.005)	0.011	(0.010)	0.003	(0.010)
NFDI (-2)	0.005	(0.006)	0.017*	(0.009)	0.013	(0.009)
NFDI (-3)	0.018***	(0.004)	0.028***	(0.008)	0.025*	(0.009)
NFDI (-4)	0.038***	(0.010)	0.045***	(0.013)	0.039*	(0.014)
NFPI	0.053**	(0.023)	-0.002	(0.023)	-0.012	(0.026)
NFPI (-1)	0.043***	(0.012)	0.002	(0.011)	0	(0.012)
NFPI (-2)	0.032*	(0.018)	0.008	(0.013)	0.009	(0.015)
NFPI (-3)	0.02*	(0.012)	0.016	(0.012)	0.015	(0.014)
NFPI (-4)	0.008	(0.020)	0.025	(0.022)	0.02	(0.024)
NREM	-0.033	(0.050)	-0.342*	(0.187)	-0.297	(0.204)
NREM (-1)	0.092***	(0.030)	0.052	(0.115)	0.089	(0.127)
NREM (-2)	0.126***	(0.046)	0.226*	(0.136)	0.254*	(0.153)
NREM (-3)	0.066**	(0.026)	0.181*	(0.093)	0.200**	(0.098)
NREM (-4)	-0.086	(0.053)	-0.084	(0.204)	-0.073	(0.223)
$NFDI^2(-1)$	0.001	(0.002)	0.003	(0.003)	0.003	(0.003)
$NFPI^2(-1)$	-0.019	(0.049)	0.007	(0.042)	0.016	(0.049)
$NREM^2(-1)$	-0.09***	(0.020)	-0.023	(0.017)	-0.023	(0.017)
Adjusted R-squared		0.753		0.797		0.79
Instrument rank				26		22
J-statistic				8.841		9.984
Prob(J-statistic)				0.183		0.125

NNRES, NFDI, NFPI and NREM stand for non-residential real estate investments, foreign direct investments, foreign portfolio investments flows and diaspora remittances all scaled by non-residential capital stock. The asterisks ***, **

and * indicate significant test statistics at the 99%, 95% and the 90% level of confidence, respectively.. The standard errors and the weighting matrices were computed using period weight HAC estimator as explained above. The RECESSION DUMMY denotes a dummy variable that stands for the recess period.

Nevertheless, and perhaps the most significant contribution of controlling for the recession period was the association between non-residential investments and remittances. If we recall from the previous specifications, when the recess period is not controlled for, the results were generally indicative of immaterial associations apart from only one quarter under the RE model. However, when we control for the global economic downturn, remittances emerge as being significantly associated with non-residential investment in the second and third quarter after the inflow, the association is statistically significant and positive on all the three models. However, the impact multiplier effect still remains negative, although not consistently.

On the whole, if we assume that these associations imply causation based on financial liberalization theory, then we have sufficient evidence showing that FDI and remittances inflows do not result in any favourable outcomes on the non-residential market in initial periods, but in the later periods, the effects are significant and positive.

This evidence is in agreement with statistical data on sectorial distribution of FDI, showing substantial amounts of FDI ending up in the manufacturing and service sectors in most African countries (see UNCTAD (2003) for Botswana and Mwega and Ngugi (2006) for Kenya, among others). It can be stated confidently that the inflow of FDI into these sectors necessitates or motivates construction of commercial or industrial buildings. However, very few studies have analysed and produced empirical evidence that link non-residential investments to FDI inflows.

On the other hand, remittances are rarely examined in terms of non-residential investments. Perceptibly, since remittance is a private transfer that is mostly meant for households, few empiricists have investigated its association with commercial or industrial real estate investments. Therefore, these findings provide a unique foundation for further studies in non-residential investments and foreign capital inflows, not only in Africa's markets but in markets beyond the African region.

3.7 Chapter summary

This chapter laid out the research philosophy on which the search for justified true beliefs, or the truth, is based. It illustrates the essentials for a positivist paradigm and provides justifications that qualify this enquiry to be identified with the positivist research philosophy. We then proceeded to analyse the theoretical underpinnings that guides the hypothesised relationships between the two classes of variables in this study and provide guidelines that directed construction of the empirical estimation equations. Basically, we combined both financial liberalization theoretical frameworks by McKinnon (1973) and Shaw (1973) with the investment behaviour framework by Bond and Meghir (1994) to derive plausible econometric specifications.

We then applied the derived empirical equations on the data from five Africa countries, namely: Botswana, Kenya, Morocco, Namibia and South Africa, to understand underlying relationships between residential and non-residential real estate investments, respectively, and foreign capital inflows. The analysis carried out in this chapter is the panel regression analysis, involving pooled models which stack all data together and estimates it as a single unit, fixed effect models in which individual-specific time invariant effects are correlated with the regressors and the random effect models where the individual-specific time invariant effects are pure stochastic disturbances.

For a check of robustness, we estimated the entire three groups of models using the feasible generalized least square estimator (FGLSE) for the pooled models and the iterated efficient generalized method of moments for the fixed and random models. The models were appropriately instrumented and the Sargan test for the validity of over-identifications together with the Hausman specification test were used to ascertain the general suitability of the FE and RE models.

Generally, the Sargan test indicated that orthogonality conditions were satisfied in all models in this chapter while the Hausman test favoured the RE model in most cases. The results of the panel analyses for both markets revealed little robust and consistent evidence, with a big part of these results being inconsistent; and thus, suggesting inconclusive outcomes. Consequently, we incorporated a dummy variable as a way to

control for the global recession period between 2006 and 2010 and re-estimated all models. This set of results turned out more robust than the earlier set of results.

More specifically, in the residential market, results indicated that FDI has positive associations in the later periods after after their inflow into the recipient country; the impact multiplier or asociations in the earlier periods are not clear. The results for FPI are unclear but for remittances, we can conclude that initial association is negative, but after a lapse of one quarter, the associations become positive, and beyond three quarters from quarter of inflow into the recipient country, the association becomes statistically insignificant.

In other words, the associations between remittances and residential investments are short lived; this suggests that models estimated using annual data are likely to miss-out on some important evidence. In the non-residential market, the results suggest that FDI and remittances inflows do not result in any favourable outcomes in the initial periods, but in the later periods, the effects are significant and positive. For the FPI, the results are inconsistent, and thus, inconclusive.

It is important to acknowledge that regression analysis on its own does not imply causality unless it is backed by theory and causality tests. In this particular case, the structural model can be upheld as the theoretical underpinning to warrant making causality inferences but the inference would be sounder when causality tests are done. Therefore, we proceed to undertake causality tests for each country, separately, to understand the underlying causal relationships that may differ from country to country.

Furthermore, it appears that grouping countries together as a panel failed to reveal the true association of investments and FPI. It seems that overall effect of FPI is "elusive". Perhaps a more focused study where every individual country is examined on its own would provide better results. In addition, it is also possible that inconclusive FPI association and impact multiplier effects are caused by structural breaks in the relationships. Perhaps, the associations, and therefore the effects, shift with the changes in the amount of inflows received.

To address these concerns raised above, we incorporate threshold structural breaks analysis after the causality tests in the next chapter. In addition, the evidence that indicates remittances to be critical to non-residential real estate markets could be seen as a surprise unless there is an understanding of the possible channels through which a private transfer meant for households (such as remittances) could influence commercial and industrial investments. This proposition is explored in the fifth chapter under tests for the significant channels by which foreign capital inflows impact real estate investments.

CHAPTER FOUR

EFFECTS OF FOREIGN CAPITAL INFLOWS ON REAL ESTATE INVESTMENTS

4.1 Introduction

This chapter introduces the empirical tests implemented in this section, presents relevant literature, and discusses the tests and their attendant results. Tests in this chapter are part of necessary analyses, which together with tests in the previous chapter seek to establish the effects of foreign capital inflows on real estate markets as required by the first research question of this study.

Chapter three examined possible associations between foreign capital inflows and real estate markets using panel data analysis. In this chapter, we focus on the direction of causality and possible structural breaks due to the size of the inflows received. We conduct two tests: the vector autoregressive test for causality relationships and Bai-Perron test for threshold of capital flows. Before implementing these tests, we run unit root and stationarity tests as prerequisite diagnostic tests.

4.2 Background of the Empirical Tests

A good understanding of an economic system or market should include a clear explanation of how key variables affect each other. In other words, a description of the nature of the relationship between variables is incomplete unless the direction of causality is established. In some cases, whenever one seeks to explain a major part of an economic system or market, it is common to formulate and estimate the *behavioural equations* or a system of equations known as 'simultaneous equation models' (SEMs) (Asteriou and Hall, 2011).

However, some economists strongly believe that the process of identification, which involves distinguishing some variables in the system as endogenous or exogenous, is not objective and scientific. In particular, Sims (1980) argues that the restrictions needed for identification are extremely *ad-hoc* and subjective. In its place, he suggests the Vector Auto-regression (VAR) models.

In a VAR, a system of equations is estimated without the arbitrary categorization of variables. All variables are presumed to be endogenous. This simplistic approach has made VAR modelling more popular in financial studies than SEMs. It is now common to find the VAR approach being used in system estimation and forecasting. One such application is testing of a hypothesis that some variables do not cause some other variables – the causality test. In this type of test, different dependent variables are regressed against their lags in a simple joint F-test for the joint significance of the lagged coefficients. As with most linear regressions, the lagged coefficients are assumed to be constant for the whole sample period. In this chapter, we follow the VAR formulation as a test of causality.

In practice, however, causal relationships may not necessarily be constant and smooth as the VAR may suggest. The underlying relationships between the variables could easily change as time goes by or as the level (size or threshold) of a specific explanatory variable changes. This means that VAR formulations with constant coefficients may at a time fail to identify some causality relationships. If this scenario prevails, structural break analysis is usually employed to identify significant change in the relationship between variables that could otherwise be hidden or masked under a VAR.

Structural break tests thrive on the notion that assuming parametrical constancy in a model over a long period is highly restrictive and not entirely consistent with reality. Maddala and Kim (1998) observe that models with constant coefficients often perform poorly in the real world. As such, they advise that an examination of possible structural breaks can instil realism in economic modelling and analysis.

In this particular study, it is unlikely that in a given country, all international capital inflows have constant relationships with real estate investments for the whole period of the study and irrespective of the amount of foreign capital inflow received. Instead, it is more likely that the relationships between real estate investments and foreign capital inflows are non-linear and change whenever the foreign capital inflows reach a certain threshold amount.

That being the case, we use the structural breaks approach to identify critical flows of each individual international capital flow in each market (residential and non-residential). These critical levels, also called 'threshold capital flows', represent the points where associations between the foreign capital flow and the real estate market suddenly change significantly. In this study, we adopt the sup-Wald type of test for multiple structural changes, as proposed by Bai and Perron (1998a)

4.3 Unit Root Tests

Traditionally, any empirical work based on time series data has an underlying assumption that the series are stationary; that is, it is not driven excessively by their own past values. A time-series is a random variable ordered in time and also an outcome of a stochastic process. A series is then said to be stationary when the joint distribution of its values at any point in time remains unchanged.

Put differently, a time-series derived from a stochastic process is said to be strictly stationary if the joint probability structure remains unchanged when shifted in time by an arbitrary value (Maddala and Kim, 1998). This means that its first moment (mean) and second moment (variance) are constant over time and covariance between two time periods depends only on the distance between the times and not on the actual time (Gujarati, 2003). Symbolically, suppose Y_t is a time series, then it is stationary, if:

$$Mean: E(Y_t) = \mu \quad (21a)$$

$$Variance: var(Y_t) = E(Y_t - \mu)^2 = \sigma \quad (21b)$$

$$Covariance: \gamma\kappa = E(Y_t - \mu)(Y_{t+\kappa} - \mu) \quad (21c)$$

Where $\gamma\kappa$, is the covariance between values at time t and at lag κ.

The most popular stationary stochastic process is the pure random process, also called the 'white noise'. It is characterised as a discrete process that is independent and identically distributed (IID) with a zero mean, a constant variance and without a memory. In general terms, however, most financial series evolve according to a simple autoregressive model

with one lag (AR (1)). In mathematical terms, most series evolves from their previous value in a way similar to Y_t below, where:

$$Y_t = \emptyset Y_{t-1} + u_t \qquad (22)$$

In this case, and in terms of stationarity of Y_t, if Y_{t-1} is the value of the series one period ago, and u_t is a Gaussian error term; that is to say that the error term is IDD, with zero mean and constant variance; then this series will be a white noise series if $\emptyset = 0$. However, when $\emptyset = 1$ (unit), the series is regarded as a random walk, which implies that current value of the series depends only on its previous value plus a random shock, and as such, the series of Y_t is said to have a unit root.

Ordinarily, a series is stationary when $|\emptyset| < 1$. It has unit root, hence, it is non-stationary when $\emptyset = 1$. In extreme cases, a series is 'unstable or explosive' when $\emptyset > 1$. When non-stationary series are used in a regression process, they result into meaningless results, unless the variables are trending (cointegrated). Yule (1926) was the first to identify this phenomenon. He called regression of non-stationary and uncointegrated series nonsense or spurious regression, which ought to be avoided. Later, the works of Newbold and Granger (1974), Granger (1981), and Engle and Granger (1987) have since proven Yule (1926) correct and advise that before any meaningful empirical analysis is undertaken, the presence of unit root or stationarity must be examined.

There are two principal techniques of spotting stationarity: subjective judgment based on graphical depictions of the series in forms of correlograms or line graphs, and formal empirical tests for unit root (or stationarity). The correlograms are graphical plots of an autocorrelation function (ACF) and several lag lengths of the series. ACF at any particular lag is computed as the ratio of the sample covariance and the sample variance. For a pure white noise, the autocorrelation values hover around zero. But for non-stationary series, the autocorrelation's coefficients are always very high and may exhibit a diminishing size as the lag lengthens.

The most popular formal test is Dickey-Fuller (DF) test and the augmented-Dickey-Fuller (ADF) developed by Dickey and Fuller (see Dickey and Fuller (1979)). They are called unit root tests because they simply examine whether the parameter $\emptyset$ in equation (22) is equal to a unit in equation (i.e., if $\emptyset = 1$) or otherwise. The tests start by subtracting Y_{t-1} from both sides of equation (22), to get a relationship that is tenable for an ordinary empirical estimation. That is:

$$Y_t - Y_{t-1} = (\emptyset - 1)Y_{t-1} + u_t \quad (23)$$

If $(\emptyset - 1) = \rho$, then equation (23) collapses to:

$$\Delta Y_t = \rho Y_{t-1} + u_t \quad (24)$$

A test for a null hypothesis of $H_0: \rho = 0$, against an alternative hypothesis of $H_0: \rho < 0$, is the conventional DF hypothesis test. If a series is a pure random walk model then $\emptyset = 1$ and $\rho \approx 0$. Dickey and Fuller (1979) propose a way of eliminating a likely deterministic trend and for controlling how a series moves upward or downward (drift) around its own mean. Specifically, the DF tests with a drift parameter and deterministic trend take the forms:

$$\Delta Y_t = \alpha_0 + \rho Y_{t-1} + u_t \quad (25)$$

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \rho Y_{t-1} + u_t \quad (26)$$

Where α_0 controls for the drift and helps to eliminate the deterministic trend. When stated in these versions, the DF test for stationarity is then a t-test on the coefficient of the lagged regressor as shown in the above model. The difference, however, is that the test statistics are not compared to the conventional student distribution statistics. Instead, specially compiled critical values called the 'tau' statistics by Dickey and Fuller are used. In financial time series, nonetheless, it is also common to have an error term u_t (as in the models (24-25) above) that is not IID. In some cases, the errors are highly correlated amongst themselves. This is a distinctive case of serially correlated errors.

To address the serial correlation in the errors, Dickey and Fuller (1979) suggested another set of tests where the test models (24–25) are augmented with lagged terms of the regressand. These form the Augmented Dickey Fuller (ADF) tests. In particular, one can estimate:

$$\Delta Y_t = \rho Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-i} + u_t \quad (27)$$

$$\Delta Y_t = \alpha_0 + \rho Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-i} + u_t \quad (28)$$

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \rho Y_{t-1} + \sum_{i=1}^{p} \beta_i \Delta Y_{t-i} + u_t \quad (29)$$

In practice, however, irrespective of the test one choses between DF and ADF, it is also important to make a decision on whether to include a deterministic trend, stochastic trend or both and the appropriate lag length. A common practice is to run the entire three models and use information criteria to choose the right lag length.

Another attempt at dealing with serial correlations in the error terms was by Phillips and Perron who proposed a non-parametric technique (Phillips and Perron, 1988). Generally speaking, the Phillip-Perron (PP) test is a simplification of the ADF test procedure. It allows for a straightforward way of accounting for serial correlation. Specifically, instead of using parametric autoregression to approximate an autoregressive moving average (ARMA) structure of the errors as done in the ADF test, PP uses a non-parametric approach. First, the non-augmented Dickey-Fuller test in equation (27) is estimated, and then the t-values are modified in a certain way so that serial correlation does not affect the asymptotic distribution of the test statistics[20].

[20] The modified t-statistics are computed as:

$$\hat{z}_\rho = z_\rho \left(\frac{\gamma_0}{f_0}\right)^{1/2} - \frac{T(f_0 - \gamma_0)(s.e.(\hat{\rho}))}{2 f_0^{1/2} s} \quad (30)$$

Where, $\hat{\rho}$ is the estimate of ρ, z_ρ is the t-statistics that is obtained as the ratio of ρ and the coefficient standard error $s.e.(\hat{\rho})$, s is the standard deviation of the test regression, γ_0 is the consistent estimate of the error variance of the test equation (46), f_0 is the estimator of the residual spectrum at frequency of zero and T is the total number of observations. However, one still has to make a choice of whether to use the model without constant, with constant only or with both constant and linear trend.

Alternatively, one could use stationarity tests instead of the unity root test. Kwiatkowski, Philips, Schmidt and Shin (KPSS) test (Kwiatkowski *et al.*, 1992) which tests for the null hypothesis that a time series is stationary i.e. $I(0)$, is a common example of a stationarity test. KPSS is called a stationarity test while ADF and PP are called unit root tests because of the way their null hypotheses are stated. Strictly speaking, KPSS is based on the residuals of the OLS regression of the series with exogenous variables being either a constant alone or a constant plus a time trend. After obtaining the residuals, KPSS simply tests whether the variance of the residuals is equal to zero (null hypothesis) or greater than zero (alternative hypothesis)[21].

4.4 Results of the Unit Root Test

We commence the testing by examining the presence of unit root, at the levels, for all variables in five countries. The result is reported in Table 4.1. The significance of this test is to ascertain the admissibility of the data series into the VAR models. It is important that only stationary series are in VAR estimations. Conventionally, when one or more variables have a unit root in a VAR test, the standard asymptotic distribution will not apply for that test and inferences will be seriously misleading (Campbell and Perron, 1991).

We adopt the traditional ADF test and the Philip-Perron (PP) test to control for any possible serial correlation in the errors of the series. These are both unit root tests, and therefore, a null hypothesis of the series having unit root against an alternative hypothesis of the series being stationary is tested.

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[20]KPSS model starts with the equation:

$$Y_t = \boldsymbol{\xi}' \boldsymbol{D_t} + u_t \qquad (31)$$

Where, $\boldsymbol{D_t}$ is the deterministic component which may contain the constant only or constant with a time trend, $\boldsymbol{\xi}$ is a vector of their coefficients and $u_t \sim N(0, \sigma_\varepsilon^2)$; that is, u_t is a pure white noise with innovation variance σ_ε^2 and mean equal to zero. This also implies that u_t is $I(0)$ but may be heteroscedastic. The null hypothesis assumes that Y_t is a $I(0)$ series hence formulated as $H_0: \sigma_\varepsilon^2 = 0$ against the alternative of $H_1: \sigma_\varepsilon^2 > 0$.

Furthermore, from the three possible models for carrying out the above tests, we estimate two models for each test – the one with a constant (stochastic trend) only (labelled 'model 1') and the one with both a constant and a deterministic trend ('model 2'). We do not consider the model with neither a deterministic nor stochastic trend following an argument by Asteriou and Hall (2011), that in reality, such model is quite unlikely to be representative of the true data generation process of a financial series. Lastly, we systematically select an appropriate lag length for every model and every series using the Schwarz Information Criterion.

Generally, we test five series for each country (Botswana, Kenya, Morocco, Namibia and South Africa) and these series are all in their levels, namely: the residential investment ('RES'), non-residential investment ('NRES'), foreign direct investment ('FDI'), foreign portfolio investment ('FPI') and diaspora remittances ('REM). The null hypothesis is tested at 1%, 5% and 10% levels of significance. The results of the two tests, for the two alternative models per test, are shown in Table 4.1. Asterisks indicate the significance of the test statistics.

For Botswana, both ADF and PP tests indicate that residential investment has a unit root because the test statistics for the residential investment are statistically insignificant in both models. Otherwise, stationarity in all other series is established when a more restrictive model 2 is used under both tests. In Kenya, the residential investment and remittances are also found to contain a unit root. However, non-residential investments, foreign direct investment (FDI), and foreign portfolio investment (FPI) do not possess a unit root. In Morocco, the presence of unit root in remittances cannot be rejected but for residential investment, non-residential investment, FDI and FPI, presence of unit root is rejected at the 1% level of significance by both tests.

In the case of Namibia, the null hypothesis is widely rejected and unit root is absent in all series under model 1 using the ADF test, except for FDI. However, when serial correlation is controlled for using the PP test, the series is found to be stationary under both models. For South Africa, the hypothesis of non-stationarity or simply the presence of unit root cannot be rejected for both non-residential investment and remittances. The

unit root is persistent in these series even after accounting for serial correlation under the PP test or even when a more restrictive model 2 is used. When other series are examined using model 2 under the ADF test, unit root is rejected for residential investment, FDI and FPI.

Table 4.1: Results of the ADF and PP Tests

VARIABLE		ADF		PP	
		Model 1	Model 2	Model 1	Model 2
Botswana	RES	-2.31	-2.41	-2.34	-2.38
	NRES	-3.07**	-3.15	-3.07**	-3.15
	FDI	-2.57	-3.62*	-2.48	-3.80*
	FPI	-4.35***	-4.25**	-4.38***	-4.29**
	REM	-4.82***	-4.66***	-5.17***	-4.98***
Kenya	RES	-1.21	-2.71	-1.03	-2.67
	NRES	-2.84**	-5.02***	-2.80**	-5.16***
	FDI	-4.50***	-4.58***	-4.50***	-4.57***
	FPI	-1.06	-5.26***	-1.03	-2.11
	REM	2.55	0.65	1.55	-1.19
Morocco	RES	-4.31***	-6.71***	-6.73***	-10.78***
	NRES	-6.02***	-5.98***	-6.02***	-5.98***
	FDI	-7.14***	-7.03***	-7.19***	-7.07***
	FPI	-7.45***	-5.95***	-5.32***	-5.31***
	REM	-0.94	-2.84	-1.02	-1.78
Namibia	RES	-3.46**	-5.52***	-3.54**	-7.46***
	NRES	-4.33***	-4.34**	-4.33***	-4.35**
	FDI	-2.53	-3.28	-2.88*	-3.29*
	FPI	3.12**	1.20	-0.84	0.55
	REM	-2.66*	-3.25	-2.68*	-3.27
South Africa	RES	-2.92*	-4.17**	-1.51	-0.83
	NRES	-0.23	-1.43	-0.33	-1.68
	FDI	-6.03***	-6.14***	-6.06***	-6.17
	FPI	-3.06**	-3.51**	-5.10***	-5.51***
	REM	-0.44	-2.68	0.16	-2.65

This table reports test statistics of the Augmented Dickey Fuller (ADF) and the Phillip-Perron (PP) unit root tests for quarterly series of the five African countries. The time of the sample varies per country but falls between 2000 Q1 and 2012 Q4. The series are in their level form expressed in the domestic currency of the country. In this table, residential investment is denoted as RES, non-residential investment is designated as NRES, foreign direct investments is symbolized by FDI, foreign portfolio investment is represented by FPI, and diaspora remittances is denoted as REM. The asterisks: ***indicates statistical significance at 1%, **indicates statistical significance at 5% and *indicates statistical significance at 10%.

In summary, the above results simply suggest that in levels, most series have unit root, in fact, only Namibia have series that are all stationary, otherwise, for the other four countries, one or more series have a persistent unit root. In particular, non-stationarity has been established in the residential investment in Botswana, residential investment and

remittances in Kenya, remittances in Morocco and non-residential investment and remittances in South Africa.

Since unit root is present in most of the series, estimating the VAR models and any other linear regression models using variables' series in their level forms is not advisable. Essentially, presence of a series with unit root in a regression model would lead to test statistics whose distribution would be statistically different from a standard normal distribution that is used to make inferences in hypothesis testing.

Literature on econometric analysis, and in particular, on regression and VAR advise that all of variables in a model should be integrated of the same order (Asteriou and Hall, 2011; Gujarati, 2003; Johnson and Dinardo, 1984). For a VAR causality test, Campbell and Perron (1991) and Davidson and MacKinnon (1991) insist that the integration should be of order 0 (zero); that is, all variables must be stationary. Since Table 4.1 shows that not all series met this threshold for all countries, we adopt the transformation proposed by the structural model in chapter three of this study.

In the structural model, all flow variables are scaled with capital stock of the respective market. For residential market models, all flow variables were scaled using residential capital stock and all variables were divided by non-residential capital stock for all non-residential models. The new series obtained were ratios or simply the previous series expressed as fractions of their respective capital stock. Once more, we test the new series for stationarity. By this variable's definition and it being a stock variable, unit root cannot be ruled out in the capital stock itself. That being the case, we use tests that are robust in examining unit root and stationarity while taking account of any serial correlation in the error terms.

We utilise the Kwiatkowski, Philips, Schmidt and Shin (KPSS) method as a stationarity test and the PP test as unit root test. Since the focuses of these tests are different, the null hypotheses are also stated differently. Whereas the null hypothesis for the PP postulates presence of unit root and its rejection implies that the series is stationary, the null for the

KPSS null hypothesis postulates that the series is stationary, and therefore, rejection of the null hypothesis indicates that the series is non-stationary.

So, for a series to be considered stationary the null hypothesis under the PP has to be rejected while the null hypothesis under the KPSS has to be accepted. The results of this analysis are presented below from Tables 4.2 to 4.6. For each country, the residential series and non-residential series are examined by implementing both a model with a constant only (model 1) and another with a constant and a deterministic trend (model 2).

The results for Botswana are presented in Table 4.2 below. In the previous results, unit root in the residential investment was persistent but when it was scaled by residential stock, the KPSS test revealed that the new series is stationary under both models. All the other test variables' series are also stationary or without unit root under one or both tests. This shows that all transformed series are stationary, and therefore, admissible into the VAR and any other regression estimation. This is important since using a non-stationary series in a regression model would produce non-standard asymptotic distributions which would undermine the normal hypothesis testing (Campbell and Perron, 1991).

Table 4.2: Results of the PP and KPSS Tests for Botswana

	PP		KPSS	
	Model 1	Model 2	Model 1	Model 2
		Residential Market		
$RES/RSTOCK$	-1.887	-1.871	0.224	-0.088
$FDI/RSTOCK$	-3.162**	-3.176	0.176	-0.100
$FPI/RSTOCK$	-3.719**	-3.622**	0.127	0.126*
$REM/RSTOCK$	-3.667**	-4.025**	0.472**	0.088
		Non-Residential Market		
$NRES/NSTOCK$	-3.702**	-3.666**	0.138	0.089
$FDI/NSTOCK$	-2.837*	-2.806	0.121	0.108
$FPI/NSTOCK$	-3.582**	-3.370**	0.195	0.163**
$REM/NSTOCK$	-3.666**	-4.420**	0.648**	0.067
GDPRATE	-1.993	-2.336	0.303	0.195**

This table reports test statistics of the Phillip-Perron (denoted as PP) unit root tests and the Kwiatkowski, Philips, Schmidt and Shin (KPSS) stationarity test for Botswana. RES, FDI, FPI and REM stand for residential real estate investments, foreign direct investments, foreign portfolio investments flows and diaspora remittances whereas NNRES, RSTOCK and NSTOCK stand for residential capital stock and non-residential capital stocks, respectively. Results in the column labelled "Model 1" indicate that the estimated model had a constant only whereas the column labelled "Model 2" indicates that the estimated model had a constant as well as a deterministic trend. The asterisk ***, **, and * indicate significance of the test statistics at 1%, 5% and 10%, respectively.

In Kenya, when the series were still in levels and untransformed, there were unit roots in the residential investment and remittances series (see Table 4.1). However, Table 4.3

shows that after scaling residential investment and remittances with residential capital stock, the unit roots are eliminated. All other variables' series including additional control variables are also found to be stationary by the KPSS test or without unit root by the PP test. This implies that implementing the VAR and any other regression analysis using the transformed series would produce asymptotic distributions which are standard and hence inferences made concerning the model parameters would be valid.

Table 4.3: Results of the PP and KPSS Tests for Kenya

	PP		KPSS	
	Model 1	Model 2	Model 1	Model 2
Residential Market				
$RES/RSTOCK$	-5.167***	-5.294***	0.228	0.086
$FDI/RSTOCK$	-4.424***	-4.458***	0.193	0.122*
$FPI/RSTOCK$	-2.122	-2.424	0.299	0.090
$REM/RSTOCK$	-2.215	-4.946***	0.681**	0.186**
$GVA/RSTOCK$	-0.259	-3.564**	0.732**	0.142*
Non-Residential Market				
$NRES/NSTOCK$	-4.995***	-4.864***	0.102	0.092
$FDI/NSTOCK$	-4.467***	-4.475***	0.173	0.122*
$FPI/NSTOCK$	-1.943	-2.110	0.333	0.093
$REM/NSTOCK$	-2.290	-3.838**	0.656**	0.146**
$GVA/RSTOCK$	-1.143	-3.518*	0.735***	0.135*
GDPGAP	-7.602***	-7.727***	0.500**	0.500**
GDPRATE	-3.623**	-3.653**	0.239	0.087
INT	0.285	-2.140	0.682**	0.048

This table reports test statistics of the Phillip-Perron (denoted as PP) unit root tests and the Kwiatkowski, Philips, Schmidt and Shin (KPSS) stationarity test for Kenya. Here, RES, FDI, FPI and REM stand for residential real estate investments, foreign direct investments, foreign portfolio investments flows and diaspora remittances whereas NNRES, RSTOCK and NSTOCK stand for non-residential real estate investment, residential capital stock and non-residential capital stocks, respectively. GVA stands for gross value added by the construction sector, GDPGAP is the GDP gap, GDPRATE is the GDP growth rate and INT is the nominal interest rate. The asterisk ***, **, and * indicate significance of the test statistics at 1%, 5% and 10%, respectively.

In the previous analysis of unit root tests of the series for Morocco, remittances were found to be non-stationary by all models and tests. However, after scaling down remittances using residential and non-residential capital stocks, the resultant series for remittances and all other variables are found to be stationary as per the KPSS tests or without unit root according to the PP test results. These results suggest that all variables for Morocco are stationary series after scaling. The importance of these findings is that the VAR and any other regression estimation using the transformed series would produce

valid test results; otherwise, presence of non-stationary series in a regression model would distort statistical inferences (Campbell and Perron, 1991).

Table 4.4: Results of the PP and KPSS Tests for Morocco

	PP		KPSS	
	Model 1	Model 2	Model 1	Model 2
		Residential Market		
$RES/RSTOCK$	-10.336***	-11.843***	0.387*	0.131*
$FDI/RSTOCK$	-7.226***	-7.096***	0.064	0.051
$FPI/RSTOCK$	-5.321***	-5.303***	0.111	0.073
$REM/RSTOCK$	-0.584	-2.088	0.648**	0.109
$GVA/RSTOCK$	-0.770	-2.347	0.671**	0.074
		Non-Residential Market		
$NRES/NSTOCK$	-5.762***	-5.893***	0.220	0.090
$FDI/NSTOCK$	-7.102***	-6.992***	0.057	0.057
$FPI/NSTOCK$	-5.347***	-5.343***	0.117	0.071
$REM/NSTOCK$	-0.905	-1.865	0.534**	0.104
GDPRATE	-2.876*	-2.898	0.230	0.126

This table reports test statistics of the Phillip-Perron (denoted as PP) unit root tests and the Kwiatkowski, Philips, Schmidt and Shin (KPSS) stationarity test for Morocco. The asterisk ***, **, and * indicate significance of the test statistics at 1%, 5% and 10%, respectively. RES, FDI, FPI, REM, NNRES, RSTOCK and NSTOCK stand for residential real estate investments, foreign direct investments, foreign portfolio investments flows, diaspora remittances, non-residential real estate investment, residential capital stock and non-residential capital stocks, respectively

As in the previous tests using untransformed variables, all series for Namibia were stationary because they rejected the unit root hypothesis. After necessary transformation, the KPSS test, using model 1, still finds all series to be stationary; hence, all variables for Namibia are once again found to be stationary. This means that using the transformed variables in the VAR would produce valid test statistics.

Table 4.5: Results of the PP and KPSS Tests for Namibia

	PP		KPSS	
	Model 1	Model 2	Model 1	Model 2
		Residential Market		
$RES/RSTOCK$	-6.171***	-6.099***	0.105	0.080
$FDI/RSTOCK$	-4.202***	-4.009**	0.139	0.138*
$FPI/RSTOCK$	-1.971	-1.667	0.154	0.146*
$REM/RSTOCK$	-3.248**	-3.596*	0.350*	0.090
		Non-Residential Market		
$NRES/NSTOCK$	-4.098***	-4.337**	0.222	0.081
$NFDI/NSTOCK$	-4.064***	-4.263***	0.200	0.180**
$NFPI/NSTOCK$	-1.570	0.325	0.280	0.224***
$NREM/NSTOCK$	-2.950*	-3.407*	0.378*	0.092

This table reports test statistics of the Phillip-Perron (denoted as PP) unit root tests and the Kwiatkowski, Philips, Schmidt and Shin (KPSS) stationarity test for Namibia. The asterisk ***, **, and * indicate significance of the test statistics at 1%, 5% and 10%, respectively. RES, FDI, FPI, REM, NNRES, RSTOCK and NSTOCK stand for

residential real estate investments, foreign direct investments, foreign portfolio investments flows, diaspora remittances, non-residential real estate investment, residential capital stock and non-residential capital stocks, respectively.

For South Africa, the KPSS test found that the null hypothesis that assumes that a series is stationary cannot be rejected for all variables when the less restrictive model 1 is used. Initially, when the series were in levels and not transformed, non-residential investment and remittances were found to possess unit root. Scaling with capital stock, nonetheless, seems to eliminate the unit root in these series. Since all series were stationary, the VAR and other linear regression models suggested in this chapter can progress without concerns over a possibility of invalid inferences.

Table 4.6: Results of the PP and KPSS Tests for South Africa

	PP		KPSS	
	Model 1	Model 2	Model 1	Model 2
		Residential Market		
$RES/RSTOCK$	-1.054	-1.552	0.313	0.153*
$FDI/RSTOCK$	-6.973***	-6.912***	0.054	0.050
$FPI/RSTOCK$	-5.790***	-6.091***	0.268	0.089
$REM/RSTOCK$	-1.472	-1.208	0.198	0.152*
		Non-Residential Market		
$NRES/NSTOCK$	-1.572	-1.566	0.140	0.143*
$NFDI/NSTOCK$	-6.741***	-6.675***	0.047	0.047
$NFPI/NSTOCK$	-5.461***	-5.667***	0.237	0.098
$NREM/NSTOCK$	-2.398	-2.303	0.260	0.217***

This table reports test statistics of the Phillip-Perron (denoted as PP) unit root tests and the Kwiatkowski, Philips, Schmidt and Shin (KPSS) stationarity test for South Africa. The asterisk ***, **, and * indicate significance of the test statistics at 1%, 5% and 10%, respectively. RES, FDI, FPI, REM, NNRES, RSTOCK and NSTOCK stand for residential real estate investments, foreign direct investments, foreign portfolio investments flows, diaspora remittances, non-residential real estate investment, residential capital stock and non-residential capital stocks, respectively.

According to Wang (2009), a $\sim I(0)$ series has no root on or inside the unit circle while Maddala and Kim (1998) remind us that a stationary series or $\sim I(0)$ series has no unit root and is neither explosive nor unstable like a non-stationary series. Only such a series as these can be used in a regression analysis without producing what, at times, is called nonsense regression or spurious regression (Johnson and Dinardo, 1984). Since unit root in all variables vanished after the transformation, we use only such transformed variables in the VAR and structural breaks analysis.

4.5 The Vector Autoregressive Model

Although much as regression analysis is an indispensable method of understanding the relationship that exists between two variables, it fails to show explicitly a variable that affects the other variable first. Fortunately, modern time-series modelling techniques allow us to find out which variable's effect comes first and the nature of that effect. These are generally called 'causality tests'. Basically, variable X causes variable Y if the past values of variable X can help explain variable Y because time does not run backwards (Granger, 1969; Koops, 2006).

Among key contributors to this literature is Granger (1969), and thus, the common phrase, 'Granger causality test' to refer to a bivariate causality analysis. Later, Sims (1980) introduced a multivariate version of the Granger causality tests. Sims's (1980) work develops from the simultaneous equation modelling work of the Cowles Commission. Sims is also credited with the use of both lagged and leading values of all variables in a model. The rationale for including leading variables is that, if Y_t causes X_t, then we can expect a significant relationship between Y and leading values of X. The product of this presentation is a system of equations called vector autoregression (VAR) equation.

We can apply the VAR causality test to establish multivariate causality between real estate investments and the international capital flows. Generally speaking, a VAR model is a set of equations in which all variables together with their lags, are explanatory variables of all other variables in the system. Essentially, this forms a system of equations similar to simultaneous equation models (SEM), but the identification of some variables as either endogenous or exogenous is what differentiates the two classes of models.

According to Sims (1980), if there is simultaneity among several variables, then all of them should be treated in the same way, without distinctions. He suggests the formulation of what is now called 'the reduced form' VAR in which endogeneity is innovatively addressed so that the equations become testable. In a VAR that is modelled along the lines of the Sims' (1980) advice, all of the variables are treated as being endogenous but

the leading values are always dropped from the equation because using more regressors leads to a great loss of degrees of freedom.

In our real estate market set-up, we use the VAR to test for likely causality between real estate investments and the three foreign capital inflows. Therefore, we form four equations structural VAR in the following way:

$$y_t = b_{10} + \sum_{j=1}^{p} b_{1yj} y_{1t-j} + \sum_{j=0}^{p} b_{11j} x_{1t-j} + \sum_{j=0}^{p} b_{12j} x_{2t-j} + \sum_{j=0}^{p} b_{13j} x_{3t-j} + e_{1t} \quad (32)$$

$$x_{1t} = b_{20} + \sum_{j=1}^{p} b_{2yj} y_{t-j} + \sum_{j=1}^{p} b_{21j} x_{1t-j} + \sum_{j=0}^{p} b_{22j} x_{2t-j} + \sum_{j=0}^{p} b_{23j} x_{3t-j} + e_{2t} \quad (33)$$

$$x_{2t} = b_{30} + \sum_{j=1}^{p} b_{3yj} y_{1t-j} + \sum_{j=0}^{p} b_{31j} x_{1t-j} + \sum_{j=1}^{p} b_{32j} x_{2t-j} + \sum_{j=0}^{p} b_{33j} x_{3t-j} + e_{3t} \quad (34)$$

$$x_{3t} = b_{40} + \sum_{j=1}^{p} b_{4yj} y_{1t-j} + \sum_{j=0}^{p} b_{41j} x_{1t-j} + \sum_{j=0}^{p} b_{42j} x_{2t-j} + \sum_{j=1}^{p} b_{43j} x_{3t-j} + e_{4t} \quad (35)$$

In these equations, y_t is the real estate investment, x_{1t} is the foreign direct investment, x_{2t} is the foreign portfolio investment and x_{3t} is the amount of remittances from abroad. e_{1t}, e_{2t}, e_{3t} and e_{4t} are the error terms for the respective equations. In the same way, b_{10}, b_{20}, b_{30} and b_{40} are respective constants of the equations. The four dependent variables are also independent variables in the three other equations, which means that y_t, x_{1t}, x_{2t} and x_{3t} are endogenous. In this type of set-up, the error terms are normally highly correlated with the endogenous variables and the structural VAR cannot be estimated unless endogeneity is treated in some way.

If we put all endogenous variables on the left side and write the structural models in matrix form, we get:

$$\begin{bmatrix} 1 & b_{110} & b_{120} & b_{130} \\ b_{210} & 1 & b_{220} & b_{230} \\ b_{310} & b_{320} & 1 & b_{330} \\ b_{410} & b_{420} & b_{430} & 1 \end{bmatrix} \begin{bmatrix} y_t \\ x_{1t} \\ x_{2t} \\ x_{3t} \end{bmatrix} = \begin{bmatrix} b_{10} \\ b_{20} \\ b_{30} \\ b_{40} \end{bmatrix} + \begin{bmatrix} b_{1yj} & b_{11j} & b_{12j} & b_{13j} \\ b_{2yj} & b_{21j} & b_{22j} & b_{23j} \\ b_{3yj} & b_{31j} & b_{32j} & b_{33j} \\ b_{4yj} & b_{41j} & b_{42j} & b_{43j} \end{bmatrix} \begin{bmatrix} \sum_{j=1}^{p} y_{1t-j} \\ \sum_{j=1}^{p} x_{1t-j} \\ \sum_{j=1}^{p} x_{2t-j} \\ \sum_{j=1}^{p} x_{3t-j} \end{bmatrix} + \begin{bmatrix} e_{1t} \\ e_{2t} \\ e_{3t} \\ e_{4t} \end{bmatrix} \quad (36)$$

Taking the inverse of the coefficient matrix on the left hand side and pre-multiplying each term on the right hand side with this inverse, we get:

$$\begin{bmatrix} y_t \\ x_{1t} \\ x_{2t} \\ x_{3t} \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \alpha_3 \\ \alpha_4 \end{bmatrix} + \begin{bmatrix} \psi_{1yj}(L) & \psi_{11j}(L) & \psi_{12j}(L) & \psi_{13j}(L) \\ \psi_{2yj}(L) & \psi_{21j}(L) & \psi_{22j}(L) & \psi_{23j}(L) \\ \psi_{3yj}(L) & \psi_{31j}(L) & \psi_{32j}(L) & \psi_{33j}(L) \\ \psi_{4yj}(L) & \psi_{41j}(L) & \psi_{42j}(L) & \psi_{43j}(L) \end{bmatrix} \begin{bmatrix} \sum_{j=1}^{p} y_{1t-j} \\ \sum_{j=1}^{p} x_{1t-j} \\ \sum_{j=1}^{p} x_{2t-j} \\ \sum_{j=1}^{p} x_{3t-j} \end{bmatrix} + \begin{bmatrix} v_{1t} \\ v_{2t} \\ v_{3t} \\ v_{4t} \end{bmatrix} \quad (37)$$

Where (L) is the lag operator. The new VAR formed is a reduced-form VAR or unrestricted VAR and can be estimated using the ordinary least square (OLS) or maximum likelihood method (Davidson and MacKinnon, 1991).

To specify a plausible, reduced-form VAR model, one has to know the variables to be considered as endogenous, how they should be transformed, and a suitable lag order to be adopted. We chose to rely on the theoretical framework and empirical equations laid out in the previous chapter. Specifically, the equations imply that the roles of foreign capital inflows in a domestic market should be examined in the context of the market size; that is, flow variables should be scaled by capital stock. The use of a theory-driven VAR is supported by the experience of empirical researchers who, for instance, argue that a VAR grounded on theory is an efficient way of confronting parametric uncertainty that is associated with wrongly specified structural models (Waggoner and Zha, 2012).

For both residential and non-residential real estate market, we scale all variables using their respective capital stock and allow a long lag order to capture the dynamic nature of investments and test for a possibility that effects of foreign capital flows are temporal not just instantaneous (see the results of the previous chapter). To set the appropriate lag order, we use the Akaike Information Criteria (AIC), Schwarz Information Criterion (SIC) and diagnostics concerning autocorrelation and heteroscedasticity ((Asteriou and Hall, 2011).

We also acknowledge that integration with the global markets is bound to show discrepancies from one national real estate market to another. As such, the effect of the 2007 global financial crisis is likely to differ across countries. We use recess dummies and other exogenous variables only when imperative to control for business cycles and short-term macroeconomic shocks.

In most financial liberalization and international capital flows studies, it is also common to scale investments and foreign capital using gross domestic product (GDP) rather than using capital stock. (Giuliano and Ruiz-Arranz, 2009; Kose *et al.*, 2003; Levchenko *et al.*, 2009). In these, the authors assume that effects of foreign capital flows can be examined with regard to the size of the economy rather than the market-size.

The fact that data on GDP is readily available whereas data on capital stocks can only be imputed could be a major impetus to using GDP as a scaling factor According to Gujarati (2003), model building, whether informed by theory, introspection or prior empirical work, should ensure that the essence of the subject matter under study is captured. In a situation of two competing models, Gujarati recommends that both models should be estimated and results subjected to a post-mortem against the criteria of a good model so that an adequate one is chosen.

In practice, however, rather than rejecting a whole set of results because the model estimated is less adequate than the other, when both models perform well, the two sets of results are interpreted together for robustness of the results. Given that both capital stock scaling (market size approach) and GDP scaling (economy size approach) are both acceptable investment models, we implement both specifications to test for robustness. This means that after estimating all VAR models in which capital stock is used as a scaling variable, we re-estimate the same relationships but instead of capital stock, we use GDP. Consistent results across the two specifications are pointed out as robust evidence of the estimated relationship

Still, the assumption of parametric constancy inherent in the VAR models means that some of the robust results are not as per the *a priori* expectations. Besides, not all results are consistent. To address these two issues, we implement the threshold capital flow test. As argued in section 4.6, threshold capital flow test, helps to identify points along the size of capital inflows where parameters shift. Next we discuss the Bai-Perron threshold test and how it is implemented.

4.6 Structural Breaks and Threshold Capital Flow Model

As explained above, a further analysis of possible structural changes is necessary to reveal threshold or critical capital flows. Normally, structural change methodologies are used to detect points of shifts in the parameters, which provide much more understanding of the relationships between variables than in traditional regression models or VAR models. In this study, for example, we assume that when specific foreign capital inflows exceed a certain amount(s), their relationship with real estate investments (residential and non-residential investment) changes significantly.

However, to isolate the breakpoints in such a manner demands that the test should first allow variables to be sorted in a certain order such that the capital flow, in which breaks are to be examined, increases or decreases systematically, without interfering with overall multivariate relationship. The test should also permit coefficients for a set of variables to remain constant while coefficients for the variables of interest are allowed to vary (partial structural breaks). On top of all these, for the test statistics to provide meaningful inferences, these should also provide formal significance tests.

In 1998, Bai and Perron significantly changed the literature of structural breaks. They developed a sup-Wald test for multiple structural changes, which can identify the unknown break dates in a model, date them, and provide significance checks. The most interesting characteristic of this test is that it can easily be modified to reveal threshold or critical values of variables in the model (Bai and Perron, 1998a). Here, multiple structural changes in a multivariate linear relationship are identified endogenously under an assumption of partial structural change.

Thus, a subset of the model parameters is held constant to permit estimation of breaks associated with the other subset that is allowed to change. This approach has been applied in financial studies to date integration of world equity markets (Bekaert *et al.,* 2002) and to analyse breaks on stock market volatility (Banerjee and Urga, 2005; Cuñado *et al.,* 2004), among others.

We implement this formulation in estimating threshold or critical flows for each foreign capital flow in each country. First, we formulate the model so as to reveal break dates and then follow the guidelines of Bai and Perron (1998) to obtain threshold capital flows.

Following the work of Bai and Perron, the multivariate linear relationship between real estate investment and foreign capital flows can be written as:

$$Y_t = \boldsymbol{M}_t'\boldsymbol{\beta} + \boldsymbol{Z}_t'\boldsymbol{\delta}_j + u_t \qquad \text{where } j = 1, \dots, m+1 \tag{38}$$

In this equation, Y_t is the real estate investment (either residential or non-residential) $\boldsymbol{M}_t$ is a $p \times 1$ vector of all variables including control variables and a constant except variables of interest that are placed in $\boldsymbol{Z}_t$; therefore, $\boldsymbol{Z}_t$ is a $q \times 1$ vector of variables of interest. All covariates are $\sim I(0)$. If the model (38) has m breaks then the number of regimes is $m+1$ regimes, and since $\boldsymbol{\beta}$ and $\boldsymbol{\delta}_j$ are vectors of coefficients, the number of coefficients in $\boldsymbol{\beta}$ is equal to the number of variables in $\boldsymbol{M}$ while the number of coefficients in $\boldsymbol{\delta}_j$ is equal to the number of regimes; therefore $j = 1, \dots, m+1$. u_t is the white noise error term with a variance[22] that needs not be constant.

Since the purpose of implementing the Bai-Perron multiple structural breaks technique is to identify possible critical flows along the causal relationships between foreign capital flows and real estate investments (residential and non-residential, estimated separately). It is obligatory that the formulation of the multivariate regression model (38) should follow the specifications adopted in the VAR models so as to reveal breaks in the causal relationship.

Specifically, we estimate the threshold capital flows in the VAR models where residential or non-residential investment is regressed on foreign capital inflows; that is, investment is the dependent variable and foreign capital flows are the explanatory variables. The

[22] Breaks in the variance are allowed provided they occur only at breakpoints of parameters.

advantage of this formulation is that the model specification is theory-driven; and therefore, it is both plausible and parsimonious.

The challenge, however, is that the regression model forms an autoregressive distributed lag (ADL). This class of models often suffer from autocorrelation because of the lagged dependent variable being used as part of explanatory variables (Baldagi, 2008; Cameroon and Trivedi, 2005; Johnson and Dinardo, 1984). In the words of Asteriou and Hall (2011), it is of great importance to test for autocorrelation first before estimating an ADL model. For that reason, we test for autocorrelation in the linear model first which provides justification of the type of linear estimator to be used in the Bai-Perron test.

Since our interest is to estimate threshold capital flows, we modify the functional form of our equations in line with the Bai and Perron (2003a). In particular, we first sort all series such that the threshold variable series is in an ascending order and then estimate the linear regression model using a type of least square estimator that addresses autocorrelation. In the model, investment is the dependent variable and the independent variables are foreign capital inflows and all control variables adopted in the corresponding VAR specification. The coefficient estimates and goodness of fit among other statistical estimates, for the re-ordered/sorted model are generally similar to the VAR estimates (for each market) since ordering series do not interfere with the underlying relationships.

We perform the Bai-Perron test for residential and non-residential markets separately for the five countries: Botswana, Kenya, Morocco, Namibia and South Africa. But first, we carry out the Ljung-Box Q test of autocorrelation because it allows one to test for higher-order (autoregressive process order (AR (p)) serial correlation (Asteriou and Hall, 2011). In this test, Ljung-Box Q-statistics are computed with their associated probability

distributions at every lag. The Q-statistics[23] are the test statistics for the null hypothesis that no serial correlation exists up to the order equivalent to the lag.

We implement this test on the capital stock-scaled models only to demonstrate commonness of serial correlation in the investment models estimated in this section. Results presented in Table 4.7 suggest that serial correlation appear to exist in all investment models for each country apart from South Africa. Therefore, we argue, the linear estimator should be adopted in the threshold capital flow test to address autocorrelation.

Table 4.7: Results of the Ljung-Box Q Autocorrelation Test

	Residential Market				Non-Residential Market			
Order	1	2	3	4	1	2	3	4
Botswana	0.073	0.238	1.628	1.768	1.421	5.127*	5.127	7.088
Kenya	0.110	0.665	2.706	3.664	2.063	4.442*	5.942	6.676
Morocco	6.968***	7.503**	8.346**	12.974**	0.941	5.296*	5.684	5.787
Namibia	0.181	0.373	0.554	7.265	4.005**	9.224**	10.583**	11.848**
South Africa	0.034	1.189	1.825	5.893	0.001	0.006	0.014	0.777

This table shows Q-statistics which are test statistics for the Ljung-Box Q test of autocorrelation. The *p*-values of each Q-statistic are used to identify statistically significant Q-statistics. The asterisks are used in this table to indicate significant values. ***, **, and * indicate the level of significance of the test statistics at the 1%, 5% and 10% levels, respectively. Significant Q-statistics indicate that serial correlation exists up to the order indicated (in the second row).

A number of linear estimators can control for autocorrelation. This class of estimators are deemed heteroscedasticity and autocorrelation consistent estimators (HAC) (Jong and Davidson, 2000; Zeileis, 2004). According to Zeileis (2004), when econometric models contain autocorrelation and/or heteroscedasticity of unknown form, it is important to employ covariance matrix estimators that can consistently estimate the covariance of the model parameters for valid inference.

In more precise terms, we specify a quadratic spectral kernel-based HAC, where the kernel bandwidth is set by Andrews autoregressive one (AR (1)) method, using pre-whitened residuals (Andrews and Monahan, 1992; Newey and West, 1994). According to

[23] Calculation of the Q-statistics considers the sample size and the autoregressive order at which autocorrelation is being examined. For instance, at lag 4, the Q-statistics provide test statistics that no serial correlation exists up to (AR (4)).

Andrews and Monahan (1992), pre-whitening is an effective procedure that reduces bias and over-rejection of t-statistics constructed using kernel HAC estimators.

Using the HAC estimator, we implement the threshold test in accordance with the explanation provided in section 4.4. We adopt an intuitive procedure of implementing the Bai and Perron test elaborated by Bai and Perron (1998b) and termed as the 'sequential determination'. The process begins with testing ℓ number of threshold capital flows in each segment. Essentially, the null hypothesis states that there are ℓ threshold flows against an alternative hypothesis that states that there are $\ell + 1$ number of thresholds. Whenever the null hypothesis is rejected in a segment, the number of breaks for the null hypothesis is then increased by one. The procedure is reiterated until the null hypothesis is accepted in the segment or the maximum allowable segment size is reached.

We constrain the minimization problem by stipulating a trimming percentage as a way of limiting the regime (segment) size to not less than five observations. Perron and Qu (2006) argue that five should always be the minimum acceptable regime size. We also allow for heterogeneity of breaks by permitting the distribution of errors to vary across regimes.

The threshold structural breaks estimation is implemented for each country using capital stock-scaled and GDP-scaled variables for both residential and non-residential markets for robustness. The results of the VAR and the threshold capital flow tests for the residential and non-residential markets in each country and market are reported in Tables 4.8 – 4.27 below. Generally, for each country, results for both market-size and economy-size approaches are reported side-by-side for residential and non-residential markets.

4.7 Results of the VAR and Threshold Capital Flow Test

4.7.1 The Causality Results for Botswana: Residential Market

In the residential market of Botswana, as in all other residential markets, a system of four equations is estimated where residential investment, FDI, FPI and remittance are the endogenous variables. First, we scale these variables using residential capital stock, allow

four lag intervals and include necessary dummy variables to account for short-run shocks to the system. After obtaining the first set of results, we re-estimate the same VAR models, but instead of capital stock, GDP is used as the scaling factor.

The results of these two approaches are presented in Table 4.8. Robust results across both specifications suggest that bidirectional causality exists between investments and foreign portfolio investment (FPI) only. Otherwise, between FDI and residential investment, there appears to be unidirectional causality running from FDI and between remittances and residential investment there appears to be unidirectional causality running from residential investment.

Regarding the effects of foreign capital inflows on residential investment, the two approaches do not appear to produce highly divergent results. Starting with FDI, the results indicate a time-varying FDI effect commencing with a significant negative effect after three quarters followed by a significant positive effect after four quarters. These pieces of evidence are statistically significant and robust across the two specifications. Similarly, robust results also show a time-varying effect of FPI on residential investment whereby the effect after one quarter is negative but after four quarters the effect is positive. On the effects of remittances on residential investment, the results are inconsistent.

Table 4.8: The Result of the Residential VAR Analysis of Botswana

	Panel A: (Capital Stock-Scaled)				Panel B (GDP-Scaled)			
	RES	FDI	FPI	REM	RES	FDI	FPI	REM
RES(-1)	0.96***	2.521	0.016	-0.043	1.456***	2.880***	0.190	0.022
	(0.409)	(2.052)	(0.434)	(0.113)	(0.274)	(0.427)	(0.151)	(0.035)
RES(-2)	-1.047*	1.872	-0.642	0.200	-2.286***	-1.228	-1.189***	0.133
	(0.584)	(2.930)	(0.619)	(0.162)	(0.682)	(1.066)	(0.377)	(0.088)
RES(-3)	0.730**	0.472	0.765*	-0.135	1.100***	2.143***	0.989***	-0.095*
	(0.369)	(1.852)	(0.391)	(0.102)	(0.412)	(0.643)	(0.228)	(0.053)
RES(-4)	-0.478**	1.173	-0.264	0.145**	-1.175***	-0.528	-0.671***	0.16***
	(0.232)	(1.164)	(0.246)	(0.064)	(0.378)	(0.591)	(0.209)	(0.049)
FDI(-1)	0.109	-0.766**	0.010	-0.043**	0.309**	-0.263	0.117*	-0.040**
	(0.074)	(0.372)	(0.079)	(0.021)	(0.125)	(0.196)	(0.069)	(0.016)
FDI(-2)	0.031	0.534	0.011	-0.011	0.187**	0.640***	0.093**	-0.015
	(0.070)	(0.353)	(0.075)	(0.019)	(0.084)	(0.131)	(0.046)	(0.011)
FDI(-3)	-0.100*	-0.275	-0.022	0.012	-0.220***	-0.393***	-0.081*	0.012
	(0.058)	(0.292)	(0.062)	(0.016)	(0.081)	(0.126)	(0.045)	(0.010)
FDI(-4)	0.146**	-0.527*	-0.036	-0.028*	0.286***	-0.13	0.010	-0.019
	(0.060)	(0.303)	(0.064)	(0.017)	(0.092)	(0.143)	(0.051)	(0.012)
FPI(-1)	-1.670***	4.859**	0.444	-0.024	-3.499***	2.068***	0.160	-0.110**
	(0.442)	(2.217)	(0.468)	(0.122)	(0.399)	(0.623)	(0.221)	(0.052)
FPI(-2)	0.673	12.18***	0.263	0.136	2.994***	15.46***	1.257***	0.072
	(0.558)	(2.797)	(0.591)	(0.154)	(0.995)	(1.554)	(0.550)	(0.128)
FPI(-3)	-1.731	5.952	-1.305	0.596*	-7.057***	-3.351	-4.418***	0.73***
	(1.242)	(6.226)	(1.315)	(0.343)	(2.430)	(3.793)	(1.343)	(0.314)
FPI(-4)	1.181*	-3.638	1.058	-0.133	1.783***	-2.763**	1.557***	-0.177*
	(0.667)	(3.347)	(0.707)	(0.185)	(0.727)	(1.136)	(0.402)	(0.094)
REM(-1)	1.068	25.58***	2.147	0.096	7.669***	29.84***	5.947***	-0.454
	(1.861)	(9.330)	(1.971)	(0.515)	(2.893)	(4.517)	(1.599)	(0.373)
REM(-2)	-3.737	9.911	-3.065	1.239*	-11.70***	1.654	-7.502***	1.44***
	(2.514)	(12.608)	(2.664)	(0.695)	(3.738)	(5.836)	(2.065)	(0.482)
REM(-3)	1.026	-3.543	1.622	0.064	-1.664	-7.809***	0.021	0.217
	(1.678)	(8.414)	(1.778)	(0.464)	(1.873)	(2.924)	(1.035)	(0.242)
REM(-4)	1.187	-10.958*	0.973	0.308	2.405**	-9.088***	1.768***	0.078
	(1.201)	(6.022)	(1.272)	(0.332)	(1.238)	(1.933)	(0.684)	(0.160)
Adj. R-sq.	0.866	0.717	0.052	0.172	0.916	0.963	0.697	0.775
F-statistic	8.224	3.828	1.062	1.232	13.264	30.384	3.572	4.839
Akaike AIC	-4.097	-0.872	-3.981	-6.667	-8.547	-7.656	-9.734	-12.642
Schwarz SC	-3.201	0.024	-3.085	-5.771	-7.651	-6.76	-8.838	-11.746
No. of Obs	20	20	20	20	20	20	20	20

The table reports coefficient estimates of the residential market VAR for Botswana and their standard errors in the parenthesis. RES, FDI, FPI and REM stand for residential investment, foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The negative number in the parenthesis next to these variables indicates the number of lags of the scaled variables. The asterisks ***, **, and * indicate significance of the test statistics at 1%, 5% and 10%, respectively

On the whole, the results indicate that initial effects of FDI and FPI on residential investment are either inconclusive or consistently negative but in later periods, the effect is positive and robust. While these results can be deemed to explain the effects of FDI

and FPI on residential investment in Botswana, inconclusiveness of the effects of remittances is noteworthy.

The results on remittances are similar to previous studies such as Campbell (2010) who found that despite migrants maintaining economic and social links with their home-based households, the economic contribution of their remittances towards national development[24] is insignificant. Mohapatra and Ratha (2011) and Dillon (2013) also seem to support this finding. Their results appear to support the general view that Botswana should be considered as a source of remittances rather than a recipient.

It is possible, however, that such inconsistencies underscore a need for a more focused analysis. It is also possible that the true effects of remittances have been masked by the structural breaks. To fully understand the role or effects of remittances, FDI, FPI on residential investments, we examine possible structural breaks along the size of the inflow using Bai and Perron test. The results of the Bai-Perron test are presented in Table 4.9. These results indicate that threshold capital flows exist along each of the foreign capital inflow. This evidence is statistically significant and robust across the two specifications.

This suggests that the causal relationships between residential investments and each of the three foreign capital inflows vary with the size of the inflow. Essentially, regression models assuming parametric constancy, such as the VAR estimated above, are likely to miss out on some important effects that could be masked by domineering effects. That is why interpreting VAR results separately could be misleading in such cases.

In summary, following results of these threshold capital flow test, in conjunction with the VAR results, we can conclude that these results suggest that the effects of FDI and FPI are contingent on time and size while effects of remittances are governed by size only.

[24] Although national development is different from residential investments, they are connected because one should logically expect that a positive contribution to residential investment would translate into positive national development.

Table 4.9: The Results of the Bai-Perron Test for the Residential Market in Botswana

	FDI	FPI	REM
PANEL A:Scaled by Capital Stock			
F-stat (0 vs. 1*)	494.177***	14,748.570***	4241.406***
PANEL B:Scaled by GDP			
F-stat (0 vs. 1*)	2831.84***	8,518.711***	509,275.4***

The table shows the Bai-Perron threshold flow test results for the residential real estate markets of Botswana. FDI, FPI and REM stand for foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The values in the table are F-statistics of the identified critical flows (break points). Significant F-statistics are flagged with the asterisks: *** indicates the threshold value is significant at the 1% level.

It is an undeniable fact that Botswana is a country of massive foreign investments relative to the size of its markets and economy (see Table 3.1 for comparable statistics). In fact, reputable international organisations have long acknowledged non-trivial role of foreign investments in the growth and investment strategy of Botswana. According to the United Nations Conference on Trade and Development (2003), foreign investments (i.e. FDI and FPI) have enabled Botswana to be the only African country to emerge out of least developed countries (LDC) cluster within a single generation after independence (Siphambe, 2006). For this reason, a positive effect of FDI is in line with the theory and expectations informed by the current statistics.

On the other hand, empirical studies have not revealed sufficient evidence that indicates a direct positive role of FDI in Botswana. Most studies maintain that FDI do not necessarily lead to greater investment and economic growth. For instance, using international capital inflows as one of the measures of financial integration, Ahmed and Mmolainyane (2014) observe that foreign capital inflows into Botswana promote economic growth by fostering financial development, but then again, the results for the direct link were not robust.

This view is shared by other researchers such as Delgado *et al.,* (2014), Durham (2004) and Kim and Li (2014) who appear to agree that positive effect of FDI is contingent on absorptive capacity of the host country. In the absence of adequate absorptive capacity, Adams (2009) observes that the initial effect of FDI to domestic investment would be negative and would only turn positive in later periods but the net effect would still be negative. Although financial development is not controlled for in the tests above, going

by the results, these tests provide additional evidence indicating that the size of FDI inflows is also a major determinant of the nature of the effects of FDI on residential real estate investment.

Further, FPI inflows are usually prone to reversal or withdrawal of investments due to uncertainties about economic, political and labour factors (Ahmad *et al.*, 2004). In Botswana, uncertainty relating to labour costs and economic growth is a documented fact (Mahembe and Odhiambo, 2013; Throup, 2011). This is the reason why some authors call FPI 'hot money' (Sula and Willett, 2009). It is also therefore extremely hard in most countries to realise positive externalities from FPI. The results above seem to suggest that in Botswana, in certain range of FPI inflow sizes, positive outcomes can still be harnessed.

This finding is highly supported by the fact that Botswana has stronger institutions, superior public governance and income than most neighbouring countries (Ahmed and Mmolainyane, 2014; De Santis and Lührmann, 2009). According to Gwenhamo and Fedderke (2013), a country is likely to attract more FPI when it has better institutional environment than neighbouring countries. High inflow of FPI relative to the size of the market or economy into Botswana is likely to cause positive externalities that would prevail over undesirable effects arising from reversibility nature of FPI.

On the contrary, remittances are considered to be a rather stable private transfer (Gupta *et al.*, 2009; Ratha and Mohapatra, 2013), and are therefore, immune to reversals. Statistics on Botswana indicate that a substantial amount of remittances was received between 2000 and 2010. Relative to the size of the economy, remittances received in Botswana were much greater than many other African countries such as Zambia, Senegal or Egypt (World Development Indicators, 2011). On this ground, a substantial positive impact of remittances cannot be rejected.

Prior studies also support a positive effect. For instance, Panin *et al.*, (1993), although not focused on investments, found that remittances in Botswana accounted for a higher proportion of rural household income (about 53%) than agriculture. However, an

indication of possible negative externalities at certain threshold flows could only be explained after a further analysis. Perhaps the use of some channels to access the residential market might encourage undesirable externalities. The effect of the channel used is investigated further in the next chapter.

4.7.2 The Causality Results for Botswana: Non-Residential Market

We also estimate the VAR in the non-residential market of Botswana using the two approaches deployed in estimating the residential market VARs. The results of both approaches are presented in Table 4.10. Results reported seem to affirm the important role of foreign capital inflows in the non-residential market.

With regard to the direction of causality, robust results indicate that statistically significant bidirectional causality exists between remittances and non-residential investment only. Otherwise, causalities between non-residential investment and the other two foreign capital inflows (FDI and FPI) are unidirectional; running from FDI to non-residential investment and from non-residential investment to FPI, respectively.

On the nature of the effects of foreign capital inflows on non-residential investment, it appears that the effect of FDI is negative after two quarters and the effect of remittances is also negative but after three quarters. These two results are statistically significant, consistent across the two specifications, and therefore, provide robust evidence. Results of the effects of FPI on non-residential investment, on the other hand, are inconsistent hence these are not clear at this point.

This indicates that VAR models fail to clarify the effects of FPI and to disclose any robust evidence of a positive effect of any of the foreign capital flows. Seemingly, additional evidence is needed for a clearer understanding of the underlying causal relationships. Indeed, FDI could be crowding-out domestic non-residential investment but the persistence of a negative effect of remittances cannot be explained without further evidence. Therefore, we implement the Bai and Perron test to examine the possibility of structural breaks along the size of inflows that could explain better the effects of FDI, FPI and remittances on non-residential investment.

Table 4.10: The Result of the Non-Residential VAR Analysis of Botswana

	Panel A: (Capital Stock-Scaled)				Panel B (GDP-Scaled)			
	RES	FDI	FPI	REM	RES	FDI	FPI	REM
NRES(-1)	-0.328*	-0.51	-0.112***	0.019**	-0.758*	0.628	-0.005	-0.004
	(0.176)	(0.435)	(0.027)	(0.010)	(0.405)	(0.855)	(0.031)	(0.011)
NRES(-2)	0.669**	-2.178***	-0.164***	0.035*	-1.206	1.283	0.330***	-0.044**
	(0.337)	(0.833)	(0.051)	(0.019)	(0.810)	(1.712)	(0.062)	(0.021)
NRES(-3)	0.349*	0.248	-0.113***	0.06***	-1.233	2.472	0.158*	0.034
	(0.194)	(0.478)	(0.029)	(0.011)	(1.195)	(2.525)	(0.091)	(0.031)
NRES(-4)	-1.157***	2.228**	0.255***	-0.09***	-0.186	-2.368	-0.445***	-0.008
	(0.368)	(0.910)	(0.056)	(0.021)	(1.945)	(4.108)	(0.148)	(0.051)
FDI(-1)	0.652***	-1.111**	-0.122***	0.003	0.245	0.684	0.156***	-0.032*
	(0.181)	(0.448)	(0.027)	(0.010)	(0.665)	(1.404)	(0.051)	(0.017)
FDI(-2)	-0.241*	-0.903***	-0.057***	0.029***	-0.859***	0.242	0.020	0.030***
	(0.130)	(0.323)	(0.020)	(0.007)	(0.276)	(0.584)	(0.021)	(0.007)
FDI(-3)	0.148**	-0.353*	-0.042***	-0.003	-0.288	0.612	0.099***	-0.018
	(0.073)	(0.182)	(0.011)	(0.004)	(0.460)	(0.971)	(0.035)	(0.012)
FDI(-4)	0.816***	-1.798***	-0.157***	0.028*	-0.592	1.277	0.296***	-0.04
	(0.263)	(0.651)	(0.040)	(0.015)	(1.125)	(2.376)	(0.086)	(0.029)
FPI(-1)	-0.918	-8.961***	0.159	-0.222***	-3.345	-0.099	0.807***	-0.272***
	(0.852)	(2.106)	(0.129)	(0.047)	(2.580)	(5.449)	(0.197)	(0.067)
FPI(-2)	5.935**	-1.709	-1.647***	0.899***	-12.246	28.872	3.317***	0.134
	(2.452)	(6.062)	(0.372)	(0.137)	(13.709)	(28.958)	(1.046)	(0.357)
FPI(-3)	-9.829***	27.37***	2.368***	-0.449**	-8.707	-5.025	-1.635***	0.180
	(3.312)	(8.188)	(0.502)	(0.185)	(6.790)	(14.343)	(0.518)	(0.177)
FPI(-4)	-4.276	14.345**	1.818***	-0.580***	2.374	-11.892	-1.047**	-0.265*
	(2.673)	(6.608)	(0.405)	(0.149)	(5.766)	(12.181)	(0.440)	(0.150)
REM(-1)	-3.537	-21.54***	-1.032**	1.071***	-30.77***	16.812	3.936***	0.291
	(3.154)	(7.798)	(0.478)	(0.176)	(11.055)	(23.353)	(0.843)	(0.288)
REM(-2)	12.38***	23.19***	-1.71***	0.579***	-19.495	56.361	6.239***	-0.742
	(3.013)	(7.451)	(0.457)	(0.168)	(27.952)	(59.045)	(2.133)	(0.728)
REM(-3)	-8.148*	17.793*	4.030***	-0.883***	-14.656*	-12.266	1.027*	-0.610***
	(4.189)	(10.357)	(0.635)	(0.233)	(7.617)	(16.089)	(0.581)	(0.198)
REM(-4)	-13.072**	34.763**	2.885***	-0.763**	-9.449	-25.221	-3.263***	-0.009
	(6.033)	(14.915)	(0.914)	(0.336)	(12.423)	(26.242)	(0.948)	(0.323)
Adj. R-sq.	0.832	0.912	0.945	0.963	0.594	-0.087	0.906	0.851
F-statistic	6.218	11.996	18.973	28.672	2.547	0.916	11.225	7.042
Akaike AIC	-2.794	-0.983	-6.568	-8.569	-6.355	-4.86	-11.502	-13.652
Schwarz SC	-1.848	-0.037	-5.622	-7.623	-5.409	-3.914	-10.556	-12.706
No. of Obs	20	20	20	20	20	20	20	20

The table reports coefficient estimates of the non-residential market VAR for Botswana and their standard errors in the parenthesis. NRES, FDI, FPI and REM stand for non-residential investment, foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the non-residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The negative number in the parenthesis next to these variables indicates the number of lags of the scaled variables. The asterisks ***, **, and * indicate significance of the test statistics at 1%, 5% and 10%, respectively.

The results of the Bai-Perron test are reported in Table 4.11. Evidently, there exists a single threshold inflow along each of the foreign capital inflows. This provides additional evidence on existing causal relationships. Although the VAR models established the

negative effects of FDI and remittances on non-residential investment and failed to provide robust evidence for the effect of FPI on non-residential investment, the threshold capital flow test indicates that the nature of the effects of each of the three foreign capital inflows is contingent on the size of the inflow.

Table 4.11: Threshold Flow Test Results for the Non-Residential market of Botswana

	FDI	FPI	REM
PANEL A:Scaled by Capital Stock			
F-stat (0 vs. 1*)	4004.303***	265.279***	10847.220***
PANEL B:Scaled by GDP			
F-stat (0 vs. 1*)	4,027,351.00***	156.290***	59.937***

The table shows the Bai-Perron threshold flow test results the non-residential real estate markets of Botswana. FDI, FPI and REM stand for foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the non-residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The values in the table are F-statistics of the identified critical flows (break points). Significant F-statistics are flagged with the asterisks: *** indicates the threshold value is significant at the 1% level.

These results of the threshold flow appear to support available statistics since the UNCTAD (2003) and the World Development Indicators (2011) present Botswana as a destination of vast foreign capital inflows in support of mining, services and manufacturing sectors. Growth of these sectors may necessitate the construction of commercial or industrial buildings that constitute the non-residential investments. The evidence provided by these results is very important as it shows that both crowding-in and crowding-out effects of FDI in the non-residential real estate market are possible.

The results of the threshold capital flow test offer additional evidence that helps to explain the investment environment in Botswana in relation to FPI better. The results indicate a size-dependent effect. A possible positive effect is the *a priori* expectation but a negative or statistically insignificant effect of FPI could be construed to indicate rampant withdrawals and reversals of investments commonly caused by uncertainties. Researchers of capital flows and investments argue consistently that uncertainties of fundamentals (Ahmad *et al.,* 2004) and industry uncertainty (Bulan, 2005) are major causes of severe reversals in FPI.

On Botswana, Throup (2011) argues that the prosperity of Botswana is very fragile because Botswana relies heavily on revenues from diamonds, which are in turn

susceptible to global prices and demand instabilities. Similarly, Mahembe and Odhiambo (2013) note that high prevalence of human immunodeficiency virus infection and acquired immunodeficiency syndrome (HIV/AIDS) are the greatest weakness of the labour force of Botswana.

Based on these lines of thought, uncertainties about long-run labour costs and sustainability of economic growth would discourage long-term investments, increase cost of doing business, and thereby, cause reversals of FPI. This manifests through a negative or statistically insignificant effects on non-residential investment but only up to a certain threshold amount. Perhaps, beyond that threshold amount, reversals do not have a significant effect and positive effects probably prevail.

On the effects of remittances on non-residential investments in Botswana, the possible positive effect is also in line with the *a priori* expectations of theory and previous studies. According to Alfaro *et al.*, (2004), the presence of developed financial markets would enable other sectors or markets beside the recipient sector to benefit from foreign capital inflows. Motivated by the findings of Alfaro *et al.*, (2004), Giuliano and Ruiz-Arranz (2009) investigated whether remittances boost financial markets in funding domestic investments. They found a positive effect.

Their findings are in line with our findings above although the threshold capital flow test provides extra evidence for suggesting that the effect is size-dependent hence both positive and negative effects are possible but are governed by the amount received. However, our results fall short of explaining why a negative effect of remittances would be possible given that remittances is a household transfer not prone to reversals or crowding-out effects. A further analysis on this point is carried out in the next chapter.

4.7.3 The Causality Results for Kenya: Residential Market

To estimate the VAR models in the residential market of Kenya, first, we follow the same systematic approach as implemented in the real estate markets of Botswana, above. Next, we control for the economic environment by including GDP gap and nominal interest as exogenous variables. The results are presented in Table 4.12. According to these results,

there is no robust bidirectional causality between any foreign capital inflows and residential investment in Kenya. Only unidirectional causalities are established by robust results.

Table 4.12: The Result of the Residential VAR Analysis of Kenya

	Panel A: (Capital Stock-Scaled)				Panel B (GDP-Scaled)			
	RES	FDI	FPI	REM	RES	FDI	FPI	REM
RES(-1)	0.421**	-0.21	0.060	0.026	0.082	0.075	0.222	0.143
	(0.196)	(0.640)	(0.721)	(0.170)	(0.149)	(0.503)	(0.564)	(0.121)
RES(-2)	0.283**	0.491	-0.109	0.122	-0.393**	1.148**	-0.426	0.091
	(0.134)	(0.438)	(0.492)	(0.116)	(0.160)	(0.540)	(0.605)	(0.130)
RES(-3)	0.223*	2.530***	-0.238	0.008	0.019	3.436***	0.067	0.051
	(0.134)	(0.437)	(0.492)	(0.116)	(0.190)	(0.639)	(0.716)	(0.154)
RES(-4)	-0.387**	1.218**	-0.412	0.012	-0.410*	2.092***	-0.475	0.029
	(0.153)	(0.501)	(0.563)	(0.133)	(0.215)	(0.727)	(0.814)	(0.175)
FDI(-1)	0.152*	-0.428*	0.383	-0.052	0.028	-0.480*	0.299	-0.074
	(0.079)	(0.258)	(0.290)	(0.069)	(0.078)	(0.264)	(0.296)	(0.064)
FDI(-2)	0.235***	-0.335	0.340	0.024	0.127	-0.31	0.212	0.018
	(0.077)	(0.253)	(0.285)	(0.067)	(0.085)	(0.285)	(0.320)	(0.069)
FDI(-3)	0.008	-0.047	-0.165	0.029	-0.104	-0.282	-0.444*	-0.047
	(0.052)	(0.170)	(0.191)	(0.045)	(0.065)	(0.219)	(0.245)	(0.053)
FDI(-4)	0.033	-0.249	-0.098	0.067	0.088	-0.420*	0.047	0.088
	(0.064)	(0.208)	(0.234)	(0.055)	(0.072)	(0.244)	(0.274)	(0.059)
FPI(-1)	-0.220**	-1.157**	0.698*	0.045	-0.219**	-1.547***	0.686*	-0.005
	(0.104)	(0.339)	(0.382)	(0.090)	(0.107)	(0.360)	(0.404)	(0.087)
FPI(-2)	0.296**	0.856**	0.424	-0.186*	0.355***	1.116**	0.306	-0.133
	(0.116)	(0.381)	(0.429)	(0.101)	(0.130)	(0.437)	(0.490)	(0.105)
FPI(-3)	-0.135	0.010	-0.244	0.32***	-0.196	0.049	-0.352	0.247**
	(0.106)	(0.347)	(0.391)	(0.092)	(0.121)	(0.409)	(0.459)	(0.099)
FPI(-4)	-0.412***	0.193	-0.518	-0.217**	-0.326*	0.485	0.068	-0.115
	(0.124)	(0.405)	(0.455)	(0.107)	(0.178)	(0.602)	(0.674)	(0.145)
REM(-1)	2.791***	-0.14	0.251	0.236	2.600***	0.097	0.137	0.466
	(0.607)	(1.986)	(2.235)	(0.528)	(0.664)	(2.240)	(2.510)	(0.540)
REM(-2)	1.031***	-2.193*	0.029	0.589**	1.275***	-3.393***	0.023	0.83***
	(0.267)	(0.874)	(0.983)	(0.232)	(0.341)	(1.152)	(1.291)	(0.278)
REM(-3)	-1.279***	0.967	0.201	0.043	-0.606	-0.337	1.619	-0.026
	(0.373)	(1.220)	(1.373)	(0.324)	(0.546)	(1.841)	(2.064)	(0.444)
REM(-4)	-1.167***	-0.037	0.675	0.121	-0.581	0.208	2.513*	0.160
	(0.264)	(0.863)	(0.971)	(0.229)	(0.401)	(1.353)	(1.516)	(0.326)
Adj. R-sq.	0.847	0.665	0.436	0.775	0.948	0.636	0.759	0.934
F-statistic	8.847	3.819	2.097	5.897	25.660	3.357	5.249	20.259
Akaike AIC	-4.986	-2.615	-2.379	-5.265	-8.665	-6.233	-6.006	-9.079
Schwarz SC	-4.034	-1.663	-1.427	-4.314	-7.666	-5.234	-5.006	-8.079
No. of Obs	28	28	28	28	28	28	28	28

The table reports coefficient estimates for the residential market VAR for Kenya and their standard errors in the parenthesis (). RES, FDI, FPI and REM stand for residential investment, foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The negative number in the parenthesis next to these variables indicates the

number of lags of the scaled variables. The asterisk ***, **, and * indicate significance of the test statistics the 1%, 5% and the 10%, respectively.

Causality appears to flow from residential investments to FDI, from FPI to residential investment and from remittances to residential investment. These pieces of evidence are statistically significant. Regarding the specific effects of foreign capital inflows on residential investments, both sets of results appear to agree substantially on FPI and remittances suggesting time-varying effects of FPI and a positive effect of remittances, based on robust results. The results of the effects of FDI on residential investment are inconclusive. All robust evidence is statistically significant.

The estimated positive relationship between remittances and residential investment is highly expected as the investment theory and the structural model in Chapter Three predicts this kind of relationship. On the contrary, the effect of FPI on residential investment appear to show signs of switching starting with a negative effect in the first lag, then becomes positive in the second lag and reverting to negative again in the fourth lag.

The time-varying nature of the FPI's effects can be read to be suggesting serious reversal of investments or a possibility of underlying structural breaks which undermine the results of the VAR models. The unexpected FPI results and the inconclusiveness of the FDI effects on residential investment highlights a need for further analysis to understand better the effects of foreign capital inflows on residential investment.

We undertake this by estimating a threshold capital inflow model for the residential real estate market in Kenya. The results are presented in Table 4.13 below. According to the threshold capital flow test results, FPI and remittances have consistent evidence of a single critical flow each, statistically significant and robust across the two specifications. Along FDI, it appears that no robust threshold capital inflow exists.

Table 4.13: The Results of the Bai-Perron Test for the Residential Market of Kenya

	FDI	FPI	REM
PANEL A:Scaled by Capital Stock			
F-stat (0 vs. 1*)	34.136***	16.437**	60.704***
F-stat (1 vs. 2*)	150.926***	82.635**	53.233***
F-stat (2 vs.3*)			2375.709***
PANEL B:Scaled by GDP			
F-stat (0 vs. 1*)	7.085	14.709*	49.540***
F-stat (1 vs. 2*)	-	---	16.150

The table shows the Bai-Perron threshold test results for the residential real estate markets of Kenya. FDI, FPI and REM stand for foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The values in the table are F-statistics of the identified critical flows (break points). Significant F-statistics are flagged with the asterisks: ***, ** and * indicate that the threshold value is significant at the 1%, 5% and the 10% level.

To summarize the causality tests' results, we interpret VAR and threshold test results together. First on FDI, by failing to identify a critical flow, the threshold capital flow test results support the VAR results on the effects of FDI on residential investment. The effects still remain inconclusive and a different line of investigation would be more relevant than structural breaks.

About the effects of FPI and remittances on residential investments, the Bai and Perron test indicates that the nature of the effect is governed by the amount of the inflow received. It is possible for the effect to be constructive or adverse when the amount received is below or above the threshold flow. In conclusion, the results of the Kenyan residential market models are not clear and thus inconclusive on the effects of FDI on residential investment; otherwise, we established that the effects of FPI are size-dependent and time-varying whereas the effects of remittances are only size-dependent.

The FDI results appear to concur with existing statistics that cite Kenya among less attractive FDI destinations because as a country, Kenya lacks natural mineral resources (Mwega and Ngugi, 2006; Ndikumana and Verick, 2008). On the direct inflows into the residential market, these statistics indicate that the Kenyan housing market attracts very little FDI in absolute and relative terms. Under such circumstances, it is unlikely that FDI would have a significant effect on residential investment unless absorptive capacity, especially financial development, is enhanced (Adams, 2009; De Santis and Lührmann,

2009). Perhaps a conclusive view would be possible after examining significant channels used by FDI to affect residential investments. It is possible that the effects of FDI vary according to whether a direct or indirect channel is used to impact the residential real estate market.

On FPI, based on economic literature, FPIs are usually considered to be unstable and a less reliable type of flow (Sula and Willett, 2009). According to Demir (2009), who studied the portfolio choice of this class of investors, portfolio investors would normally prefer to invest in reversible short-term financial investments depending on respective rates of returns and the overall uncertainty in the economy rather than investing in irreversible long-term fixed investments.

Uncertainties in the Kenyan investment environment have been common in the last decade. Kenya has witnessed macroeconomic instabilities (started in 1990s into 2000s), high cost of doing business, corruption, ethnic clashes and politically-instigated violence (Durnev, 2010; Mwega and Ngugi, 2006). According to Durnev (2010), investment-to-stock price sensitivity is greater when election results are less certain, in countries with higher corruption, and weak standards of political leaders' disclosure. Where such uncertainties prevail, it is expected that the effect of FPI would be substantially negative or unclear.

Nonetheless, going by the threshold results, it appears that when FPI is at certain threshold levels, it can still exert substantial positive externalities on residential investment. The positive effect can be attributed to the existence of more developed financial markets compared to other East African countries (Uddin *et al.,* 2013) and higher return on portfolio investments (Hearn *et al.,* 2010). Gwenhamo and Fedderke (2013) use South Africa and Zimbabwe to illustrate how comparative advantage plays a role in increasing the country's share of FPI. Perhaps, FPI has positive externalities when high level of FPI inflows are received which would then overshadow possible negative externalities and thus the positive effects would prevail after a certain threshold inflow.

A positive impact of remittances on residential investments in Kenya is indeed an expectation given prior research and data. On the ground, emerging data-based evidence suggests that remittances are responsible for a significant part of residential investments in the country. A recent survey commissioned by the World Bank indicates that of remittance received in Kenya, more than 25% is used to construct a new house, rebuild an existing house or purchase land (Ratha, 2011). Empirical evidence has not been left behind either. A study by Kagochi and Kiambigi (2012) using autoregressive distributed lag model shows that remittance is one of the key determinants of housing supply in Kenya.

However, the additional information provided by the threshold flow model suggesting that the effect of remittances is size-dependent is an important aspect to be exploited by policymakers and future studies. We perform an analysis of the channel of impact in the next chapter to understand whether the channel of impact explains the negative effect of remittances on residential investment.

4.7.4 The Causality Results for Kenya: Non-Residential Market

The non-residential models are similarly parameterised and estimated. We use gross value added (GVA) and GDP growth rate as control variables (also called exogenous variables) on top of GDP gap and nominal interest. The results of this analysis are reported in Table 4.14. The results show that only remittances have bidirectional causality with non-residential investment, statistically significant and robust across the specifications. For FDI and FPI, in relation to non-residential investment, consistent results show that causality is unidirectional and flows from FDI to investment and also from FPI to investment.

In terms of *a priori* expectations, that is, the effects of foreign capital inflows on non-residential investment, the results provide sufficient evidence that is consistent across the two models indicating that FDI has positive effects while FPI has negative effects. Estimation of the effects of remittances on non-residential investment indicated statistically significant effects under capital stock-scaled model and under GDP-scaled

model but none of these significant effects appears in similar periods, and therefore, the evidence of remittances' effect is inconsistent and not robust.

Table 4.14: The Result of the Non-Residential VAR Analysis of Kenya

	Panel A: (Capital Stock-Scaled)				Panel B (GDP-Scaled)			
	RES	FDI	FPI	REM	RES	FDI	FPI	REM
NRES(-1)	1.143***	-0.293	-1.422	-0.432**	1.015***	-0.743	0.669**	0.091
	(0.187)	(1.273)	(0.919)	(0.173)	(0.241)	(0.703)	(0.292)	(0.114)
NRES(-2)	-0.211	0.132	-0.613	0.232	-1.206***	0.981	1.095***	0.233**
	(0.166)	(1.128)	(0.815)	(0.154)	(0.232)	(0.676)	(0.281)	(0.109)
NRES(-3)	0.098	0.703	0.829	0.013	0.405	1.150	1.383***	-0.025
	(0.122)	(0.831)	(0.600)	(0.113)	(0.305)	(0.889)	(0.369)	(0.144)
NRES(-4)	-0.470***	1.238	0.062	0.011	-0.464**	1.011*	-0.465*	-0.176*
	(0.123)	(0.834)	(0.603)	(0.114)	(0.208)	(0.609)	(0.253)	(0.098)
FDI(-1)	0.281***	-0.205	-0.335	-0.095	0.197**	0.114	-0.317***	-0.062
	(0.063)	(0.429)	(0.310)	(0.058)	(0.099)	(0.289)	(0.120)	(0.047)
FDI(-2)	0.361***	-0.257	-0.167	-0.056	0.314***	0.103	-0.169	-0.027
	(0.058)	(0.397)	(0.286)	(0.054)	(0.087)	(0.253)	(0.105)	(0.041)
FDI(-3)	-0.029	0.017	-0.406*	0.003	-0.083	0.114	-0.556***	-0.071*
	(0.045)	(0.303)	(0.219)	(0.041)	(0.083)	(0.242)	(0.100)	(0.039)
FDI(-4)	0.266***	-0.122	-0.623**	-0.042	0.307***	0.027	-0.775***	-0.018
	(0.057)	(0.387)	(0.279)	(0.053)	(0.092)	(0.269)	(0.112)	(0.044)
FPI(-1)	-0.259**	-0.003	0.256	0.192**	-0.559***	0.424	-0.117	0.009
	(0.104)	(0.709)	(0.513)	(0.097)	(0.214)	(0.625)	(0.260)	(0.101)
FPI(-2)	0.218	-0.013	1.575**	-0.203	0.758***	-0.978	2.022***	0.053
	(0.159)	(1.080)	(0.780)	(0.147)	(0.277)	(0.810)	(0.336)	(0.131)
FPI(-3)	-0.498***	0.454	-0.598	0.478***	-1.133***	1.252	-0.697**	0.283**
	(0.135)	(0.916)	(0.661)	(0.125)	(0.280)	(0.819)	(0.340)	(0.132)
FPI(-4)	-0.212	0.539	0.648	-0.237	0.617*	-0.977	1.467***	-0.063
	(0.162)	(1.103)	(0.797)	(0.150)	(0.342)	(0.998)	(0.414)	(0.161)
REM(-1)	2.614***	-0.975	-4.940*	-0.359	0.772	2.852	-5.660***	-0.211
	(0.574)	(3.903)	(2.819)	(0.531)	(0.778)	(2.270)	(0.942)	(0.367)
REM(-2)	0.473	-1.879	-2.228	0.567*	1.637***	-3.406**	-1.918***	0.616**
	(0.351)	(2.381)	(1.720)	(0.324)	(0.591)	(1.726)	(0.716)	(0.279)
REM(-3)	-1.401***	-0.479	2.822	0.455	-0.044	-5.161**	5.699***	0.759**
	(0.389)	(2.644)	(1.910)	(0.360)	(0.695)	(2.030)	(0.843)	(0.328)
REM(-4)	0.059	1.573	0.872	-0.115	0.986	0.513	2.803***	0.102
	(0.316)	(2.149)	(1.553)	(0.293)	(0.612)	(1.787)	(0.742)	(0.289)
Adj. R-sq.	0.860	0.247	0.516	0.902	0.783	0.564	0.960	0.965
F-statistic	8.869	1.421	2.372	12.835	5.628	2.664	32.181	36.141
Akaike AIC	-4.971	-1.139	-1.79	-5.127	-8.279	-6.136	-7.895	-9.78
Schwarz SC	-3.925	-0.093	-0.743	-4.081	-7.232	-5.09	-6.848	-8.733
No. of Obs	28	28	28	28	28	28	28	28

The table reports coefficient estimates for the non-residential market VAR for Kenya and their standard errors in the parenthesis ().NRES, FDI, FPI and REM stand for non-residential investment, foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the non-residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The negative number in the parenthesis next to these variables indicates the number of lags of the scaled variables. The asterisk ***, **, and * indicate significance of the test statistics the 1%, 5% and the 10%, respectively.

Two pieces of evidence from these results are unexpected. First, the results consistently indicate that FPI has significant negative effects on non-residential investment, and secondly, the results of the effects of remittances are inconclusive. It is possible for FPI to have a negative effect in cases where FPI withdrawals or reversal are persistent to an extent of discouraging investments but a further scrutiny of possible structural breaks will be important. In addition, going by the existing statistics, Kenya receives a considerable amount of remittances that even exceeds FDI and FPI.

The spillover effect theory and extant studies suggest that in the presence of developed financial markets, such inflows would have considerable effects on other markets beyond the receiving sector or market (Azman-Saini *et al.*, 2010b; Giuliano and Ruiz-Arranz, 2009). To this end, the VAR results do not provide sufficient evidence for a reliable conclusion regarding the effects of FPI and remittances on non-residential investment.

Therefore, we estimate the Bai and Perron test of threshold flows to further establish effects of foreign capital inflows on non-residential investment in Kenya. The results are reported in Table 4.15. The threshold capital flow test established only one critical flow that was consistent and robust across the two model specification. This critical flow is along remittances.

Table 4.15: Threshold Flow Test Results for the Non-Residential Market of Kenya

	FDI	FPI	REM
PANEL A:Scaled by Capital Stock			
F-stat (0 vs. 1*)	3.236	6.308	15.753**
F-stat (1 vs. 2*)	-	---	130.053**
F-stat (2 vs.3*)			---
PANEL B:Scaled by GDP			
F-stat (0 vs. 1*)	3.890	18.349**	13.668*
F-stat (1 vs. 2*)	-	---	

The table shows the Bai-Perron threshold test results for the non-residential real estate markets of Kenya. FDI, FPI and REM stand for foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the non-residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The values in the table are F-statistics of the identified critical flows (break points). Significant F-statistics are flagged with the asterisks: ***, ** and * indicate that the threshold value is significant at the 1%, 5% and the 10% level.

In summary, therefore, the two causality tests for the non-residential real estate market in Kenya provide evidence suggesting the positive effects of FDI, negative effects of FPI and size-dependent effects of remittances on non-residential investment.

While statistics on sectorial distribution of FDI show Kenya as a least attractive FDI destination (Mwega and Ngugi, 2006; Ndikumana and Verick, 2008), previous empirical work of Uddin *et al.*, (2013) indicate that FDI received in Kenya plays a significant economic role through total factor productivity (TFP). Since TFP is associated with growth in output, it is possible that growth in output stimulates demand of non-residential buildings in the form of commercial and industrial buildings. This possible link and the fact that most of the FDI received goes into manufacturing and services sectors imply that a positive effect of FDI to non-residential investment is highly expected.

On the other hand, the consistent negative effects of FPI on non-residential investment appear to be persistent and independent of the size of FPI received. This evidence appear to support findings of prior studies that have confirmed the efficacy of FPI, which is regarded as 'hot money' to be limited (Guo and Huang, 2010; Sula and Willett, 2009). In the light of this findings, it appears that the effects of FPI on non-residential investment in Kenya are more sensitive to uncertainties such as macroeconomic and politically instigated uncertainty (Demir, 2009) than in the residential market, and thus the dominance of the negative effects.

On remittances, evidence suggests that the direction of the effects of remittances is governed by the amount received. Prior surveys provide very little evidence that suggests a flow of migrant remittances into commercial or industrial ventures directly. Nevertheless, it is essential to recognize this possibility and to motivate future research in the area as the results above suggest a possible positive link which may either be direct or indirect. Based on the work of Giuliano and Ruiz-Arranz (2009), the presence of developed equity and credit markets can cause positive externalities from remittances.

Much more recently, Aggarwal *et al.*, (2011) showed that remittances could be a source of greater bank deposits and credit, which can be accessed easily by established business enterprises for expansion. Kenya, in particular, receives more remittances than FDI or any other foreign capital inflow and this link is a strong likelihood. Much as that is the case, evidence provided by these tests appears to support these authors since remittances are private transfers to households and not a direct flow to firms. However, a possible

negative effect of remittances on non-residential investment is investigated in the next chapter where the effects of the channels of impact are examined.

4.7.5 The Causality Results for Morocco: Residential Market

We also estimate VAR models for Morocco in a similar way to the approaches on Botswana and Kenya. In addition to the endogenous variables, we control for short-term economic shocks using GDP growth rate as the only exogenous variable. We present the results of this analysis below in Table 4.16. Estimation of the direction of causality existing between foreign capital inflows and residential market of Morocco indicates unidirectional causalities only.

Using robust results, it appears that causality runs from foreign capital inflow to residential investment for FDI and remittances but for FPI, causality seems to flow from residential investment to FPI. On the effects of foreign capital inflows on residential investment, the VAR coefficient estimates in the table below provide robust evidence indicating that FDI has a negative effect after two quarters while remittances have time-varying effects. This evidence is statistically important and consistent across the model specifications. The results of the effects of FPI are inconsistent.

Interpreting these results in line with the investment theory and expectations based on the structural model in Chapter Three, estimation of the VAR models seem to provide insufficient and unexpected evidence on the effect of the entire three foreign capital inflows. The results indicate that FDI has a negative effect on residential investment only whereas the effects of FPI are not clear. On remittances, robust evidence suggests that after a positive effect established after three quarters, it seems that the effect of remittances then turns negative. These unexpected results could be attributed to structural breaks. Perhaps the effects are contingent to certain threshold(s) amount.

Table 4.16: The Result of the Residential VAR Analysis of Morocco

	Panel A: (Capital Stock-Scaled)				Panel B (GDP-Scaled)			
	RES	FDI	FPI	REM	RES	FDI	FPI	REM
RES(-1)	1.030***	2.979	0.013	-0.432	0.830***	0.363	-0.084	-0.163
	(0.274)	(2.131)	(0.200)	(0.404)	(0.172)	(1.014)	(0.105)	(0.181)
RES(-2)	-0.204	0.169	-0.324***	0.165	-0.066	-0.593	-0.322***	0.096
	(0.154)	(1.193)	(0.112)	(0.226)	(0.201)	(1.189)	(0.123)	(0.213)
RES(-3)	-0.27	1.824	0.075	0.088	-0.495**	0.741	-0.04	-0.109
	(0.199)	(1.541)	(0.145)	(0.292)	(0.198)	(1.171)	(0.121)	(0.209)
RES(-4)	0.828***	2.291	0.320	-0.32	0.600***	-0.176	0.194***	0.090
	(0.271)	(2.101)	(0.197)	(0.398)	(0.121)	(0.717)	(0.074)	(0.128)
FDI(-1)	-0.031	-0.466*	-0.006	0.036	-0.005	-0.215	0.018	0.019
	(0.034)	(0.262)	(0.025)	(0.050)	(0.032)	(0.189)	(0.020)	(0.034)
FDI(-2)	-0.098***	-0.327	-0.016	0.044	-0.062*	-0.13	0.004	0.031
	(0.034)	(0.260)	(0.024)	(0.049)	(0.033)	(0.192)	(0.020)	(0.034)
FDI(-3)	-0.022	-0.126	-0.002	-0.054**	-0.016	-0.232	0.000	-0.021
	(0.016)	(0.125)	(0.012)	(0.024)	(0.028)	(0.165)	(0.017)	(0.029)
FDI(-4)	-0.013	-0.02	0.000	0.000	-0.035	-0.232	-0.009	-0.004
	(0.022)	(0.171)	(0.016)	(0.032)	(0.028)	(0.165)	(0.017)	(0.029)
FPI(-1)	-0.067	1.028	0.189***	-0.103	-0.121	0.742	0.163**	0.017
	(0.083)	(0.646)	(0.061)	(0.122)	(0.105)	(0.620)	(0.064)	(0.111)
FPI(-2)	0.196*	-0.782	0.208***	-0.151	0.071	-0.866	0.186***	-0.183*
	(0.101)	(0.786)	(0.074)	(0.149)	(0.093)	(0.550)	(0.057)	(0.098)
FPI(-3)	0.042	-0.461	-0.079	0.035	0.199	0.038	-0.03	0.144
	(0.107)	(0.830)	(0.078)	(0.157)	(0.124)	(0.732)	(0.076)	(0.131)
FPI(-4)	-0.253**	-0.271	0.087	0.124	-0.186	0.524	0.102	-0.053
	(0.120)	(0.935)	(0.088)	(0.177)	(0.120)	(0.712)	(0.073)	(0.127)
REM(-1)	-0.152	-0.154	-0.124	1.43***	-0.075	1.082	-0.037	0.92***
	(0.234)	(1.819)	(0.171)	(0.345)	(0.266)	(1.570)	(0.162)	(0.281)
REM(-2)	-0.246	3.127	0.282	-0.494	-0.123	2.167	0.189	-0.199
	(0.387)	(3.007)	(0.282)	(0.570)	(0.345)	(2.038)	(0.210)	(0.364)
REM(-3)	1.069***	-0.736	0.224	-0.012	0.649***	-1.56	0.060	0.369
	(0.354)	(2.752)	(0.258)	(0.521)	(0.236)	(1.393)	(0.144)	(0.249)
REM(-4)	-0.515***	-0.625	-0.255***	-0.059	-0.363**	0.006	-0.143	-0.443**
	(0.169)	(1.309)	(0.123)	(0.248)	(0.180)	(1.063)	(0.110)	(0.190)
Adj. R-sq.	0.692	0.608	0.926	0.936	0.790	0.517	0.935	0.707
F-statistic	4.203	3.215	18.910	21.955	6.389	2.532	21.428	4.448
Akaike AIC	-7.253	-3.154	-7.887	-6.481	-8.569	-5.015	-9.558	-8.459
Schwarz SC	-6.235	-2.136	-6.869	-5.464	-7.552	-3.998	-8.54	-7.441
No. of Obs	31	31	31	31	31	31	31	31

The table reports coefficient estimates for the residential market VAR for Morocco and their standard errors in the parenthesis (). RES, FDI, FPI and REM stand for residential investment, foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The negative number in the parenthesis next to these variables indicates the number of lags of the scaled variables. The asterisk ***, **, and * indicate significance of the test statistics the 1%, 5% and the 10%, respectively.

That being the case, we test for threshold capital flows in the residential VAR model and report the results in Table 4.17. The threshold results indicate that the relationship between investments and FDI varies according to the size of the FDI inflows received

because one critical flow along FDI in the residential market is established. This evidence helps to clarify the results of the VAR model estimation of the effect of FDI.

Although a robust negative effect was established by the VAR models as being statistically significant, the threshold flow test shows that the nature of the effect is also governed by the size of the inflow, and therefore, significant positive and negative effects are both possible. However, the threshold capital flow test fails to identify any critical flow along FPI and remittances that is robust.

Table 4.17: The Results of the Bai-Perron Test for the Residential Market in Morocco

	FDI	FPI	REM
PANEL A:Scaled by Capital Stock			
F-stat (0 vs. 1*)	16.690**	9.440	15.808**
F-stat (1 vs. 2*)	10.533		52.238**
F-stat (2 vs. 3*)			291.404**
PANEL B:Scaled by GDP			
F-stat (0 vs. 1*)	15.935 **	6.913	12.268
F-stat (1 vs. 2*)	23.492**		
F-stat (2 vs. 3*)	1714.032**		

The table shows the Bai-Perron threshold flow test results the residential real estate markets of Morocco. FDI, FPI and REM stand for foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The values in the table are F-statistics of the identified critical flows (break points). Significant F-statistics are flagged with the asterisks: ***, ** and * indicate that the threshold value is significant at the 1%, 5% and the 10% level.

On the whole, the two tests of causality provide evidence which when interpreted together indicates that the effects of FDI on residential investment in Morocco is size-dependent, the effect of FPI is not clear and the effect of remittances is time-dependent only.

It of importance to understand that after the adoption of the adjustment plan of 1983 and the accompanying complementary measures, Morocco became one of the leading recipients of FDI in Africa (Bouoiyour, 2007). This fact is supported by available data and statistics (World Development Indicators, 2011). That said, the threshold flow test results suggest that the nature of the effect is majorly contingent to the size of inflow although based on the VAR results, the negative effect is the most domineering effect. This indicates crowding-out effect when amount received is within certain threshold amounts.

Crowding-out effect has been long established in Morocco. Haddad and Harrison (1993) did not find any evidence of spillover effects in the manufacturing sector of Morocco from foreign firms while Abdelhafidh (2013) rejected a hypothesis of foreign capital-led growth in Morocco, only grants appear to spur growth. With specific reference to residential real estate market in Morocco and in view of findings of the previous studies, these results provide very important evidence indicating that negative effects of FDI are only possible when the amount of inflow is beyond certain threshold amount after which the effect may be positive.

Separately, inconclusiveness of the results relating to effects of FPI highlights a need of further tests to explain clearly the effects of FPI on residential investment. Existing literature identifies uncertainties as a major cause of reversals and withdrawals of FPI (Ahmad *et al.,* 2004). A possible source of uncertainties in the housing market of Morocco would be forced slum upgrading projects (Arandel and Wetterberg, 2013) and prevalence of squatting (Erbaş and Nothaft, 2005).

Government intervention is always suggested as a major source of housing market imperfection which mostly results into massive exit of private investors from a market (World Bank, 1993). Similarly, practices such as unauthorized or squatting erode confidence in the property right laws (Erbaş and Nothaft, 2005), which also discourages private investment into the market.

On the effects of remittances, previous studies, such as one by De Haas (2006), found that international migrant households invest more than others in housing, among other sectors in Morocco. Indeed, compared to other developing countries, Morocco has the highest immigrant population in developed countries and receives among the highest remittances compared to other African countries (De Haas, 2006; Mohapatra and Ratha, 2011; World Development Indicators, 2011). In this regard, a positive effect is in support of existing statistics and previous research but the negative effect that manifests after four quarter calls for further inquiry. The channels used by foreign capital inflows to affect residential investment are examined in the next chapter could explain these inconsistences.

4.7.6 The Causality Results for Morocco: Non-Residential Market

In the non-residential market, we also control for the economic environment on the causality relationships by including GDP growth rate. Otherwise, the models are parameterized in a manner similar to the approaches adopted in the estimation of the residential market models above. The results are also presented side-by-side in Table 4.18 below.

The robust results reveal that only unidirectional causalities exist between foreign capital inflows and non-residential investment. Causality appears to run from non-residential investment towards FDI and remittances. Between FPI and non-residential investment, causality appears to flow from FPI to investments. While regarding the effects of foreign capital flows on non-residential investment, consistent results indicate that only FPI seem to have a statistically significant effect on non-residential investment. The nature of the effect is time-dependent. This evidence is consistent and robust across model specifications.

The results on FDI and remittances are truly startling findings which call for a further investigation of the underlying causal relationships. Existing data shows that since 1983, Morocco has been known as a country of high FDI inflows and with a high number of citizens in the diaspora, Morocco also receives more remittances than most African countries (Bouoiyour, 2007; De Haas, 2007). Unless crowding-out effects or structural breaks are concealing the true causal relationships, with huge amounts of inflows, one would expect FDI and remittance to have a significant influence on non-residential investment in Morocco.

Table 4.18: The Result of the Non-Residential VAR Analysis of Morocco

	Panel A: (Capital Stock-Scaled)				Panel B (GDP-Scaled)			
	RES	FDI	FPI	REM	RES	FDI	FPI	REM
NRES(-1)	0.016	-11.21***	-0.061	1.470***	0.054	-12.01***	-0.101	0.309
	(0.148)	(3.755)	(0.903)	(0.539)	(0.082)	(1.933)	(0.481)	(0.408)
NRES(-2)	0.037	4.412	-0.237	-0.376	0.159	3.052	0.132	-0.347
	(0.114)	(2.882)	(0.693)	(0.414)	(0.117)	(2.752)	(0.684)	(0.580)
NRES(-3)	0.227**	-2.305	0.135	0.838**	0.237***	-2.143	-0.156	0.831**
	(0.104)	(2.646)	(0.637)	(0.380)	(0.083)	(1.940)	(0.482)	(0.409)
NRES(-4)	0.179	6.495**	0.010	-0.790*	0.265***	5.298***	0.126	0.242
	(0.113)	(2.868)	(0.690)	(0.412)	(0.085)	(1.990)	(0.495)	(0.420)
FDI(-1)	-0.004	-0.134	0.016	0.027	-0.007	0.052	0.017	-0.035
	(0.010)	(0.242)	(0.058)	(0.035)	(0.009)	(0.200)	(0.050)	(0.042)
FDI(-2)	0.007	-0.317**	-0.011	0.059***	0.007	-0.296**	-0.014	0.063**
	(0.006)	(0.146)	(0.035)	(0.021)	(0.005)	(0.128)	(0.032)	(0.027)
FDI(-3)	-0.002	0.148	-0.004	-0.088***	0.004	0.095	0.010	-0.037
	(0.007)	(0.167)	(0.040)	(0.024)	(0.005)	(0.123)	(0.031)	(0.026)
FDI(-4)	0.005	-0.318*	0.005	0.037	0.004	-0.17	0.005	-0.034
	(0.007)	(0.180)	(0.043)	(0.026)	(0.005)	(0.122)	(0.030)	(0.026)
FPI(-1)	0.056***	1.023**	0.119	-0.150**	0.048**	1.542***	0.076	-0.123
	(0.019)	(0.493)	(0.119)	(0.071)	(0.022)	(0.513)	(0.128)	(0.108)
FPI(-2)	0.021	-0.654	0.156	-0.09	0.011	-0.624	0.116	-0.215*
	(0.022)	(0.564)	(0.136)	(0.081)	(0.023)	(0.531)	(0.132)	(0.112)
FPI(-3)	-0.075***	0.532	-0.011	0.028	-0.080***	0.734	0.000	-0.096
	(0.024)	(0.606)	(0.146)	(0.087)	(0.024)	(0.558)	(0.139)	(0.118)
FPI(-4)	-0.046*	-1.113*	0.045	0.165*	-0.049*	-1.345**	-0.017	0.087
	(0.026)	(0.668)	(0.161)	(0.096)	(0.025)	(0.594)	(0.148)	(0.125)
REM(-1)	0.017	0.770	0.064	1.827***	-0.044	2.852**	-0.016	0.387
	(0.082)	(2.083)	(0.501)	(0.299)	(0.059)	(1.374)	(0.342)	(0.290)
REM(-2)	-0.067	2.097	-0.169	-0.968**	0.003	-1.354	-0.2	0.556*
	(0.130)	(3.289)	(0.791)	(0.472)	(0.064)	(1.505)	(0.374)	(0.317)
REM(-3)	0.045	-2.073	0.281	0.137	0.036	-0.518	0.221	0.249
	(0.085)	(2.146)	(0.516)	(0.308)	(0.045)	(1.056)	(0.262)	(0.223)
REM(-4)	0.000	-0.287	-0.147	-0.023	-0.014	-0.533	0.014	-0.257
	(0.045)	(1.131)	(0.272)	(0.162)	(0.033)	(0.782)	(0.194)	(0.165)
Adj. R-sq.	0.862	0.652	0.651	0.960	0.878	0.671	0.741	0.722
F-statistic	10.858	3.952	3.940	38.446	12.408	4.223	5.529	5.108
Akaike AIC	-5.677	0.789	-2.061	-3.093	-11.639	-5.327	-8.111	-8.441
Schwarz SC	-4.752	1.714	-1.136	-2.168	-10.714	-4.402	-7.186	-7.515
No. of Obs	31	31	31	31	31	31	31	31

The table reports coefficient estimates for the non-residential market VAR for Morocco and their standard errors in the parenthesis (). NRES, FDI, FPI and REM stand for non-residential investment, foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the non-residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The negative number in the parenthesis next to these variables indicates the number of lags of the scaled variables. The asterisk ***, **, and * indicate significance of the test statistics the 1%, 5% and the 10%, respectively.

Therefore, we implement the threshold capital flow test in the non-residential real estate market of Morocco. The results are presented in Table 4.19. These results provide robust evidence that is consistent in the two model specifications, indicating that there exists one critical flow along remittances in the non-residential VAR model. For FDI and FPI, the breaks found are not statistically significant and therefore not important. Essentially, the

presence of a critical flow along remittances indicates that both positive and negative effects of remittances on non-residential investment are possible because the nature of the effects of remittance is governed by the size of the inflow.

Table 4.19: Bai-Perron Test Results for the Non-Residential Market of Morocco

	FDI	FPI	REM
PANEL A:Scaled by Capital Stock			
F-stat (0 vs. 1*)	12.103	4.570	82.166***
F-stat (1 vs. 2*)			3.330
PANEL B:Scaled by GDP			
F-stat (0 vs. 1*)	3.908	6.120	43.118***
F-stat (1 vs. 2*)			2.788

The table shows the Bai-Perron threshold flow test results for non-residential real estate markets of Morocco. FDI, FPI and REM stand for foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the non-residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The values in the table are F-statistics of the identified critical flows (break points). Significant F-statistics are flagged with the asterisks: ***, ** and * indicate that the threshold value is significant at the 1%, 5% and the 10% level.

In summary, the results of these two tests suggest that FDI has no statistically significant effects on non-residential investment; FPI has time-varying effects while remittances have size-dependent effects.

It appears that vast foreign resources received as FDI in Morocco have a pronounced crowding-out effect on non-residential real estate market than in the residential real estate market. This evidence is supported by the previous work of Haddad and Harrison (1993) and Abdelhafidh (2013) who established evidence of FDI crowding-out domestic investment. Indeed, as part of productive sectors of the economy such as the manufacturing and services sectors, non-residential real estate markets are expected to be exceedingly affected with crowding-out effect than residential real estate market.

On FPI, Abid and Bahloul (2011) noted that because of its location Morocco is positioned to attract more FPI from Canada and the United States than other Middle East and North Africa countries. However, they observed that strong bilateral trade and institutional quality are important determinants of the size of FPI flowing into MENA countries. In addition, Hearn *et al.,* (2010) found that the rate of return on equity is relatively high in Morocco compared to other countries. These factors are likely to work for the better of high inflows of FPI into Morocco. These explain why the size of FPI is

not a determining factor of the nature of FPI's effects instead time is the only guiding factor perhaps as a result of stable inflows.

The evidence of significant effects of remittances is supported by the fact that Morocco is also a major recipient of global remittances (De Haas, 2006; Mohapatra and Ratha, 2011). Moreover, the argument put forward by Alfaro *et al.,* (2004) and substantiated by other studies such as Alfaro *et al.*, (2010) and Giuliano and Ruiz-Arranz (2009) that presence of developed financial markets aid in marking a private transfer such remittance to finance domestic investments supports findings above. Nevertheless, a further investigation of the channel used by remittances to affect non-residential real estate would provide additional explanation of why the effect is sometimes negative for FPI and remittances.

4.7.7 The Causality Results for Namibia: Residential Market

The causality relationships that exist between residential and non-residential investments in Namibia are also examined in a similar way to the approach adopted in the other countries. For exogenous variables, we include gross value added (GVA) by the construction sector as the only control variable. The results of this analysis are presented in Table 4.20. It appears that estimates of coefficients revealed by both specifications are about the same size, appear at the same time and are of similar sign each time, which suggest that both specifications performed equally with regard to coefficient estimates.

In the residential market of Namibia, the results show that all foreign capital inflows have significant favourable effects on the residential investment. A bidirectional causality relationship exists between residential investment and FDI only, where the feedback from the residential investment to FDI seems to be negative while FDI drives investments positively. The direction of causality regarding FPI and remittances relative to residential investment appears to be unidirectional, flowing from foreign capital inflows (FPI and remittances) towards residential investments.

Table 4.20: The Result of the Residential VAR Analysis of Namibia

	Panel A: (Capital Stock-Scaled)				Panel B (GDP-Scaled)			
	RES	FDI	FPI	REM	RES	FDI	FPI	REM
RES(-1)	-0.316	-6.425***	-0.017	-0.566	-0.211	-6.244***	-0.009	-0.383
	(0.223)	(0.979)	(0.012)	(2.102)	(0.297)	(0.684)	(0.005)	(1.773)
RES(-2)	-0.445*	1.777	-0.003	-1.207	-0.354	1.747**	0.006	-1.189
	(0.269)	(1.180)	(0.014)	(2.535)	(0.348)	(0.799)	(0.005)	(2.072)
RES(-3)	0.124	-1.697*	-0.004	-0.061	0.133	-1.615**	-0.007	-0.228
	(0.230)	(1.011)	(0.012)	(2.172)	(0.331)	(0.760)	(0.005)	(1.971)
FDI(-1)	0.047	0.985***	0.001	0.062	0.059	1.004***	0.003***	0.121
	(0.042)	(0.184)	(0.002)	(0.395)	(0.049)	(0.112)	(0.001)	(0.290)
FDI(-2)	0.154***	0.559***	0.003	0.197	0.171**	0.480***	0.001	0.159
	(0.042)	(0.185)	(0.002)	(0.398)	(0.071)	(0.163)	(0.001)	(0.423)
FDI(-3)	-0.025	-0.630***	-0.002	-0.1	-0.025	-0.653***	-0.001	-0.063
	(0.027)	(0.116)	(0.001)	(0.250)	(0.034)	(0.078)	(0.001)	(0.203)
FPI(-1)	4.918	129.64**	1.62**	56.283	-2.264	139.8***	1.238***	56.602
	(12.175)	(53.437)	(0.656)	(114.78)	(13.449)	(30.920)	(0.211)	(80.163)
FPI(-2)	41.59***	-29.945	-1.427***	-6.14	46.56***	-46.934	-1.467***	-12.08
	(9.477)	(41.597)	(0.511)	(89.347)	(13.064)	(30.035)	(0.205)	(77.870)
FPI(-3)	-1.475	99.369	2.071**	46.951	-12.126	121.4***	1.736***	53.144
	(16.360)	(71.806)	(0.882)	(154.24)	(19.370)	(44.532)	(0.304)	(115.46)
REM(-1)	-0.036	-1.563***	-0.011	-0.33	-0.054	-1.804***	-0.010***	-0.392
	(0.131)	(0.576)	(0.007)	(1.237)	(0.174)	(0.399)	(0.003)	(1.035)
REM(-2)	0.445***	2.164***	0.003	0.463	0.442**	2.054***	0.00	0.354
	(0.158)	(0.692)	(0.008)	(1.487)	(0.225)	(0.517)	(0.004)	(1.341)
REM(-3)	0.918***	1.355	-0.002	0.404	0.968***	0.816	-0.005	0.280
	(0.241)	(1.058)	(0.013)	(2.274)	(0.351)	(0.807)	(0.006)	(2.093)
Adj. R-sq.	0.454	0.918	0.551	-5.614	0.283	0.961	0.945	-3.593
F-statistic	1.892	12.997	2.314	0.091	1.424	27.456	19.318	0.162
Akaike AIC	-7.311	-4.353	-13.153	-2.824	-8.923	-7.258	-17.23	-5.353
Schwarz SC	-6.587	-3.629	-12.428	-2.1	-8.199	-6.534	-16.506	-4.629
No. of Obs.	16	16	16	16	16	16	16	16

The table reports coefficient estimates for the residential market VAR for Namibia and their standard errors in the parenthesis (). RES, FDI, FPI and REM stand for residential investment, foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The negative number in the parenthesis next to these variables indicates the number of lags of the scaled variables. The asterisk ***, **, and * indicate significance of the test statistics the 1%, 5% and the 10%, respectively.

All results on the influence of FDI, FPI and remittance on residential investment in Namibia are positive and robust to alternative specifications. These provide robust and consistent evidence that sufficiently indicate that FDI, FPI and remittances all have significant constructive effects on residential investments in Namibia although the time of impact varies. For FDI and FPI, significant effect appears during the second quarter after the quarter of inflow, this is the only time when FDI and FPI have statistically significant effect on residential investment. For remittances, the effects are positive and

extend from the second quarter into the third quarter. All established significant positive effects are consistently revealed by the two specifications, and are therefore, robust.

Robustness of results is a desirable quality that is sought in most estimation; although, robust results might still be masking structural breaks, revealing only the domineering effect. It is therefore important that we establish whether threshold capital flows exist in the relationship between foreign capital inflows and residential investment for a clearer understanding of the underlying causal relationship. This test is implemented and results are reported in Table 4.21 below.

As before, the scaling factor did not seem to matter to the estimation of critical flows; either of the specifications appears to produce the same number of threshold flows in each regressor. The results are all robust and consistent across specifications suggesting that there is one critical flow along the size of each foreign capital flow. This implied that the effects of FDI, FPI and remittances are mainly dependent on the size of the inflows received. The positive effect is possibly domineering but the evidence below suggests that the nature of the causal effects is contingent on the size of the inflows, and therefore, negative and insignificant effects can also be possible.

Table 4.21: Results of the Threshold Flow Test in the Residential market of Namibia

	FDI	FPI	REM
PANEL A:Scaled by Capital Stock			
F-stat (0 vs. 1*)	583.959***	257.090***	15.434**
PANEL B:Scaled by GDP			
F-stat (0 vs. 1*)	127.162***	80,660.2***	40.130***

The table shows the Bai-Perron threshold flow test results for the residential real estate markets of Namibia. FDI, FPI and REM stand for foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The values in the table are F-statistics of the identified critical flows (break points). Significant F-statistics are flagged with the asterisks: ***, ** and * indicate that the threshold value is significant at the 1%, 5% and the 10% level.

Naturally, FDI is mostly attracted to countries that offer large domestic markets or with abundant natural resources. But policies also matter. Namibia, has neither huge natural mineral deposits nor a big market but as early as 1997, Morisset (2000) showed that Namibia had already implemented investment sensitive policies which aimed at making the business environment most attractive to investors. Perhaps this explains why FDI and FPI have significant positive impacts on residential investment. Be that as it may, we can

only tell whether the effect is direct or intermediated after a further examination since Namibia is ranked only second to South Africa in terms of outstanding mortgage debt (Rust, 2012), which suggests that the credit market plays a more important role in the residential real estate market relative to other African countries.

Nevertheless, a likelihood of a negative effect under/above certain threshold amount could be explained by a possible crowding-out effect for FDI, especially when it discourages domestic investment and possible reversibility of FPI when negative effects of macroeconomic uncertainties prevails over the desirable effects. This is supported by evidence of reversal of FPI by Brambila-Macias and Massa (2010) and crowding-out of FDI established by Ikhide (2006) in Namibia. According to Ikhide (2006), the nature and quality of FDI could explain whether positive spillovers are effective. For residential markets, this study provides additional robust evidence that the size of the inflows also matters.

Regarding the persistent of positive effect of remittances, a study by Lartey (2011), where Namibia was one of the countries in his sub-Saharan panel, remittance was found to impact the economies positively through investment but only at a certain threshold level of financial development. In other words, Lartely (2001) showed that remittance can play a great role in creation of capital in an economy, which can go a long way in developing economies by augmenting domestic investments. Namibia is a neighbour to a wealthier South Africa.

Indeed, proximity to a wealthier neighbour was identified as one of the prerequisite conditions necessary for a consistent flow of *diaspora* remittance (Lee *et al.,* 2009). As such, a significant positive effect on investment is highly expected. Nonetheless, the possibility of a negative impact is subject to further analysis in the next chapter to see whether the channel of impact has a role to play on the nature of remittances' effects.

4.7.8 The Causality Results for Namibia: Non-Residential Market

In the non-residential market, we parameterize the VAR models as before and obtain the estimated causality relationships between non-residential investments and foreign capital inflows. The results of these estimations are presented in Table 4.22. The results provide robust and sufficient evidence that statistically significant bidirectional causality exists between FDI and non-residential investment only, even though, the two specifications do not agree on the nature of causality flowing from non-residential investment to FDI.

The GDP-scaled model found the effect of investment to be positive while the capital stock-scaled model found the effect to be negative. About the direction of causality between non-residential investment and FPI, it appears that FPI drives non-residential investment based on robust evidence. The results for the direction of causality between non-residential investment and remittances and on the effect of non-residential investment on FPI are not consistent; and therefore, not conclusive.

The specific results on the effects of foreign capital inflows on non-residential investment appear to agree between the two models in most cases, which make them robust - with the exception of remittances. The results show that the effect of FDI on investment is negative, statistically significant and during the first quarter after the quarter of receipt. For FPI, the effect is positive during the first and third quarter after the quarter of inflow. These two sets of results are robust. However, results for the effect of remittances are inconsistent, only the GDP-scaled model found statistically significant effect which is negative after two quarters but the capital stock-scaled model did not find any important effect.

Negative effects of FDI probably indicate crowding-out effects which appear to be persistent and stronger in the non-residential market than in the residential market. In the later periods, the positive effects are anticipated, based on earlier studies and the structural model, but the VARs fail to reveal that. This unexpected results and unclear results relating to the effects of remittances require that we check for possible structural breaks along the size of foreign capital inflows.

Table 4.22: The Result of the Non-Residential VAR Analysis of Namibia

	Panel A: (Capital Stock-Scaled)				Panel B (GDP-Scaled)			
	RES	FDI	FPI	REM	RES	FDI	FPI	REM
NRES(-1)	0.152	0.636	-0.001	0.289	1.655**	8.962**	0.003	1.164
	(0.358)	(2.176)	(0.012)	(0.795)	(0.770)	(3.714)	(0.013)	(1.406)
NRES(-2)	-0.001	-3.567**	-0.022**	-0.941	0.971**	1.794	-0.011	-0.521
	(0.280)	(1.700)	(0.009)	(0.621)	(0.473)	(2.279)	(0.008)	(0.863)
NRES(-3)	0.082	1.111	-0.006	-1.965**	0.530	4.601*	-0.003	-1.48
	(0.430)	(2.615)	(0.014)	(0.956)	(0.570)	(2.751)	(0.009)	(1.041)
FDI(-1)	-0.139*	1.229**	0.005*	0.071	-0.294**	0.172	0.004**	-0.052
	(0.080)	(0.489)	(0.003)	(0.179)	(0.116)	(0.559)	(0.002)	(0.212)
FDI(-2)	0.032	0.526	0.003	0.501**	-0.046	-0.3	0.002	0.400*
	(0.101)	(0.612)	(0.003)	(0.224)	(0.127)	(0.613)	(0.002)	(0.232)
FDI(-3)	-0.064	-0.443	0.001	0.136	-0.111*	-0.784***	0.000	0.060
	(0.047)	(0.287)	(0.002)	(0.105)	(0.059)	(0.284)	(0.001)	(0.108)
FPI(-1)	20.427**	162.6***	0.736***	1.180	113.58**	814.3***	1.084	82.079
	(8.547)	(51.968)	(0.284)	(18.990)	(49.154)	(237.064)	(0.800)	(89.755)
FPI(-2)	6.543	51.882	-0.940***	13.433	34.206*	216.78**	-0.990***	33.439
	(9.130)	(55.514)	(0.303)	(20.285)	(20.036)	(96.631)	(0.326)	(36.586)
FPI(-3)	29.29***	13.087	0.543	-22.975	151.38**	873.9***	1.102	79.647
	(10.968)	(66.693)	(0.364)	(24.370)	(62.913)	(303.425)	(1.025)	(114.880)
REM(-1)	0.083	-2.298**	-0.008	-0.57	-0.408	-5.366***	-0.006	-1.005
	(0.172)	(1.046)	(0.006)	(0.382)	(0.375)	(1.807)	(0.006)	(0.684)
REM(-2)	-0.275	3.465*	0.010	-0.686	-1.018*	-0.865	0.005	-1.068
	(0.339)	(2.062)	(0.011)	(0.753)	(0.529)	(2.549)	(0.009)	(0.965)
REM(-3)	0.078	2.453*	0.007	0.512	-0.102	1.039	0.004	0.377
	(0.207)	(1.258)	(0.007)	(0.460)	(0.265)	(1.279)	(0.004)	(0.484)
Adj. R-sq.	0.431	0.696	0.734	0.286	0.101	0.699	0.896	0.244
F-statistic	1.874	3.637	4.190	1.462	1.130	3.686	10.925	1.372
Akaike AIC	-3.595	0.015	-10.405	-1.998	-7.793	-4.646	-16.028	-6.589
Schwarz SC	-2.919	0.691	-9.729	-1.322	-7.117	-3.97	-15.352	-5.913
No. of Obs.	16	16	16	16	16	16	16	16

The table reports coefficient estimates for the non-residential market VAR for Namibia and their standard errors in the parenthesis (). NRES, FDI, FPI and REM stand for non-residential investment, foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the non-residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The negative number in the parenthesis next to these variables indicates the number of lags of the scaled variables. The asterisk ***, **, and * indicate significance of the test statistics the 1%, 5% and the 10%, respectively.

The results for the threshold flow models for Namibia are presented in Table 4.23. The results are all robust and consistent across specifications signifying that a threshold capital flows exists along each foreign capital flow when their effects on non-residential investments are examined. The results suggest that the negative robust FDI effect established by the VAR only persists within certain amounts of inflows, so the possibility of favourable effects cannot be ruled out. Similarly, the absence of robust constructive remittance effect could also be masked by the structural breaks along the size of remittance inflows as established and reported above.

Table 4.23: Threshold Flow Test Results for the Non-Residential market of Namibia

	FDI	FPI	REM
PANEL A:Scaled by Capital Stock			
F-stat (0 vs. 1*)	557.202***	244.784***	4769.488***
PANEL B:Scaled by GDP			
F-stat (0 vs. 1*)	1,4341.600***	625.153***	3166.800***

The table shows the Bai-Perron threshold flow test results for the non-residential real estate markets of Namibia. FDI, FPI and REM stand for foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the non-residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The values in the table are F-statistics of the identified critical flows (break points). Significant F-statistics are flagged with the asterisks: ***, ** and * indicate that the threshold value is significant at the 1%, 5% and the 10% level.

Interpreting the VAR and threshold capital flow tests results together, it becomes clear that the effect of each of the three foreign capital inflows on non-residential investment is governed by the size of the flow received. The nature of the effect could change from negative to positive depending on whether amount received exceeds, or otherwise, the critical flow amount. Nonetheless, the effects of FDI tend to be mostly negative while the effects of FPI are mostly positive.

The findings on FDI are supported by statistical evidence and empirical findings. First, data shows Namibia as one of the African countries whose inflow of FDI has risen drastically since mid-2000s (Ajayi, 2006; Ndikumana and Verick, 2008). According to Ikhide (2006), translation of the FDI into economic benefit has been slow because of size, quality and nature of FDI are important determinants of the effect of FDI in Namibia.

There is much doubt as to whether desirable economic effects are possible when FDI is predominantly natural resource-driven or when FDI targets firms that compete harshly with domestic firms as the case is in Namibia (Ikhide, 2006). This explains the conflicting results between residential and non-residential real estate markets in terms of the domineering effect of FDI. The results here, provides additional evidence suggesting that effectiveness of FDI in Namibia, especially in real estate market, is also dependent on the size of FDI received.

On FPI, despite the conducive investment environment set forth by investor-friendly policies (Morisset, 2000), reversal and withdrawal of FPI is a common occurrence in Namibia after the global financial crisis (Brambila-Macias and Massa, 2010). The findings of this study on FPI, indicate the possibility of both positive and negative effects

being governed by a statistically significant critical flow, are supported by the above writer. In addition, these results can be interpreted to imply that the undesirable effects of reversibility are only significant when FPI received is below/above the threshold amount; otherwise, positive externalities on non-residential investments can still be achieved.

Remittances, on the other hand, are regarded as private household transfers whose direct benefits are expected to be borne by households not commercial and industrial ventures (Giuliano and Ruiz-Arranz, 2009). Evidence of positive effect on non-residential investment is supported by the finding of Giuliano and Ruiz-Arranz (2009) and evidence by Alfaro *et al.*, (2010) who indicate that developed financial markets can help to make such private transfers be beneficial to firms and domestic investors. Nonetheless, negative effects of remittances are subject of further analysis in the next chapter.

4.7.9 The Causality Results for South Africa: Residential

We parameterize the VAR for South Africa in a way similar to the systematic approaches adopted for the other countries. We present the results in Table 4.24. The fits for all models in the residential VARs are relatively high, which suggest a considerable adequacy of the models to the data. However, significant t-ratios are few, which suggest that very few significant causal relationships can extracted directly from a reduced-form VAR unless, perhaps, a different parameterization or modelling is adopted.

The results do not provide any robust evidence on the effects of FDI, FPI and remittances on residential investments. It appears that the entire three foreign capital inflows are not important on residential investment. Furthermore, residential investment does not appear to influence any of the foreign capital flows. It appears though that residential investment is driven by its own previous levels of investment and, perhaps, together with other variables not included in this study.

Table 4.24: The Result of the Residential VAR Analysis of South Africa

	Panel A: (Capital Stock-Scaled)				Panel B (GDP-Scaled)			
	RES	FDI	FPI	REM	RES	FDI	FPI	REM
RES(-1)	1.646***	-0.48	20.399	-0.043	1.643***	-3.86	12.462	-0.103
	(0.177)	(10.150)	(17.826)	(0.322)	(0.171)	(8.426)	(16.155)	(0.230)
RES(-2)	-0.929***	-7.465	-34.206	0.075	-0.750**	-1.619	-19.691	0.197
	(0.329)	(18.917)	(33.222)	(0.600)	(0.333)	(16.382)	(31.409)	(0.448)
RES(-3)	0.381	18.102	20.976	-0.106	0.375	16.795	12.831	-0.163
	(0.311)	(17.850)	(31.348)	(0.566)	(0.320)	(15.746)	(30.190)	(0.430)
RES(-4)	-0.088	-10.111	-8.124	-0.044	-0.321*	-10.223	-2.991	0.108
	(0.170)	(9.769)	(17.156)	(0.310)	(0.173)	(8.494)	(16.286)	(0.232)
FDI(-1)	0.000	0.019	0.039	0.002	0.001	0.030	0.003	0.001
	(0.002)	(0.127)	(0.223)	(0.004)	(0.003)	(0.134)	(0.258)	(0.004)
FDI(-2)	-0.002	0.044	0.204	-0.003	-0.002	0.050	0.151	-0.004
	(0.002)	(0.122)	(0.214)	(0.004)	(0.003)	(0.130)	(0.249)	(0.004)
FDI(-3)	0.001	0.075	0.021	0.006	0.000	0.029	-0.197	0.005
	(0.002)	(0.126)	(0.221)	(0.004)	(0.003)	(0.132)	(0.254)	(0.004)
FDI(-4)	-0.003	-0.204	-0.228	0.001	-0.001	-0.270**	-0.273	0.002
	(0.002)	(0.127)	(0.223)	(0.004)	(0.003)	(0.138)	(0.265)	(0.004)
FPI(-1)	0.00	-0.064	0.112	0.002	-0.001	-0.102	0.186	0.002
	(0.002)	(0.096)	(0.169)	(0.003)	(0.002)	(0.087)	(0.168)	(0.002)
FPI(-2)	-0.002	-0.02	0.254	0.001	-0.001	-0.049	0.171	0.00
	(0.002)	(0.095)	(0.167)	(0.003)	(0.002)	(0.086)	(0.166)	(0.002)
FPI(-3)	0.001	0.079	0.308*	-0.002	0.003	0.026	0.239	-0.001
	(0.002)	(0.094)	(0.166)	(0.003)	(0.002)	(0.088)	(0.168)	(0.002)
FPI(-4)	0.000	-0.101	-0.399**	-0.002	0.000	-0.076	-0.492***	-0.001
	(0.002)	(0.105)	(0.184)	(0.003)	(0.002)	(0.091)	(0.174)	(0.002)
REM(-1)	0.238***	0.063	-11.925	0.85***	0.107	1.921	-8.138	0.82***
	(0.091)	(5.253)	(9.226)	(0.167)	(0.125)	(6.135)	(11.762)	(0.168)
REM(-2)	-0.029	1.732	-6.106	0.103	0.097	5.226	-4.496	0.118
	(0.122)	(6.987)	(12.271)	(0.222)	(0.163)	(8.017)	(15.372)	(0.219)
REM(-3)	-0.05	-2.991	12.662	-0.513**	-0.003	-2.78	14.051	-0.430**
	(0.117)	(6.753)	(11.860)	(0.214)	(0.158)	(7.792)	(14.940)	(0.213)
REM(-4)	0.045	-1.934	-1.435	0.379**	-0.182	-1.843	0.384	0.44***
	(0.102)	(5.846)	(10.267)	(0.186)	(0.123)	(6.033)	(11.567)	(0.165)
Adj. R-sq.	0.988	0.583	0.301	0.784	0.987	0.446	0.247	0.961
F-statistic	216.089	4.785	2.166	10.834	213.883	3.176	1.887	66.834
Akaike AIC	-9.426	-1.323	-0.197	-8.224	-12.332	-4.539	-3.237	-11.738
Schwarz SC	-8.718	-0.615	0.512	-7.515	-11.623	-3.83	-2.528	-11.029
No. of Obs	47	47	47	47	47	47	47	47

The table reports coefficient estimates for the residential market VAR for South Africa and their standard errors in the parenthesis (). RES, FDI, FPI and REM stand for residential investment, foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The negative number in the parenthesis next to these variables indicates the number of lags of the scaled variables. The asterisk ***, **, and * indicate significance of the test statistics the 1%, 5% and the 10%, respectively.

Existing data on South African FDI and FPI suggests otherwise. Accordingly, South Africa is a leading recipient of FDI and FPI in Africa (World Development Indicators, 2011). On remittances, South Africa has a sizeable *diaspora* that lives outside the

continent and an additional *diaspora,* though much smaller, lives and works within the African continent (Crush, 2011). As a result, one would naturally expect the effect of these foreign capital inflows to be robust and favourable as opposed to insignificant effects suggested by the VAR results above. We therefore investigate the possibilities of threshold capital flows which can obscure the true relationship between two variables.

The results of the thresholds capital flow tests are reported in Table 4.25. The results provide robust evidence that suggest one critical flow along the size of FDI and two critical flows along the size of remittances. The results for FPI are inconsistent, and therefore, inconclusive. These results greatly help in clarifying and understanding the causality results provided by the VAR estimations where no robust or consistent effects of any of the foreign capital flows on the residential investment was revealed.

In summary, the causality tests' results suggest that the effects of FDI and the effects of remittances on residential investments are governed by the size of the inflows received. Therefore, FDI and remittances can have either a favourable or unfavourable effect on residential investment depending on the amount received. The effect of FPI remains unclear.

Table 4.25: Threshold Flow Test Results for the Residential market of South Africa

	FDI	FPI	REM
PANEL A:Scaled by Capital Stock			
F-stat (0 vs. 1*)	29.481***	15.637**	22.897***
F-stat (1 vs. 2*)	13.714		18.257**
PANEL B:Scaled by GDP			
F-stat (0 vs. 1*)	15.425**	12.536	17.360**
F-stat (1 vs. 2*)	12.670		32.132**

The table shows the Bai-Perron threshold test results for the residential real estate markets of South Africa. FDI, FPI and REM stand for foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The values in the table are F-statistics of the identified critical flows (break points). Significant F-statistics are flagged with the asterisks: ***, ** and * indicate that the threshold value is significant at the 1%, 5% and the 10% level.

The results on FDI appear to support the findings of Fedderke and Romm (2006) who established a complementarity relationship between FDI and domestic investment only in the long-run, in the short-run, negative effects of FDI on investment were found to persist. Although this implies a time effect on the relationship between FDI and

investment, the evidence above shows that a similar shift in the relationship happens according to the size of FDI received.

The results of remittance indicating a possibility of positive effects are in line with existing statistics on migration and remittance inflows. South Africa is a country of significant immigration (Adams and Page, 2005; Maphosa, 2005). Ratha (2011) showed that the size of remittances into South Africa, between 2006 and 2010, ranked fifth in sub-Saharan countries and had one of the highest growth rates since 2008.

However, it is not clear at this point, how remittances can have a significant negative effect on residential investment. Similarly, the effects of FPI on residential investment are still not clear as well despite relatively large inflows compared to other African countries. These two inconsistencies are investigated further along channels of impact in the next channel.

4.7.10 The Causality Results for South Africa: Non-Residential Market

The results for the non-residential VAR, presented in Table 4.26 below, indicate similar evidence to the residential market analysis reported above. Once again, very few statistically significant t-ratios are reported for foreign capital inflows despite having very high explanatory power. It appears that most variables are largely explained by previous non-residential investments and variables not included in the study, as captured by the constant term.

Regarding to the direction of causalities, the results indicate that only unidirectional causalities exist, all running from non-residential investment. However, these occur between investment and FDI and between investment and FPI only. On the effect of individual foreign capital inflows on non-residential investment, the results appear to reject any significant effects of the inflows. The non-residential VAR indicate that no foreign capital inflows have any significant influence on non-residential investments in South Africa that is robust to alternative specifications. Specifically, the results for FDI are inconclusive but for FPI and remittances, the results simply indicate immaterial effects, and are therefore, not important to the investment in this market.

Table 4.26: The Result of the Non-Residential VAR Analysis of South Africa

	Panel A: (Capital Stock-Scaled)				Panel B (GDP-Scaled)			
	RES	FDI	FPI	REM	RES	FDI	FPI	REM
NRES(-1)	1.064***	-4.35	2.887	0.062	1.035***	-6.438	5.584	0.074
	(0.200)	(9.551)	(13.687)	(0.203)	(0.200)	(7.627)	(11.945)	(0.160)
NRES(-2)	-0.136	11.215	-23.311	-0.021	-0.04	13.245	-20.85	0.030
	(0.287)	(13.716)	(19.654)	(0.291)	(0.283)	(10.802)	(16.918)	(0.227)
NRES(-3)	-0.352	-19.529	44.823**	0.225	-0.339	-17.228*	43.07***	0.124
	(0.266)	(12.710)	(18.214)	(0.270)	(0.269)	(10.254)	(16.059)	(0.216)
NRES(-4)	0.306*	20.879**	-34.45***	-0.24	0.331	20.13***	-35.95***	-0.108
	(0.174)	(8.282)	(11.868)	(0.176)	(0.203)	(7.732)	(12.111)	(0.163)
FDI(-1)	-0.003	-0.246	0.228	0.003	-0.003	-0.193	0.171	0.000
	(0.004)	(0.196)	(0.281)	(0.004)	(0.005)	(0.181)	(0.283)	(0.004)
FDI(-2)	-0.001	-0.087	0.384	-0.003	-0.001	-0.083	0.343	-0.005
	(0.004)	(0.178)	(0.255)	(0.004)	(0.004)	(0.167)	(0.262)	(0.004)
FDI(-3)	0.002	0.003	-0.077	0.004	0.003	0.000	-0.224	0.004
	(0.004)	(0.172)	(0.247)	(0.004)	(0.004)	(0.164)	(0.257)	(0.003)
FDI(-4)	-0.007*	-0.453***	0.049	0.000	-0.006	-0.458***	-0.019	0.001
	(0.004)	(0.172)	(0.247)	(0.004)	(0.004)	(0.170)	(0.266)	(0.004)
FPI(-1)	-0.002	-0.298**	0.320	0.006*	-0.005	-0.326**	0.428**	0.002
	(0.003)	(0.149)	(0.214)	(0.003)	(0.003)	(0.128)	(0.200)	(0.003)
FPI(-2)	0.003	-0.034	0.094	0.001	0.002	-0.056	0.074	0.00
	(0.003)	(0.148)	(0.213)	(0.003)	(0.003)	(0.122)	(0.191)	(0.003)
FPI(-3)	-0.001	0.019	0.303	0.000	-0.002	-0.02	0.349*	0.00
	(0.003)	(0.142)	(0.203)	(0.003)	(0.003)	(0.119)	(0.186)	(0.002)
FPI(-4)	-0.001	-0.18	-0.249	-0.003	0	-0.133	-0.374**	-0.001
	(0.003)	(0.136)	(0.195)	(0.003)	(0.003)	(0.111)	(0.174)	(0.002)
REM(-1)	0.074	-4.425	0.285	0.870***	0.041	-5.242	-0.17	0.790***
	(0.160)	(7.652)	(10.965)	(0.163)	(0.209)	(7.975)	(12.491)	(0.168)
REM(-2)	-0.088	-3.26	-2.632	0.183	-0.214	-2.898	-1.255	0.090
	(0.211)	(10.079)	(14.444)	(0.214)	(0.265)	(10.102)	(15.821)	(0.212)
REM(-3)	0.055	3.760	5.855	-0.444**	0.113	-0.068	9.670	-0.425**
	(0.196)	(9.347)	(13.395)	(0.199)	(0.253)	(9.662)	(15.133)	(0.203)
REM(-4)	0.085	-2.816	7.339	0.361**	0.090	0.325	0.869	0.430***
	(0.161)	(7.693)	(11.024)	(0.163)	(0.194)	(7.404)	(11.596)	(0.156)
Adj. R-sq.	0.861	0.108	0.138	0.571	0.953	0.122	0.204	0.963
F-statistic	18.756	1.349	1.460	4.822	59.391	1.398	1.735	75.748
Akaike AIC	-8.537	-0.807	-0.087	-8.51	-11.372	-4.087	-3.19	-11.81
Schwarz SC	-7.868	-0.138	0.582	-7.841	-10.702	-3.418	-2.52	-11.141
No. of Obs	47	47	47	47	47	47	47	47

The table reports coefficient estimates for the non-residential market VAR for South Africa and their standard errors in the parenthesis (). NRES, FDI, FPI and REM stand for non-residential investment, foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the non-residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The negative number in the parenthesis next to these variables indicates the number of lags of the scaled variables. The asterisk ***, **, and * indicate significance of the test statistics the 1%, 5% and the 10%, respectively.

Still, it is important to acknowledge that South Africa has undergone considerable changes in its monetary and macroeconomic policies in the last decade, which normally amount to structural change in most economic relationships. For example, there was a sudden change in the monetary policy with a focus on inflation targeting around 2003 and subsequent massive drop of the inflation rates (Van der Merwe, 2004) followed by eventual macroeconomic uncertainties (Fedderke and Schaling, 2005; Hodge, 2006). It is

therefore essential that we examine for possible structural breaks along sizes of foreign capital inflows.

The results for existing thresholds are reported in Table 4.27 below. The results indicate that only remittances have a significant critical flow, other foreign capital inflow do not appear to have a statistically significant threshold flow. In view of these results, we can summarize the two sets of causality tests' results as indicating that the effects of FDI on non-residential investment are inconclusive while the effects of FPI are statistically insignificant but the effects of remittances are governed by the amount of remittances received. Contingent on the amount received, depending on whether are below or above the critical flow, the effects of remittances can be either positive or negative.

Table 4.27: Bai-Perron Test Results for the Non-Residential Market of South Africa

	FDI	FPI	REM
PANEL A:Scaled by Capital Stock			
F-stat (0 vs. 1*)	8.524	7.963	24.506***
F-stat (1 vs. 2*)			11.789
PANEL B:Scaled by GDP			
F-stat (0 vs. 1*)	8.524	8.022	36.489***
F-stat (1 vs. 2*)			24.808***

The table shows the Bai-Perron threshold test results for non-residential real estate markets of South Africa. FDI, FPI and REM stand for foreign direct investment, foreign portfolio investment and remittances, respectively, scaled by the non-residential capital stock in the panel A and by the real gross domestic product (GDP) in panel B. The values in the table are F-statistics of the identified critical flows (break points). Significant F-statistics are flagged with the asterisks: ***, ** and * indicate that the threshold value is significant at the 1%, 5% and the 10% level.

Evidence of positive effects of remittance is in line with expectations given the size of South Africans living and remitting their savings back to their country (Crush, 2011; Ratha, 2011). In fact, a substantive number of new entrepreneurs and informal business start-ups in some settlements in South Africa have been found to identify remittances from relatives abroad to be their main impetus (Geyer *et al.*, 2011). Geyer calls it internationalization of the informal sector. However, the evidence indicating insignificance of FDI and FPI on non-residential investment are rather surprising outcomes of the above analyses.

It is somewhat unexpected that FDI would have a more domineering crowding-out effect in non-residential real estate. Although Fedderke and Romm (2006) established a negative complementary effect in the short-run, we expect the threshold capital flow test

to unearth a critical flow or the VAR model to identify the effect after twelve to fifteen months (fourth lag) of inflow to be positive.

Similarly, we expect a positive FPI effect despite possible macroeconomic uncertainties in early 2000s (Fedderke and Schaling, 2005; Hodge, 2006; Van der Merwe, 2004). Such sudden changes in the macroeconomic policies or environment are expected to translate into structural changes rather than insignificant FPI effects. That being the case, to elucidate a clear understanding of the effects of FDI and FPI on non-residential investment, we employ a channel effect analysis in the next chapter

4.8 Chapter Summary

The purpose of this chapter was to establish effects of foreign capital inflows on residential and non-residential investments in each of the five African countries. The Vector Autoregressive (VAR) models were employed to gauge the direction of causality and specific significant effects of foreign capital inflow on real estate investments that possibly exist in each of these markets. Being an autoregressive model, the results also indicate whether effects are time-varying or otherwise, but since a VAR model assumes parametric constancy, which is not always the case in fact, a structural break methodology is important to supplement VAR results.

We used the Bai-Perron threshold test, which is a structural break test, to identify break points in a linear relationship along the size of the variables. The results of the Bai-Perron test simply indicate whether the effect of foreign capital inflows is size-dependent or not. The results varied from country to country and from market to market which implies that a generalization of results is not possible.

In the residential market of Botswana, we found that the effects of FDI and FPI on residential investment are contingent on time and size whereas effects of remittances are governed by the size of the inflow only. In the non-residential market, evidence established indicates that the nature of the effects of each of the three foreign capital inflows on non-residential investment is largely size-dependent.

The results of the Kenyan residential market models are not clear and thus inconclusive on the effects of FDI on residential investment; nevertheless, we established that the effects of FPI are both size-dependent and time-varying whereas the effects of remittances are only size-dependent. On the other hand, the two causality tests for the non-residential real estate market in Kenya provide evidence suggesting positive effects of FDI, negative effects of FPI and size-dependent effects of remittances on non-residential investment.

The results of the two tests of causality for the residential market of Morocco provide evidence that indicates that the effect of FDI on residential investment in Morocco are size-dependent while the effects of remittances are time-varying, but the results for the effects of FPI are neither consistent nor clear and thus inconclusive. In the non-residential market, the results of the two tests suggest that FDI has no statistically significant effects on non-residential investment in Morocco but FPI has time-varying effects whereas remittances have size-dependent effects.

In Namibia, for both residential and non-residential markets, results established robust evidence showing that the effects of each of the three foreign capital inflows on respective market's investment are size-dependent. Separately, the results for the residential market of South Africa indicate that the effects of FDI and the effects of remittances on residential investments are governed by the size of the inflows received. However, the results did not provide robust evidence on the effects of FPI, they were inconsistent and therefore inconclusive. For South Africa, the effects of FDI on non-residential investment are inconclusive while the effects of FPI are statistically insignificant; and the effects of remittances are size-dependent.

In conclusion, although a general view applicable to all markets and countries cannot be inferred from these results, an important emerging trend is that the size of foreign capital received plays a significant role in determining whether a specific foreign capital inflow exerts desirable or undesirable effects on the residential or non-residential real estate investments. Some estimates of foreign capital inflows' effects are unclear and

inconsistent. In this regard, it is important that we explore the channel through which the foreign capital inflows impacts real estate investments to clarify the inconclusive effects.

CHAPTER FIVE

FOREIGN CAPITAL, FINANCIAL MARKETS, AND REAL ESTATE INVESTMENTS

5.1 Introduction

This chapter presents the direct and indirect channels (financial market type) through which foreign capital inflows funnels into residential and non-residential real estate investments. Basically, the intermediary roles of credit and equity markets in the transmission of foreign capital inflows to productive real estate investment opportunities are examined with a view to identifying the most effective and essential channel for each of these kinds of foreign capital inflows. Therefore, we discuss financial intermediation with a particular reference to foreign capital inflows and real estate investments, with further emphasis on estimation models, procedures, and discussions of estimated results.

5.1.1 Financial Intermediation

The previous two chapters provided the results of associations and causal relationships between real estate investments (residential and non-residential) and foreign capital inflows. However, a significant part of these sets of evidence did not clarify the specific ways through which foreign capital inflows would affect or be linked to investments. A positive foreign capital inflow to investment correlation or effect is established in the theoretical frameworks of investments.

Therefore, given the *a priori* expectations of the framework, there is a call for additional exploration and clarification of the negative associations or effects. Some authors have argued that negative FDI effects are indications of crowding-out externalities (Spencer, 2008; Zhipeng and Zinai, 2004) and negative FPI effects are possible hints of reversals of this kind of cross-border inflows or indication of investors' pessimistic opinions of the FPI (Demir, 2009; Sula and Willett, 2009).

Ordinarily, an unfavourable effect shows that the inflow encourages resources to be pushed away from the said market or the inflow fails to enable the said market. However, the explanations of 'crowding-out' and 'reversibility' fails to show the exact means

through which a flow would lead to a negative or positive externality. It is even harder to explain how remittances, a stable private transfer, would elicit a negative investment response or why remittances, as a transfer to households, would exert a positive influence on non-residential investments. These allude to the need for understanding the channel by which foreign capital inflows influence real estate investments.

Domestic financial markets generally act as a bridge or intermediary between those economic agents in need of capital and those with an excess of financial resources. An analysis of the roles of domestic financial markets about the relationship between foreign capital inflows and real estate investments would reveal whether these are the necessary conduits for the inflows or whether these capital inflows can still affect real estate investments significantly in the absence of financial markets.

In fact, theory and previous studies provide considerable evidence that attempts to explain these behaviours. The theory on economic spillover, for instance, argues that externalities of an economic activity, such as inflow of foreign capital, can still be felt by economic agents that are not directly involved in the said economic process (Caves, 1974). Accordingly, even where foreign capital inflows do not provide direct financing to a sector or market, it is still possible that there are positive or important externalities through modern technology, knowledge, and management skills spillovers; all of which in turn improve domestic firm's productivity, competitiveness and performance (Caves, 1974; Fernandes and Paunov, 2012; Kemeny, 2010).

According to Alfaro *et al.,* (2004) and (2010), the spillover effect may not necessarily be positive unless the domestic entrepreneurs, or perhaps investors, are able to access these capital inflows via financial markets. In their view, the presence of developed credit and equity markets is a prerequisite for positive externalities, which may then explain why the impact of foreign capital inflows, at a time, is insignificant or negative. Moreover, the theory of financial liberalization posits that financial markets are part of the 'absorptive capacity' necessary for positive externalities.

According to McKinnon (1973), one of the proponents of this theory, financial market's development is a 'necessary and sufficient condition' to nurture the "adoption of best-practices, technologies and learning by doing." For this reason, it is important to acknowledge that whereas foreign capital are expected to have significant positive impacts on investments, consideration of domestic market conditions is necessary in determining the nature of their effect (Alfaro *et al.*, 2004).

Previous empirical analyses appeared to support this assertion. Evidently, most of these authors seem to agree that although foreign capital brings with it some advantages to the domestic economy, local conditions (absorptive capacity), such as the level of financial market development, can at the same time impose limits on the possible positive externalities for the host country (Alfaro *et al.,* 2004; Giuliano and Ruiz-Arranz, 2009; Nyamongo *et al.,* 2012).

Essentially, well-functioning financial markets reduce the hurdles faced by local firms to imitate the new technologies and efficiencies of multi-national corporations (MNC), thereby improving the absorptive capacity of a country (Azman-Saini *et al.,* 2010a). A theoretical model such as the one provided by Alfaro *et al.,* (2004) attempts to illustrate how financial markets act as a means through which an economy realises positive externalities from foreign capital inflows.

Alfaro *et al.,* (2004) model shows that economic agents are in a continuum in terms of their ability to choose whether to work for an MNC or undertake entrepreneurial activities. Empirical estimation of their model suggests that efficient financial markets permit agents to take advantage of knowledge spillover from MNCs. In the words of Alfaro *et al.,* (2004), improvement of financial market efficiency, increases 'social marginal product' of foreign capital by increasing the number of entrepreneurs in the society. Most studies in support of this view have since proved Alfaro *et al.*, (2004) right.

The general finding of these studies is that financial market development is a prerequisite for positive effects of foreign capital inflows (Ang, 2009; Giuliano and Ruiz-Arranz, 2009; Lee and Chang, 2009). Although these studies examine the role of financial

markets in the relationship between foreign capital flows and the recipient economy; most of these studies use economic growth and very few extend their analysis to take account of investments as a proxy of the domestic economy. Moreover, very few have analysed whether domestic financial markets are necessary for eliciting significant externalities from the real estate investments, and to the best of our knowledge, there is no study that focuses on Africa's national real estate markets.

Besides eliciting investment through financing spillover effects, other authors, such as Demirgüç-Kunt *et al.*, (2011), argue that foreign capital inflows magnify the liquidity of financial institutions which then allows them to expand their credit facilities, and thus drive investments beyond the sector into which the inflow entered the economy. This is indeed what the empirical model in chapter three indicated. The intuition is that foreign capital inflows, together with domestic savings, finance diverse types of domestic investments.

Some of the foreign funds form direct foreign investments while others become indirect foreign investments through the financial markets. This way of financing domestic investments indirectly through financial markets could be the most acceptable way of explaining how remittances, which are private transfers, can exert influence on non-residential investments, as depicted by some of the VAR results in Chapter Three.

According to Demirgüç-Kunt *et al.*, (2011), financial institutions are basic channels or means through which official foreign capital inflow is remitted. Therefore, as agents and intermediaries, several financial benefits accrue to financial institutions. Firstly, deposits grow because high transaction costs of sending funds tend to encourage a lump-sum transmission, which is often in excess of current needs. Secondly, revenues rise since the whole process of receiving funds on behalf of local beneficiaries, safekeeping, and performing other consequential transactions are components of the revenue streams to financial institutions.

Thirdly, expansion of lending capital base and information building on potential borrowers from the transactions improve credit profiles of otherwise opaque borrowers.

Lastly, demand for credit generated from domestic savings reduces because some of the domestic investments will be financed directly using foreign capital inflows, thus freeing up banks to offer loans to other borrowers beyond traditional borrowers (for more, see Demirgüç-Kunt *et al.,* (2011)). Cumulatively, it means that foreign capital inflows through financial institutions can increase liquidity; and therefore this could increase investments in the economy.

In other words, foreign capital inflows help fund investments in a real estate market directly, as part of the project's capital or indirectly through financial markets. The indirect channel means that domestic investors are able to finance their real estate investments by using capital drawn from financial institutions. In this case, financial institutions could be either financing the spillover-generated demand for credit or initially unfunded demand for credit not necessarily generated by spillover effects.

Either way, via the indirect channel, financial market's development is critical in pushing financial resources towards the real estate market. In other words, effective financial markets can facilitate entrepreneurs with long-term finances for them to take advantage of the spillover effects (Giuliano and Ruiz-Arranz, 2009) or they could use their role in intermediating foreign capital flows to amplify financial markets' liquidity and finance more domestically-inspired investments (Ojeda and Center, 2003; Terry and Wilson, 2005).

In our study context, the above discussion suggests that foreign capital inflows into African countries, irrespective of the recipient sector, would have greater positive externalities on real estate investments in addition to the effects of direct capital inflows, if these countries financial markets develop further. Therefore, credit and equity markets can be conduits or channels through which foreign capital inflows foster positive residential and non-residential real estate investments. But African financial markets are still small in comparison to financial markets in Europe or Americas.

The African banking sector is either dominated by state-owned banks or by a few large, sometimes foreign-owned, banks (Allen *et al.,* 2011). The corporate bond markets are in

the nascent and formative stage of development, with very low market capitalization (Mu *et al.,* 2013) while equity markets are virtually underdeveloped, 'thin and illiquid' (Andrianaivo and Yartey, 2010; Beck *et al.,* 2010; Ojah and Kodongo, 2014). This landscape leaves most of the investors with bank credit as the only resort for long-term finance. Even so, the low penetration and limited access to banking products and services remains a dominant feature of African countries. In particular, the size of housing finance in most African countries is a measly 0–2 % of GDP compared to over 80% in most European countries (Roy, 2012; Rust, 2012).

Nevertheless, despite the underdevelopment of the African financial markets, foreign capital inflows are on the rise (Misati and Nyamongo, 2011; Ratha, 2011; World Bank, 2011) and real estate markets are burgeoning with research suggesting that growth of African real estate markets is likely to be sustained (Bolaane and Kalabamu, 2013; Bradlow *et al.,* 2011; Cheung *et al.,* 2012). This raises the question as to what could be the most effective channel foreign capital inflows funnel into real estate markets investments in Africa. In particular, what roles do credit and equity markets play?

Since the results in the previous chapter suggest that there are causal relationships between foreign capital inflows and real estate investments, a major focus of this chapter is to estimate important financial markets' channels used by foreign capital inflows for greatest investments influence in these African countries.

5.2 Model Specification

Empirical literature on channels of transmission of economic transactions and policies suggests that there is more than one way of examining the importance of a channel in a given linear relationship. The simplest, and perhaps weakest method is the 'Chow test' approach (Gujarati, 2003), where observations are classified into groups according to some degree of access to the channel and the 'Chow structural stability' test is used to test the importance of the channel (Chow, 1960; Johnson and Dinardo, 1984; Peek and Rosengren, 1998).

In practice, however, some proxy measures for the channel are continuous indicators, which cannot be dissected to fit a binary variable (e.g. bank credit). Similarly, absence of the channel could also cause other intervening or mediating variables to be absent or different, and thus, affect the estimated relationship.

An alternative method is the threshold-VAR (TVAR) where the importance of the channel is modelled as a non-linear variable which separates the sample into regimes according to whether the indicator or the channel is of significance or not (Ehlers, 2009). This methodology is especially advantageous in a multivariate regression scenario because the TVAR is able to partition a continuous variable into different regimes according to a certain significant threshold value that is endogenously determined.

However, the hypothesis of this test does not allow one to check for the nature of the underlying effect in the presence of the said channel. Instead, it only allows us to state whether the channel is 'important' or 'not important' (see CAHF (2013), Balke (2000) and Ehlers (2009), among others). In our case, an indication of whether the channel leads to positive, negative or insignificant effects would be more important.

Another approach of measuring significance of a channel is by incorporating a measure of the channel in the model as an interactive term (Baglioni, 2007). This method has been variously used with exceptionally reliable results. For instance, Aizenman and Jinjarak (2009) used the 'interactive term' approach to analyse the role of inflation and financial depth on the relationship between current account deficit and real asset appreciation. Alfaro *et al.,* (2004) used it to analyse the role of equity and credit markets as channels through which FDI affects economic growth while Giuliano and Ruiz-Arranz (2009) similarly applied it to examine credit and equity markets as channels for remittances in influencing domestic investment and economic growth.

Since our aim, at this point, is to estimate the effects of foreign capital flows on real estate investments, and in particular, to examine the effects of the inflows when financial market channels are used to effect investments, we use the interactive term approach and specify our baseline model as:

$$y_t = b_0 + b_1 y_{t-1} + b_2 x_{fdi,t} + b_3 x_{fpi,t} + b_4 x_{rem,t} + \boldsymbol{C_t}'\phi + e_t \quad (39)$$

Where, y, x_{fdi} , x_{fpi}, and x_{rem} represent a specific real estate investment (residential or non-residential), foreign direct investment (FDI), foreign portfolio investment (FPI), and remittances, respectively, all scaled down by capital stock, $\boldsymbol{C_t}$ is a vector of control variables and ϕ is a vector of their coefficients while e_t is the error term. Coefficients b_2, b_3, and b_4 indicate the direct effect of FDI, FPI and remittances to real estate investment, respectively.

We include lagged investment to avoid possible significant deviation from the VAR specifications in the previous chapter and to also avoid an over-estimation of the coefficients of the other regressors (see Alfaro *et al.,* 2004; Giuliano and Ruiz-Arranz, 2009). According to these studies, the findings of the above baseline model could either show a positive or negative significance of foreign capital flow on investment. However, the result should be sufficiently robust across different specifications for one to make a general conclusion. In our case, we first scale investments and foreign capital flows with the capital stock of their respective market, and then re-estimate the same model again. But instead of using capital stock, we use GDP to scale the variables.

To examine the indirect channel of foreign capital inflows, that is, their effects on investments through the financial markets, we multiply each foreign inflow with a measure of the financial markets to form interaction terms. To ensure that each interaction term does not proxy for either of its constituent variables, Alfaro *et al.*, (2004) advise that both constituent variables that form the interaction term should be included in the model as well.

In other words, our new model has foreign capital inflow variables, financial market measures and a new set of variables where each foreign capital inflow variable is multiplied by each measure of the financial markets. Because our interest is to establish whether the credit and the equity market channels are significant, we include an indicator

for the banking system development as proxy for the credit market and a stock market development indicator as proxy for equity market channel. Specifically, we estimate:

$$y_t = b_0 + b_1 y_{t-1} + b_2 x_{fdi,t} + b_3 x_{fpi,t} + b_4 x_{rem,t} + b_5\left(x_{fdi,t} * Credit\right) + b_6\left(x_{fpi,t} * Credit\right) + b_7\left(x_{x_{rem,t}} * Credit\right) + b_8\left(x_{fdi,t} * Equity\right) + b_9\left(x_{fpi,t} * Equity\right) + b_{10}\left(x_{rem,t} * Equity\right) + b_{11} Credit + b_{12} Equity + \boldsymbol{C_t}'\phi + u_t \quad (40)$$

Intuitively, a positive coefficient would indicate that positive effects of the flow are enhanced in deeper financial systems (represented in the interaction term). In other words, a positive coefficient estimate would indicate that the indirect channel through the specified financial market is effective in producing positive externalities to the real estate investment when used as a funnelling channel for a given kind of foreign capital inflow. A negative coefficient estimate would imply that the channel would cause unfavourable externalities when used as a funnel to channel the foreign capital inflow into the real estate market.

In more simplified way, we could write the above model (40) as:

$$y = \boldsymbol{x}'\boldsymbol{\beta} + u \quad (41)$$

Where $\boldsymbol{x}$ and $\boldsymbol{\beta}$ denote vectors of all covariates and coefficients, respectively. As a proxy for the credit market, we use claims on the private sector (CPS), and to proxy for the stock market development, we alternate between equity market capitalization and equity market turnover.

5.2.1 Endogeneity and Instrumentation

In the previous chapters, we discussed how autocorrelation and heteroscedasticity could lead to non-spherical disturbances. However, beyond uneven variances and serial correlations, error terms might also exhibit significant correlations with regressors. This is referred to as 'endogeneity bias' which is closely related to the 'simultaneous bias'

discussed in the previous chapter. The distinction between endogenous and exogenous regressors in a model is a subtle issue and often misunderstood by many.

A rather simpler and more precise definition is that a regressor that is reasonably expected to vary autonomously independent of other regressors in a model should be thought of as an exogenous variable, otherwise, it should be treated as an endogenous variable (Greene, 2003). A variable is predetermined, as opposed to being determined within a model if the expectation of the structural disturbances u_t is zero, conditional on the variable. A common term is to say that the errors are innovations, meaning that, the error term is not correlated with any of the regressors. Concisely, we could state that an endogenous variable is one which is determined by some other variable(s) within the model, and is therefore correlated with the error term.

In our formulation above, it is plausible that positive attributes of financial markets could be responsible for enhancing foreign capital inflows and also possible that growth of foreign capital inflows could strengthen financial markets (Alfaro *et al.,* 2004; Demirgüç-Kunt *et al.,* 2011). For instance, Baltagi *et al.,* (2009) and Chinn and Ito (2002) found an empirically significant relationship between capital account liberalization and the size of financial markets (i.e., equity and credit markets).

Additionally, it is also possible that causality may run from previous investments to foreign capital inflows or the size of credit and equity markets, as in the case of reverse causality (Mody and Murshid, 2005). Still, Longstaff and Schwartz (1995) demonstrate that changing the size of credit changes the amount of risk that risk-averse investors are willing to take, which in turn affects equity market prices, return volatility, and the term structure of interest rates. This suggests that the performance or size of credit and equity markets are highly intertwined and thus points to the likelihood of endogeneity bias.

The likely endogeneity of explanatory variables means that the error distribution could be dependent on the distribution of the regressors. Accordingly, regression without consideration of the bias can result in inconsistent estimates. In particular, regression would only provide an estimate of the magnitudes of associations but the estimates of the

directions of causalities would not be reliable (Cameroon and Trivedi, 2005). To correct for endogeneity, one could remove the suspected variables or use instrumental variables. Extant econometric literature insists on the use of the instrumental variables approach as the most plausible means of redress while cautioning that care should be taken in the choice of appropriate set of instruments (Baum *et al.,* 2003, 2011; Sovey and Green, 2011; Staiger and Stock, 1994).

There are different instruments for financial market development, such as the legal origin of a country, also called LLSV (from initials of the authors of the article) (Porta *et al.,* 1997). Most writers believed that LLSV are the most valid instruments for financial development because LLSV meet all of the conditions for valid instruments (to be discussed below). For instance, Alfaro *et al.,* (2004) used LLSV to instrument financial development in a two-stage least-square estimation (2SLS). In recent times, however, LLSV have been less popular in time-series analysis with authors, such as Giuliano and Ruiz-Arranz (2009), arguing that since these variables do not vary over time, they suffer from drawbackness.

In their view, the LLSV would not proxy financial development adequately in an arrangement where the nature and magnitude of the relationships between financial development and other variables is sought. On the contrary, foreign capital flows are often proxied by the United States (US) interest rates or by a phase of the US business cycle based on the work of Calvo *et al.,* (1993), clearly stressing the foreign capital supply-side shocks.

Similarly, Bosworth *et al.,* (1999) introduced a more direct supply-side measure when they used the global pool of capital. Their argument is that changes in the global pool of capital could be interpreted as implying a change in the developing countries' access to foreign capital. Mody and Murshid (2005) also found this proxy to be considerably more efficient than the LLSV.

Nevertheless, while advocating for the first difference generalized method of moment estimator, Arellano and Bond (1991) illustrate that while the error term such as $\Delta\varepsilon_{it}$

could be correlated with the endogenous variable Δy_{it-1}(for example), but cannot be correlated with y_{it-2} and other regressand lags. The logic here is simple. Lagged values of the explanatory variables, their first differences and lags of their first differences can be used as additional valid instruments for endogenous variables over and above pre-determined variables. This seemingly simple logic has been applied severally in economic analysis.

For example, while analysing the effect of remittances on economic growth in the presence of financial development, Giuliano and Ruiz-Arranz (2009) used two lags of the endogenous variables as instruments of all non-strictly exogenous variables, which included credit market size, equity market size, investments and remittances. In most recent studies, this approach seems to be the most common method of obtaining instruments given that economic variables are deeply interrelated and finding a pre-determined instrument that meets the essentials of a valid instrument is a daunting task.

Further, Alfaro *et al.,* (2004), Mody and Murshid (2005) and Gomes and Veiga (2008), all used lagged values, first differences and lagged first difference of endogenous variables, including foreign capital flows, as instrument in their studies. In this study, we employ this approach in acquiring valid instruments in different countries' analyses.

5.3 Financial Market Data

As described above, several indicators for credit market and equity market development or depth are needed for this analysis. Except for Namibia whose data was sourced from the Bank of Namibia and Namibia Stock Exchange (NSX) directly, claims on the private sector (CPS), equity market capitalization and equity market turnover datasets for Botswana, Kenya, Morocco and South Africa were obtained from the respective country's central bank but through Euromoney and Institutional Investor (EII) databank, called CEIC data.

CEIC data is collected from primary sources of economic and investment data for over 120 countries around the globe and is mostly used by economists, investment analysts, corporations and universities for research, among other purposes. This dataset is by and

large similar to data on the same indicators as published by the central banks of these countries in their monthly reports.

These series were in quarterly frequency and covered the period between 2000 Quarter One through to 2012 Quarter Three. Normally, CPS represents the stock of loans and advances, at a given time, made to domestic borrowers with exception of the government and government agencies. According to Demirgüç-Kunt *et al.,* (2013), CPS should be taken as "measure of bank development and equals deposit money bank credit to the domestic private sector". Accordingly, they recommend that the CPS should be divided by GDP before inclusion in an economic model if bank development is to be proxied properly.

It is common for most empirical analyses focusing on credit market development to use CPS as a proxy of the size of the credit market of a country and not M2 (see Eller *et al.,* (2010), Čihák *et al.,* (2012) and (Borio *et al.,* 2011), among others). M2 is often rejected or performs poorly in such analysis because unlike CPS it is a measure of money supply, it includes some items that can hardly form part of credit, like highly-liquid money equivalents (M1) such as demand deposits and travellers cheques and 'near money' items, such as money-market funds.

Similarly, a country's equity market is often measured in two ways: using market capitalization and market turnover. Normally, market capitalization is the current market value of all listed shares on a stock market and is a better indicator of the size of the equity market (see its application by Białkowski and Otten (2011), Büttner and Hayo (2011), and Gray and Johnson (2011), among others). According to Demirgüç-Kunt *et al.,* (2013), when market capitalization is divided by GDP, it can be used as an alternative measure of stock market development.

The other measure is value of stock traded also called 'stock market turnover'. This turnover is equal to the value of the stock market transactions in a given period, which is often considered a proxy for stock market liquidity (see Næs *et al.,* (2011) and Ginglinger and Hamon (2012)) but when divided by GDP, turnover can be used as a measure of

stock market development (Demirgüç-Kunt *et al.*, 2013). In this section, we use both the 'capitalization-to-GDP' ratio and 'turnover-to-market capitalization' ratio as proxy for equity market development.

5.4 Data Description

Since monthly and quarterly time-series are prone to short-term fluctuations (Akkoyun *et al.*, 2011), the three series for each country are filtered using Census X-12 method to obtain seasonally adjusted values (see Atuk and Ural (2002) and (Akkoyun *et al.*, 2011)). The seasonally adjusted series so generated are theoretically free from short-term variations, which can obscure the true trend of a series. Therefore, we use the seasonally adjusted series in computing descriptive statistics that describe and help facilitate comparisons of the size of financial market development in the sample countries. A summary of this computation is provided in Table 5.1 below.

Using the mean and median, South Africa appears to have the most developed credit market or banking system followed by Namibia, Kenya and then Morocco. The banking system of Botswana seems to be most under-developed of the five sampled countries. This descriptive findings closely mirror the finding of the 2013 Global Financial Development survey by the World Bank for the period between 2008 and 2010 (World Bank, 2013). The relative under-development of the Botswana banking system is mainly an outcome of its banking history since independence in 1966 and the lack of competition, as well as, lack of efficiency in the industry.

According to Kayawe and Amusa (2003), Standard Chartered and Barclays dominated the banking sector all through to 1975 without a domestic regulatory body or a Central Bank. As a result of extremely high foreign ownership dominance and low competition, financial depth and efficiency were depressed because an oligopoly market structure generally discourages risk-taking behaviours (Jefferis, 1995). Despite rapid changes initiated in early 1990s by the Bank of Botswana, the number of commercial banks still remains low compared to other countries and ownership is still largely foreign. However, for some reason, the CPS has grown significantly in recent years (Eita and Jordaan, 2010; World Bank, 2013).

Regarding the equity market, Table 5.1 indicates that Namibia has the highest equity market capitalization relative to the size of the economy followed by South Africa, Kenya, Morocco and Botswana, in that order. Indeed, Johannesburg Stock Exchange (JSE) is the largest stock market in the continent but considering the size of the economy that JSE has to serve, Namibia Stock Exchange (NSX) emerges as a more developed stock market (World Bank, 2013). Morocco appears to attract more transactions on their stock exchange than South Africa and Kenya, whereas Botswana and Namibia stock exchanges appear dormant and very little transactions seem to happen relative to the capitalization of these markets.

Table 5.1: Descriptive Statistics of the Financial Market Indicators

		Botswana	Kenya	Morocco	Namibia	South Africa
Mean	CPS/GDP	0.876	2.082	1.778	2.893	3.185
	EQCAP/GDP	1.371	2.443	1.565	81.578	9.193
	EQTURN/EQCAP	0.007	0.021	0.261	0.002	0.12
Median	CPS/GDP	0.819	2.008	1.668	2.980	3.05
	EQCAP/GDP	1.361	2.342	1.121	83.353	9.688
	EQTURN/EQCAP	0.006	0.019	0.211	0.002	0.12
Std. Dev	CPS/GDP	0.139	0.565	0.314	0.286	1.108
	EQCAP/GDP	0.378	1.037	0.991	16.572	3.995
	EQTURN/EQCAP	0.003	0.006	0.221	0.001	0.02
No. of Obs.	CPS/GDP	24	32	35	16	51

Except for values under row labelled 'No. of Obs' which are counts of observations, all other values in the table are ratios. The initials CPS have been used to denote credit to the private sector, EQUITYCAP stands for equity market capitalization, EQUITYTURN stands for equity turnover, and GDP denotes real gross domestic product.

To assess the tendency of financial development indicators, investments and foreign capital flows to move in tandem, we compute the Pearson Correlation coefficient and its attendant probabilities. This computation is necessary since prior research indicates that the three classes of variables are tightly interrelated and tend to have multiple causalities existing between them (Lee and Chang, 2009; Levine and Zervos, 1998; Spyrou, 1999). We use correlation analysis to provide preliminary indications of any pattern in the co-movements of these variables. To compare like terms, we divide investment and foreign capital flows by GDP and correlate the ratios with financial development indicators.

Table 5.2 below indicates that banking sector development, in all countries sampled, measured by CPS divided by GDP, is greatly associated with residential investment. The Pearson Correlation coefficients indicate substantial positive correlations, with the

exception of Morocco, which appears to have a negative correlation. However, the banking sector development and non-residential investments do not appear to have significant correlations apart from in Kenya and South Africa.

Table 5.2: Correlation Matrix

Pairs	Botswana	Kenya	Morocco	Namibia	South Africa
CPSGDP and GRES	0.382*	0.792***	-0.282*	0.405*	0.351***
CPSGDP and GNRES	0.134	0.656***	-0.211	-0.292	0.941***
CPSGDP and GFDI	0.577***	0.170	-0.025	0.032	0.127
CPSGDP and GFPI	0.078	0.742***	-0.029	0.006	0.261*
CPSGDP and GREM	-0.267	0.892***	-0.120	0.169	0.980***
EQCAPGDP and GRES	0.243	0.224	-0.417***	-0.047	0.421***
EQCAPGDP and GNRES	0.277	0.167	-0.239	0.248	0.880***
EQCAPGDP and GFDI	0.199	0.058	-0.076	0.323	0.134
EQCAPGDP and GFPI	0.161	0.326*	-0.039	0.052	0.370***
EQCAPGDP and GREM	-0.492**	0.092	-0.218	-0.010	0.911***
EQTURNEQCAP and GRES	0.520***	-0.140	-0.149	0.308	0.410***
EQTURNEQCAP and NRES	0.268	-0.076	-0.134	-0.143	0.571***
EQTURNEQCAP and GFDI	0.628***	0.173	0.069	-0.118	0.069
EQTURNEQCAP and GFPI	-0.215	0.130	-0.115	0.136	-0.065
EQTURNEQCAP and GREM	-0.094	-0.102	0.401**	-0.025	0.565***
CPSGDP and EQCAPGDP	0.298	0.269	0.928***	-0.564**	0.938***
CPSGDP and EQTURNEQCAP	0.472**	-0.052	-0.570***	-0.077	0.558***
EQCAPGDP and EQTURNEQCAP	0.372*	0.063	-0.527***	-0.462*	0.393***
No. of Obs.	24	32	35	16	51

The asterisk ***,** and * indicate significant test statistics at 99%, 95% and 90% level of confidence. The test for correlation here is the Pearson product moment correlation coefficient (PPMCC) developed by Pearson (1920). Therefore, the values in the table represent the PPMCC values which, as usual, do not have a unit of measurement.

The equity market development on the other hand, does not seem to have many statistically significant relationships with real estate investments, but in South Africa, perhaps for the reason that the equity market in South Africa is relatively deeper, there appears to exist statistically significant correlations with investments. Lastly, amongst the indicators of financial markets, with exception of Kenya, it seems that the credit and equity markets are positively and significantly interrelated.

5.5 Regression Results

To ascertain the channel through which international capital flows impact on the residential and non-residential real estate markets, we estimate model (41) as explained above, for both residential and non-residential markets, separately. Several variants of the model are estimated for the purpose of getting reliable and robust results, though, the variations do not include the functional form of the model. We first estimate a market size-based model in which investment and foreign capital flows are scaled using the

respective market's capital stock, then we replace capital stock with GDP to form an economy size-based model, which is then re-estimated.

Because the equity market development can be represented by either the capitalization-to-GDP ratio or by the turnover-to-market capitalization ratio (Demirgüç-Kunt *et al.*, 2013), four models are estimated for every market in each country. That is, for capital stock-scaled models, we estimate two models (one using the capitalization-to-GDP ratio and another one using the turnover-to-market capitalization ratio) and for the GDP-scaled models, we also estimate two models (one using the capitalization-to-GDP ratio and another one using the turnover-to-market capitalization ratio).

Instrumentation of possible endogenous variables does not present important challenges given the available approaches to estimation. Basically, there are three sets of variables scaled differently for different models. One set of variables is either residential capital stock-scaled or non-residential capital stock-scaled and the other set is GDP-scaled. The lags and the first differences of variables of interest and of the related variables in the other sets provide adequate valid instruments in each equation. The instruments chosen are examined to ensure that they are orthogonal to the error term, are strongly correlated with the regressors that they instrument, and are not too many as to over-fit the model (Roodman, 2009).

To test whether instrumentation has been successful, we use the Hansen J-statistics. Normally, in just-identified models, the value of the optimized objective function, which is called the J-statistics, is equal to zero, but if the instruments are more than the parameters then the J-statistics exceed zero. Therefore, we use J-statistics as a test of whether the orthogonality conditions are satisfied in all our estimations (Agbloyor *et al.*, 2013).

The results of this analysis are presented below for each to the country to which the reported results pertain. For each country's presentation, Model 1.1 and 1.2, present results of the capital stock-scaled forms of equation (41). This is where the real estate investment and foreign capital inflows are scaled by residential capital stock. In model

1.1, equity market development is proxied by equity capitalization to GDP ratio, while in model 1.2 it is proxied by equity turnover to market capitalisation ratio. These two models form the first panel of results in each table.

In panel two, we present results for economy size-based estimation where investments and foreign capitals are scaled using GDP. Similar to the above, model 2.1 presents the results for the GDP-scaled model form of equation (41) in which equity market development is proxied by the equity capitalization to GDP ratio, while in Model 2.2 it is proxied by equity turnover to market capitalisation ratio. In other words, Panel One shows the results for capital-scaled models while panel two are the result for GDP-scaled models.

5.5.1 Regression Results for the Residential Market of Botswana

To estimate equation (41) for the residential real estate market in Botswana, we first select instruments, carefully, by following the criteria of Cameroon and Trivedi (2005), as discussed above. We then estimate model (41) using optimally-weighted GMM estimator, employing heteroscedasticity and autocorrelation consistent estimators of long-run covariance matrix to approximate the weighting matrices. In each case, the estimated weighting matrix is iterated several times to convergence or continuously updated, where necessary. We alternate between residential stock and GDP in scaling all variables. The results are presented below in Table 5.3.

The insignificance of the *J*-statistics, provided at the end of the table of results for each model, shows that valid instruments have been chosen, therefore, the instruments satisfy all necessary orthogonality conditions. In addition, the Q-statistics provided also indicate that autocorrelation is significantly minimised or eliminated. Most importantly, we are able to provide results for the main variables. According to the results, when equity turnover to market capitalisation is used instead of capitalization to GDP ratio (i.e., Model 1.2 and 2.2), the models appear to perform relatively poorer even though the fit is generally high for all models.

Focusing on the first part of the results that examines the direct channel of foreign capital inflows (i.e., where foreign capital inflows are not multiplied by a financial market indicator), according to the results, only FDI has robust direct positive externalities on residential investments whereas the direct channel of remittances appear to cause negative outcomes on residential investments.

It also seems that FPI has direct positive externalities as well but this evidence is not consistent on the entire four model specifications. In other words, the results that FDI causes positive externalities and remittances causes unfavourable externalities to the residential investment in Botswana are robust and consistent across the entire four models but the results for FPI are inconclusive.

Table 5.3: Regression Results for the Residential Market of Botswana

	Model 1.1		Model 1.2		Model 2.1		Model 2.2	
Variable	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error
RESLAG1	0.184***	(0.040)	0.355**	(0.123)	0.203**	(0.071)	0.203**	(0.072)
FDI	0.283**	(0.099)	0.481**	(0.170)	0.521***	(0.148)	0.379**	(0.138)
FPI	2.080***	(0.302)	5.964***	(1.898)	3.422***	(0.743)	-2.258	(2.372)
REM	-10.13***	(1.420)	-28.99***	(7.372)	-8.509**	(3.052)	-10.127**	(4.179)
FDI*Credit	-0.043	(0.052)	-0.585*	(0.283)	-0.088	(0.137)	-0.677**	(0.253)
FPI* Credit	-0.984	(0.963)	-8.781***	(2.761)	0.329	(2.535)	1.018	(3.216)
REM* Credit	20.405***	(3.475)	37.213***	(10.464)	22.927***	(5.829)	8.050*	(4.426)
FDI*Equity	-0.130***	(0.041)	-2.418	(8.973)	-0.232*	(0.107)	32.235**	(13.43)
FPI* Equity	-1.394**	(0.491)	182.546**	(69.610)	-3.550**	(1.512)	-18.367	(128.5)
REM* Equity	-6.186***	(1.444)	-275.842*	(150.197)	-10.415**	(4.465)	10.452	(693.4)
Credit	-0.349***	(0.060)	0.010	(0.034)	-0.035	(0.024)	0.034**	(0.013)
Equity	0.260***	(0.034)	10.137***	(3.296)	0.026**	(0.012)	-2.607	(1.709)
Adjusted R-sq	0.808		0.527		0.829		0.750	
Instrument rank	21		21		16		18	
J-statistic	5.667		5.708		2.436		1.430	
Prob(J-statistic)	0.684		0.680		0.487		0.921	
Q-Stat	1.561		0.543		0.303		0.261	
Q-Stat (Prob)	0.212		0.461		0.582		0.61	

The table shows coefficient estimates and their associated standard errors for residential market models in Botswana. The asterisk ***,** and * indicates significant test statistics at 99%, 95% and 90% level of confidence. FDI, FPI and REM stands for ratios of foreign direct investment, foreign portfolio investments and remittances. These are the values of the foreign capital inflows scaled by capital stock (in model 1.1 and 1.2) and scaled by GDP (in model 2.1 and 2.2), accordingly.

Most importantly, the interactions terms between the credit market and the FDI as well as between the credit market and the FPI are either negative or insignificant but interactions between remittances and the credit market are consistently positive. That is, upon using the credit channel, only remittances have a positive robust indirect effect on real estate

investments, but, for FDI and FPI, using the credit market appears to have undesirable externalities on residential investment. Conversely, when we multiply the equity market measure with each of the foreign capital inflows, the results for all interaction terms are inconsistent with expectations and appear to change from one specification (model) to another. Unexpected direct effects are also documented for the financial measure when considered as stand-alone.

In summary, robust results suggest that in the absence of financial markets, only the FDI has significant positive impact on residential investment. Although, FPI may also be positive, the evidence is inconsistent, and therefore, inconclusive. However, in the presence of credit market or simply in a developed banking system, remittances appear to utilize the credit market channel effectively to deliver positive externalities to residential investments.

Therefore, only the FDI, and perhaps the FPI, can be effective directly for positive outcomes on residential investment but remittances require developed credit markets to channel them into the residential market. Interestingly, the stock market did not appear to consistently help in channelling foreign capital inflows into the residential market of Botswana.

To a greater extent, the above results appear to vindicate the arguments that uncertainties of fundamentals (Ahmad *et al.*, 2004) and industry (Bulan, 2005) discourage long-term investments in Botswana and to an extent encourages a reversal of FDI and FPI. Perhaps this could explain why only direct inflows are important to the residential real estate market while indirect inflows fail to have a positive impact on residential investments. Possibly, this is a result of being prone to reversibility; and therefore, financial markets are unable to use such funds for long-term lending.

However, for remittances, which are traditionally not subject to reversal, banks appear to have harnessed them efficiently for positive impact on the residential real estate market. Consequently, the divergent results on remittances, such as the one by Campbell (2010)

could have been as a result of examining the direct channel of remittances only. Instead, this result appears to support the early findings by Panin *et al.,* (1993) where remittances were found to account for a greater proportion of rural household income beyond agriculture.

5.5.2 Regression Results for the Non-Residential Market of Botswana

The above procedure adopted in the analyses around the residential market is similarly adopted in the non-residential market estimations. The *J*-statistics obtained also provide evidence of the sufficiency of the instruments in meeting the orthogonality conditions in the models and the Q-statistics indicate the absence of autocorrelation. The coefficient estimates, on the other hand, indicate that residential and non-residential markets interact with foreign capital flows in a markedly different manner. The goodness of fits is substantially lower for the non-residential investment analyses, which suggest that the non-residential market is driven by much more than just the foreign capital inflows.

The examination of the direct channel, where foreign capital inflows are not interacted with financial market indicators, returned results suggesting that externalities of FDI are robust and consistently positive which, in turn, suggests that in this market the direct inflow of FDI is important. On the other hand, the direct externalities of FPI and remittances are either negative or insignificant, therefore, when FPI and remittances are funnelled directly into this market, the outcome on non-residential investment are unfavourable.

Table 5.4: Regression Results for the Non-Residential Market of Botswana

	Model 1.1		Model 1.2		Model 2.1		Model 2.2	
Variable	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error
NRESLAG1	0.335*	(0.186)	0.054	(0.255)	0.478***	(0.010)	0.378***	(0.066)
FDI	0.810**	(0.335)	1.867**	(0.694)	0.311***	(0.090)	0.879***	(0.261)
FPI	13.958	(9.935)	-0.341	(17.67)	-0.998	(0.626)	6.722*	(4.006)
REM	-41.19***	(5.474)	-64.114**	(24.53)	11.308***	(2.429)	31.770*	(15.08)
FDI*Credit	-1.443***	(0.344)	-2.714**	(1.064)	-0.453***	(0.066)	-1.203***	(0.325)
FPI* Credit	-28.475	(20.65)	0.827	(25.73)	-2.368*	(1.348)	-7.830*	(4.805)
REM* Credit	33.868*	(16.54)	83.630**	(33.64)	-15.74***	(4.560)	-37.869**	(14.05)
FDI*Equity	0.089*	(0.049)	39.530	(38.02)	0.000	(0.058)	5.662	(4.050)
PI* Equity	7.351	(5.961)	-123.984	(579.2)	2.285***	(0.735)	19.760	(127.2)
REM* Equity	13.760	(15.64)	-560.201	(528.3)	0.651	(1.562)	-516.163	(790.6)
Credit	1.123	(1.071)	0.236*	(0.117)	0.067***	(0.016)	0.178**	(0.058)
Equity	-0.691	(0.723)	-1.178	(16.12)	-0.001	(0.005)	1.618	(1.972)
Adjusted R-sq	0.497		0.349		0.781		0.844	
Instrument rank	17		16.000		19.000		20.000	
J-statistic	1.061		0.567		4.206		7.984	
Prob(J-statistic)	0.787		0.753		0.520		0.239	
Q-Stat	0.431		2.334		1.868		0.004	
Q-Stat (Prob)	0.511		0.127		0.172		0.951	

The table shows coefficient estimates and their associated standard errors for non-residential market models in Botswana. The asterisk ***,** and * indicates significant test statistics at 99%, 95% and 90% level of confidence. FDI, FPI and REM stands for ratios of foreign direct investment, foreign portfolio investments and remittances. This are the values of the foreign capital inflows scaled by capital stock (in model 1.1 and 1.2) and scaled by GDP (in model 2.1 and 2.2), accordingly.

Regarding the indirect channel via the credit market, the results indicate that only remittances have significant positive externalities on non-residential investment, but only under capital stock-scaled models, the indirect credit market channel of FDI and FPI appear to cause negative or statistically insignificant externalities[25]. In other words, we do not find any foreign capital inflow that has robust evidence indicating positive indirect externalities on non-residential investments through the credit market channel. On the indirect channel of the equity market, it appears that via the stock market, remittances have statistically insignificant externalities on non-residential investment while the results of the FDI and FPI externalities are inconclusive.

On the whole, based on the robust results documented above, the indication is that in the absence of a developed banking (credit) system, FPI and remittances have unfavourable direct impact on non-residential investment and that only the FDI is effective in utilizing

[25] When effects or externalities are insignificant or negative, we refer to them us undesirable or unfavourable to that market.

the direct channel. Further, only remittances appear to utilize the credit market channel positively. FDI and FPI appear to cause unfavourable effects on the non-residential market when funnelled through the banking system.

However, the positive effects of remittances are revealed under the capital stock-scaled model; the GDP–scaled models indicated a negative effect. Therefore, the indirect effects of remittances through the credit market are not robust. Lastly, the stock market channel seems not to be effective in channelling any of the foreign capital inflows into the non-residential market of Botswana.

These results appear to agree with the existing statistics on sectorial distribution of FDI, which suggested a direct flow into the service and manufacturing sectors (UNCTAD, 2003). This in turn probably drives the construction of commercial and industrial buildings for trade, retail, financial services, tourism, hotels and lodges and manufacturing and distribution activities. However, uncertainties pointed out by Ahmad *et al.,* (2004) and Bulan (2005) could still explain the inability of the financial sector to utilise FDI and FPI in the mining or other sectors for the good of non-residential investments.

According to Alfaro *et al.,* (2004) and Giuliano and Ruiz-Arranz (2009), even if a sector may not be a direct recipient of a certain foreign inflow, the presence of a developed financial intermediation can aid in transmitting such flows to the benefit of other sectors. The results above failed to prove this assertion conclusively in the case of remittances, which is a private flow, normally meant for households.

5.5.3 Regression Results for the Residential Market of Kenya

Similar to above, for Kenya, we also start by estimating the residential models. The results of this analysis are reported in the table below. It is essential to understand that the suitability of an instrumental variable model is often tested using the J-statistics where the null hypothesis assumes that the instruments satisfies the orthogonality conditions (Hansen, 1982). However, J-statistics are traditionally χ-distributed with the difference between the total number of moments and the number of instruments as the degree of

freedom (Baum *et al.*, 2003). For this reason, the acceptance of the null hypothesis implies the validity of the instruments. In the results below, the J-statistics indicate the adequacy of the instruments and the Q-statistics show that autocorrelation is totally eliminated by the GMM.

Specifically, the results indicate that except for FPI, the direct effects of the foreign capital inflows are either negative or statistically insignificant. For FPI the direct channel seems to cause positive residential investments externalities while FDI and remittances appear to cause either negative or statistically insignificant externalities; this suggests that the direct channel of these flows is not important. But then again, when foreign capital inflows are interacted with the credit market indicator, both FDI and remittances appear to cause significant indirect positive impacts on the residential investments while externalities of FPI appear to be negative or insignificant.

Table 5.5: Regression Results for the Residential Market of Kenya

	Model 1.1		Model 1.2		Model 2.1		Model 2.2	
Variable	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error
RESLAG1	-0.113	(0.08)	-0.254**	(0.098)	-0.124	(0.096)	-0.21***	(0.043)
FDI	-3.630***	(0.91)	-0.955	(1.389)	-2.38***	(0.590)	-0.389	(0.682)
FPI	2.778***	(0.41)	1.468***	(0.381)	0.688*	(0.358)	1.320***	(0.283)
REM	-4.874***	(0.89)	-1.87***	(0.646)	-0.362	(0.464)	-1.36***	(0.396)
FDI*Credit	2.301***	(0.20)	0.644*	(0.317)	1.657***	(0.216)	0.829***	(0.249)
FPI* Credit	-0.933***	(0.20)	-0.483**	(0.179)	-0.114	(0.140)	-0.34***	(0.101)
REM* Credit	2.970***	(0.71)	0.749*	(0.424)	0.409*	(0.190)	0.833***	(0.155)
FDI*Equity	-0.287	(0.27)	-2.522	(35.11)	-0.297*	(0.143)	-38.7***	(11.49)
FPI* Equity	-0.237***	(0.06)	-2.378	(12.84)	-0.128*	(0.064)	-15.431*	(8.562)
REM* Equity	-0.116	(0.20)	15.503	(23.74)	0.141	(0.159)	0.977	(18.28)
Credit	-0.203**	(0.07)	0.060	(0.049)	-0.01***	(0.002)	-0.01***	(0.002)
Equity	0.103*	(0.05)	-6.134	(4.377)	0.003	(0.003)	0.446*	(0.233)
Adjusted R-sq	0.570		0.442		0.794		0.822	
Instrument rank	26.000		22.000		25.000		25.000	
J-statistic	6.968		4.010		7.313		7.348	
Prob(J-statistic)	0.728		0.675		0.885		0.883	
Q-Stat	1.028		0.379		0.337		1.348	
Q-Stat (Prob)	0.311		0.538		0.562		0.246	

The table shows coefficient estimates and their associated standard errors for residential market models in Kenya. The asterisk ***, ** and * indicates significant test statistics at 99%, 95% and 90% level of confidence. FDI, FPI and REM stands for ratios of foreign direct investment, foreign portfolio investments and remittances. This are the values of the foreign capital inflows scaled by capital stock (in model 1.1 and 1.2) and scaled by GDP (in model 2.1 and 2.2), accordingly.

This indicates that the indirect credit market channel is very significant for positive or favourable externalities of FDI and remittances; otherwise, FPI do not require the credit

market to deliver desirable outcomes on residential investment. On the other hand, the estimates for the indirect equity market channel for the three foreign capital inflows indicate that this channel is not important for positive externalities of the entire three foreign capital inflows. The results indicate either negative or insignificant externalities of FDI, FPI and remittances on investments.

In summary, going by the robust results, FPI produces positive externalities when this flow is channelled directly into the Kenyan residential market; otherwise, the indirect effects of FPI are undesirable. On the other hand, FDI and remittances do not have favourable direct effects on residential investments; however, using the credit market channel, these flows have significant positive indirect effects. On indirect equity market channel, it seems that the equity market does not assist in channelling foreign capital flows into the residential market in any way as to cause positive externalities.

Although Kenya is not deemed as a favourable foreign investment destination (Mwega and Ngugi, 2006; Ndikumana and Verick, 2008), the Economic Recovery Strategy for Wealth and Employment Creation (ERS) and the Vision 2030 (Ndung'u *et al.*, 2013) appear to have succeeded in encouraging spillovers into housing markets of not only the FDI but also of remittances as well.

However, FPI inflows, which are traditionally small in magnitude but many in number, appear to flow directly into the residential market but banks appear to be unable or cynical about utilizing FPI for long-term lending. This could be due to the fact that FPIs are usually considered to be unstable and a less reliable type of inflow (Sula and Willett, 2009) or that the political and macroeconomic instabilities witnessed in Kenya around 2000 and 2008 makes FPI much more riskier for banks (Durnev, 2010; Mwega and Ngugi, 2006).

5.5.4 Regression Results for the Non-Residential Market of Kenya

The results for the non-residential market are presented in Table 5.6 below. The adjusted R-squared indicate a significant drop in the fit compared to the residential market results. Nonetheless, this instrumentation appeared to have been successful and going by the *J*-

statistics, the orthogonality conditions are fulfilled in all of the models. Similarly, the Q-statistics are insignificant, which is also another way of saying that different lags of the error term are not highly correlated with each other. In this case, and in all other results in this section, we provide the results of the first lag only. That being the case, we have adequate evidence to make the claim that the GMM is efficient and has eliminated any possible autocorrelation.

In terms of the channel tests, the results indicate that the direct channel, where foreign capital inflows are not interacted with either of the financial development indicators, is not important to FDI and remittances for favourable residential investment's effect. In other words, in the absence of the financial markets, FDI and remittances do not stimulate or encourage residential investment in any beneficial way. The results of the direct FPI effects are not consistent in the four model specifications. The estimates are either statistically insignificant or significantly positive, which means that the direct FPI effects are not destructive to non-residential investment and a further analysis would be important.

Table 5.6: Regression Results for the Non-Residential Market of Kenya

	Model 1.1		Model 1.2		Model 2.1		Model 2.2	
Variable	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error
NRESLAG1	0.233	(0.152)	0.119	(0.165)	0.096*	(0.052)	0.329**	(0.161)
FDI	-3.025*	(1.553)	-2.724**	(1.374)	-0.898	(0.965)	-2.957***	(0.946)
FPI	1.063***	(0.353)	0.948	(0.666)	0.782**	(0.330)	0.822	(0.800)
REM	-1.600**	(0.606)	-1.431	(1.059)	-1.213**	(0.486)	-1.850	(1.251)
FDI*Credit	0.965*	(0.608)	1.757***	(0.625)	0.778*	(0.398)	1.345**	(0.525)
FPI* Credit	-0.591**	(0.242)	-0.477**	(0.199)	-0.277**	(0.124)	-0.397*	(0.235)
REM* Credit	0.835*	(0.435)	0.885*	(0.525)	0.199*	(0.123)	0.682*	(0.435)
FDI*Equity	0.464	(0.420)	-27.211	(33.77)	-0.248	(0.222)	12.111	(22.06)
FPI* Equity	0.101	(0.157)	3.616	(20.42)	-0.055	(0.069)	6.573	(15.70)
REM* Equity	-0.127	(0.214)	-20.417	(39.52)	0.319**	(0.139)	-0.336	(34.34)
Credit	0.043	(0.127)	-0.046	(0.111)	0.011**	(0.004)	0.006	(0.005)
Equity	-0.009	(0.113)	7.339	(10.68)	-0.006*	(0.004)	-0.059	(0.572)
Adjusted R-sq	0.376		0.466		0.461		0.504	
Instrument rank	30		27		23		23	
J-statistic	14.000		7.407		4.035		4.583	
Prob(J-statistic)	0.450		0.765		0.776		0.598	
Q-Stat	0.000		0.924		1.976		0.597	
Q-Stat (Prob)	0.995		0.336		0.160		0.440	

The table shows coefficient estimates and their associated standard errors for non-residential market models in Kenya. The asterisk ***, ** and * indicates significant test statistics at 99%, 95% and 90% level of confidence. FDI, FPI and REM stands for ratios of foreign direct investment, foreign portfolio investments and remittances. This are the values

of the foreign capital inflows scaled by capital stock (in model 1.1 and 1.2) and scaled by GDP (in model 2.1 and 2.2), accordingly.

On the other hand, when we interact FDI and remittances with the credit market indicator, it appears that the indirect channel externalities of these flows are strong and positive on the residential investments while for FPI, the externalities are strong but negative. All of these results are robust across all model specifications. However, when the foreign capital inflows are interacted with either of the equity market's indicators, we do not see any positive association that is consistent across the different model variants used. This suggests that the indirect equity market channel is not important to the three foreign capital inflows for positive or constructive non-residential investment externalities.

In view of the above results, we conclude that for FDI and remittances have substantial positive externalities on the non-residential market in Kenya, but only when funnelled via the credit market. Otherwise, via the direct channel, FPI's externalities are not clear whereas the indirect credit market channel leads to undesirable FPI's externalities. The indirect equity market channel is not important to any of the three foreign capital inflows for positive externalities.

Basically, these results appear to support the assertion that the presence of developed financial markets, in this case the banking sector, is important for passing on foreign capital inflows from one sector for the good of other sectors as well (Alfaro *et al.,* 2010; Giuliano and Ruiz-Arranz, 2009). It appears that the argument made by Aggarwal *et al.,* (2011) that remittances could be a source of greater bank deposits and credit holds in Kenya.

5.5.5 Regression Results for the Residential Market of Morocco

We parameterize and implement the optimally-weighted GMM in the residential market of Morocco in a similar way, as discussed above. Instrumentation is also sufficient and J-statistics reported in Table 5.7 below indicate that the orthogonality conditions are satisfied. The autocorrelation measured using the Q-statistics also suggest that the GMM

is efficient and optimal. However, although the goodness of fit is sufficient; it is not particularly high as in the other countries estimated above.

In the absence of financial markets, the results presented in Table 5.7 below, provide very consistent evidence that is robust across all models, suggesting that the direct FDI externalities are positive to the residential investment. The results for the direct externalities of FPI and remittances are inconsistent across model specifications. However, through the credit channel, the externalities of FDI are destructive but for FPI, the externalities are statistically significant and positive. The outcomes for remittances through this channel are not clear. Remittances appear to have positive coefficient estimates on all models with the exception of model 1.2.

Equally, the results for the indirect equity market channel for the three foreign capital inflows are inconsistent across model specifications, and thus, inconclusive. Similar mixed results are also established for the effects of the financial markets in the absence of foreign capital inflows.

Table 5.7: Regression Results for the Residential Market of Morocco

	Model 1.1		Model 1.2		Model 2.1		Model 2.2	
Variable	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error
RESLAG1	0.412***	(0.032)	0.570***	(0.032)	0.520***	(0.046)	0.466***	(0.067)
FDI	0.336***	(0.108)	0.179**	(0.073)	1.510**	(0.654)	1.019***	(0.152)
FPI	-8.363***	(2.235)	-4.394***	(0.737)	-12.613***	(4.459)	-4.384***	(0.836)
REM	-0.286***	(0.031)	2.171***	(0.211)	-0.626***	(0.196)	-0.240***	(0.053)
FDI*Credit	-0.271***	(0.087)	-0.065*	(0.034)	-1.043**	(0.423)	-0.451***	(0.068)
FPI* Credit	5.575***	(1.613)	3.011***	(0.442)	8.681***	(3.119)	3.258***	(0.388)
REM* Credit	0.521***	(0.052)	-1.199***	(0.125)	0.195**	(0.094)	0.103*	(0.056)
FDI*Equity	0.086***	(0.025)	-0.140**	(0.066)	0.230***	(0.058)	-0.845***	(0.174)
FPI* Equity	-0.482	(0.407)	-0.769*	(0.379)	-1.326*	(0.659)	-3.414**	(1.403)
REM* Equity	-0.535***	(0.067)	-0.569***	(0.057)	0.338***	(0.057)	0.926***	(0.295)
Credit	-0.056***	(0.009)	0.303***	(0.034)	0.022***	(0.005)	0.003	(0.005)
Equity	0.107***	(0.015)	0.152***	(0.008)	-0.035***	(0.006)	-0.049**	(0.023)
Adjusted R-sq	0.537		0.436		0.504		0.349	
Instrument rank	19.000		20		19.000		18.000	
J-statistic	2.770		1.344		6.190		2.847	
Prob(J-statistic)	0.735		0.969		0.185		0.584	
Q-Stat	0.064		0.7752		0.111		0.007	
Q-Stat (Prob)	0.801		0.379		0.740		0.932	

The table shows coefficient estimates and their associated standard errors for residential market models in Morocco. The asterisk ***,** and * indicates significant test statistics at 99%, 95% and 90% level of confidence. FDI, FPI and REM stands for ratios of foreign direct investment, foreign portfolio investments and remittances. This are the values of the foreign capital inflows scaled by capital stock (in model 1.1 and 1.2) and scaled by GDP (in model 2.1 and 2.2), accordingly.

Drawing from the robust evidence provided above, we conclude that there is sufficient evidence suggesting that only FDI has direct positive externalities on the Moroccan residential investment while, through the indirect credit market channel, only FPI has favourable externalities whereas the results of the equity market channel are inconclusive. Perhaps a different parameterization or model specification would yield more conclusive results on the indirect equity market channel of these foreign capital inflows.

In view of the above results, it seems that the adoption of the adjustment plan of 1983 and the accompanying complementary measures, appear to have encouraged FDI to flow into the residential real estate market of Morocco (see Bouoiyour (2007)). In addition, these results offer more information regarding the previously inconclusive studies on FDI and on those studies that indicated negative effect or the crowding-out effects of FDI and FPI (see the work and arguments of Görg and Greenaway (2004), among others). Apparently, the crowding-out effects of FDI and FPI in Morocco depend on whether a direct or indirect credit market channels is used to impact the residential market.

In terms of remittances, these findings appear to support the conclusions of De Haas (2006) who showed that international migrant households invest more than others in housing, among other sectors in Morocco. Although the results are not robust and consistent, there is an indication that remittances might have an indirect positive effect through the credit market because only one model fails to show this outcome.

5.5.6 Regression Results for the Non-Residential Market of Morocco

The results for the non-residential GMM are presented in Table 5.8. Although the instruments' orthogonality conditions are adequately met by all models as per the probability distribution of J-statistics, the autocorrelation measure indicated that the last model on the far right of Table 5.8 (model 2.2) still suffered from positive autocorrelation and therefore not efficient. In such situation, the variance and the standard errors could be under-estimated and t-statistics could be overestimated although the estimates could still be unbiased (Andrews, 1991). But, since results from other models can still be relied on

for robustness, we reject the results of model 2.2 and base our interpretations on the results of other three models.

All in all, the robust results indicate that only FPI has statistically significant positive direct channel externalities, the results of the direct externalities of FDI and remittances are inconsistent and inconclusive across the three models. Even though, they indicate that the FDI and remittances externalities are either insignificant; in statistical terms, or negative, which means that the direct channel is not important to FDI and remittances for positive influence on non-residential investments in Morocco.

For indirect credit market channel, it appears that the externalities of FDI are not statistically significant whereas externalities of FPI are negative whereas externalities of remittance are not clear. Estimates of indirect credit market channel externalities of remittances are inconsistent across the model specifications. For the equity market channel and the financial markets, without interaction with foreign capital inflows, all of the results are not robust, hence, not conclusive.

Table 5.8: Regression Results for the Non-Residential Market of Morocco

	Model 1.1		Model 1.2		Model 2.1		Model 2.2	
Variable	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error
NRESLAG1	0.221	(0.360)	0.153	(0.187)	0.727**	(0.301)	0.839***	(0.217)
FDI	0.017	(0.110)	0.111	(0.184)	0.240	(0.170)	-0.415*	(0.243)
FPI	2.122***	(0.717)	1.091*	(0.630)	4.571*	(2.228)	1.352*	(0.712)
REM	0.037	(0.040)	0.703***	(0.184)	-0.999*	(0.529)	0.228*	(0.139)
FDI*Credit	-0.014	(0.092)	-0.031	(0.093)	-0.186	(0.126)	0.243*	(0.127)
FPI* Credit	-1.535***	(0.497)	-0.643*	(0.395)	-3.337*	(1.625)	-0.785*	(0.450)
REM* Credit	-0.063	(0.053)	-0.457***	(0.099)	0.770*	(0.393)	-0.161	(0.118)
FDI*Equity	0.014	(0.036)	-0.157*	(0.089)	0.072*	(0.038)	0.061	(0.087)
FPI* Equity	0.446***	(0.111)	0.160	(0.222)	0.982**	(0.467)	-0.494	(0.430)
REM* Equity	0.021	(0.033)	0.202***	(0.067)	-0.244**	(0.108)	0.022	(0.152)
Credit	0.097*	(0.056)	0.850***	(0.245)	-0.055*	(0.031)	0.003	(0.005)
Equity	-0.041	(0.048)	-0.251*	(0.150)	0.017*	(0.009)	-0.004	(0.014)
Adjusted R-sq	0.738		0.112		0.773		0.215	
Instrument rank	17.000		25		17.000		18.000	
J-statistic	1.740		6.804		0.806		1.374	
Prob(J-statistic)	0.783		0.558		0.369		0.712	
Q-Stat	1.636		0.106		0.598		3.007	
Q-Stat (Prob)	0.201		0.744		0.439		0.083	

The table shows coefficient estimates and their associated standard errors for non-residential market models in Morocco. The asterisk ***, ** and * indicates significant test statistics at 99%, 95% and 90% level of confidence. FDI, FPI and REM stands for ratios of foreign direct investment, foreign portfolio investments and remittances. This are the values of the foreign capital inflows scaled by capital stock (in model 1.1 and 1.2) and scaled by GDP (in model 2.1 and 2.2), accordingly.

Based on the robust results discussed above, it is evident that FPI is able to cause positive externalities to the non-residential investment in Morocco, directly without a need for developed capital markets. Otherwise, based on robust results, no other flow appears to have significant desirable externalities whether via the financial markets or not. The results are inconclusive, insignificant or negative. A more striking finding is that FDI and remittances appeared to have no consistent positive externality to this market at all whether directly or indirectly despite the established notion that developed financial markets channels remittances, which are private transfers, for the benefit of the whole economy.

These results appear to support crowding effects of FPI and FDI. It seems that for FPI, crowding-out effect is channel-dependent but for FDI, crowding-out is prevalent irrespective of the channel of impact. As indicated under the causality tests, once again, it seems like vast foreign resources received as FDI in Morocco have pronounced crowding-out effect which is a piece of evidence supported the work of Haddad and Harrison (1993) and Abdelhafidh (2013) who established evidence of FDI crowding-out domestic investment.

For FPI, however, crowding-out is only possible when FPI is funnelled through the financial markets; direct investment appears to bear significant fruits in the non-residential market. For remittances, since results for direct and indirect channels are all inconclusive, yet Morocco is documented as a country of high inflows of remittances than most African countries (Bouoiyour, 2007; De Haas, 2007), it is therefore important that a further investigation is undertaken for a clearer understanding.

5.5.7 Regression Results for the Residential Market of Namibia

The residential models for Namibia were sufficiently instrumented with 16 instruments for capital stock-scaled model and 14 instruments for GDP-scaled models. The probabilities for the Hansen *J*-statistics indicate that the null hypothesis of orthogonality of instruments should be accepted, thus signifying that the instruments are valid. The measures of the goodness of fit are also adequately high, although model 2.1 has only

44.2% explanatory power. However, the Q-statistics indicate that the results of model 1.2 should be interpreted with care since autocorrelation is not completely eliminated. However, since the results of this model do not differ significantly from the results of other models, we interpret the results of this model together with the results of other models.

Nevertheless, the results are generally robust and consistent across all specifications, which suggest that these are possibly reliable pieces of evidence. In the estimation of the direct channel of foreign capital flows into the residential market of Namibia, the results suggest that the direct externalities of FDI and remittance are negative on residential investment whereas the direct externalities of FPI are positive. In contrast, through the indirect credit channel, FDI and remittances appear to cause positive residential investment externalities whereas the indirect externalities of FPI via the credit channel are negative. However, when we estimate the equity market channel, the results are not robust and also not consistent for all foreign capital inflows.

Table 5.9: Regression Results for the Residential Market of Namibia

	Model 1.1		Model 1.2		Model 2.1		Model 2.2	
Variable	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error
RESLAG1	0.291*	(0.091)	0.112	(0.055)	0.520	(0.268)	0.317*	(0.090)
FDI	-3.107***	(0.249)	-0.154*	(6.844)	-4.531*	(1.109)	-0.365*	(0.133)
FPI	459.86***	(34.429)	54.209**	(0.228)	575.296**	(121.3)	81.568*	(21.49)
REM	-5.175*	(1.787)	-4.934***	(0.017)	-5.369	(4.065)	-7.092**	(0.870)
FDI*Credit	0.334***	(0.022)	0.057*	(1.613)	0.538**	(0.093)	0.134*	(0.042)
FPI* Credit	-35.15***	(4.256)	-13.433**	(0.075)	-43.335*	(13.40)	-24.508*	(6.073)
REM* Credit	1.433**	(0.346)	1.823***	(8.382)	2.005*	(0.706)	2.465***	(0.271)
FDI*Equity	0.024*	(0.002)	23.411*	(1553.)	0.033*	(0.010)	15.895	(13.78)
FPI* Equity	-4.476***	(0.279)	-2552.9	(9.955)	-5.583**	(1.318)	1298.4	(2311)
REM* Equity	0.015	(0.010)	-156.7***	(0.003)	-0.004	(0.029)	-81.693**	(15.52)
Credit	-0.074***	(0.006)	0.003	(3.548)	-0.027**	(0.005)	0.000	(0.002)
Equity	0.004***	(0.000)	9.793	(0.003)	0.001**	(0.000)	0.518	(1.533)
Adjusted R-sq	0.792		0.803		0.442		0.917	
Instrument rank	16		16		14		16	
J-statistic	2.738		1.029		3.807		2.724	
Prob(J-statistic)	0.434		0.794		0.051		0.436	
Q-Stat	1.494		2.791		0.013		0.168	
Q-Stat (Prob)	0.222		0.095		0.911		0.682	

The table shows coefficient estimates and their associated standard errors for residential market models in Namibia. The asterisk ***, ** and * indicates significant test statistics at 99%, 95% and 90% level of confidence. FDI, FPI and REM stands for ratios of foreign direct investment, foreign portfolio investments and remittances. This are the values of the foreign capital inflows scaled by capital stock (in model 1.1 and 1.2) and scaled by GDP (in model 2.1 and 2.2), accordingly.

Therefore, these results provide adequate evidence indicating the importance of the banking sector to the Namibian residential real estate market. As it can be seen, only the FPI can directly influence residential investment favourably; otherwise, in the absence of the banking system, FDI and remittances have no desirable impact on the residential investment. However, through the indirect credit market channel, externalities of FDI and remittance are favourable to the residential investment while externalities of FPI are not. The equity market, on the other hand, appear to be a less effective channel for foreign capital inflows than the credit market since only FDI appeared to have positive externalities, although the evidence for this is inconclusive.

These results provide clear evidence that indicate the importance of developing investment-sensitive policies and a business positive environment to attract foreign investments as advanced by Namibia, which despite having very limited natural mineral resources has managed to do (see Morisset (2000) on a discussion on the strategy adopted by Namibia to attract foreign investments).

It seems that these policies work well with FPI to harness direct benefit in the residential market. However, for FDI and remittances, it appears that developed credit market is important for positive externalities. These clearly support the work of Alfaro *et al.*, (2010) and Giuliano and Ruiz-Arranz (2009). According to these authors, well-developed financial markets are important to harness whatever little foreign capital is received. This is also in agreement with the findings of Lartey (2011) who found positive impact of remittances at a certain threshold level of financial development.

5.5.8 Regression Results for the Non-Residential Market of Namibia

On the other hand, estimates of the non-residential market models appear to be estimated in an efficient way. The measure of autocorrelation, using Q-statistics, provides clear evidence that serial correlation in the errors was completely eliminated. Similarly, the J-statistics also indicate that the instrumentation is adequate and orthogonality is achieved. The number of instruments do not exceed 16 in any of the models since over-fitting the model is also undesirable property (Roodman, 2009). According to Roodman (2009), the

number of instruments used in a model should not be too many, relative to the number of observations, otherwise the probability distribution of *J*-statistics could lack meaning.

In terms of foreign capital inflows, the results indicate that the FDI has significant direct positive externalities on non-residential investments while direct externalities of FPI and remittances are negative and insignificant, respectively. These results are robust and consistent across all specifications. On the indirect channel through the credit market, it appears that FDI and remittances have insignificantly negative externalities, respectively; whereas the estimates of the FPI's externalities are inconclusive. Once again, as was with the residential market, the evidence for the equity market channel is inconsistent across the model specifications.

Table 5.10: Regression Results for the Non-Residential Market of Namibia

	Model 1.1		Model 1.2		Model 2.1		Model 2.2	
Variable	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error
NRESLAG1	-0.406***	(0.085)	-0.690**	(0.212)	-0.047	(0.062)	-0.548*	(0.213)
FDI	2.715***	(0.291)	0.898**	(0.195)	3.921***	(0.204)	0.802*	(0.326)
FPI	-258.5***	(39.99)	-18.598	(26.35)	-435.6***	(23.529)	-26.685	(40.06)
REM	0.350	(0.389)	2.086	(2.568)	0.483	(0.405)	-0.570	(4.271)
FDI*Credit	-0.383***	(0.024)	-0.287**	(0.086)	-0.554***	(0.015)	-0.286**	(0.098)
FPI* Credit	54.281***	(3.548)	-1.282	(8.625)	102.191***	(6.152)	0.016	(11.92)
REM* Credit	-0.069	(0.114)	-0.706	(0.747)	-0.069	(0.135)	0.113	(1.320)
FDI*Equity	-0.017***	(0.003)	34.468	(90.90)	-0.025***	(0.002)	88.649	(50.30)
FPI* Equity	0.962*	(0.374)	5324.152	(9006)	1.277***	(0.212)	6255.191	(6365)
REM* Equity	-0.005	(0.006)	-57.793	(156.4)	-0.008	(0.005)	-0.720	(124.1)
Credit	-0.188***	(0.016)	0.119	(0.067)	-0.031***	(0.003)	0.016**	(0.005)
Equity	0.009***	(0.001)	-90.937	(71.95)	0.001***	(0.000)	-15.105*	(6.861)
Adjusted R-sq	0.915		0.139		0.877		0.151	
Instrument rank	13		15		15		16	
J-statistic	1.841		2.030		2.253		4.432	
Prob(J-statistic)	0.175		0.362		0.522		0.351	
Q-Stat	1.626		1.270		0.297		0.226	
Q-Stat (Prob)	0.202		0.260		0.586		0.635	

The table shows coefficient estimates and their associated standard errors for non-residential market models in Namibia. The asterisk ***,** and * indicates significant test statistics at 99%, 95% and 90% level of confidence. FDI, FPI and REM stands for ratios of foreign direct investment, foreign portfolio investments and remittances. This are the values of the foreign capital inflows scaled by capital stock (in model 1.1 and 1.2) and scaled by GDP (in model 2.1 and 2.2), accordingly.

The results above appeared to suggest that apart from the direct channel used by FDI, the role of foreign capital inflows to non-residential investment of Namibia is not dependent on the financial markets' development. Although it can be strongly asserted that the

credit and equity channels do not lead to any significant positive externalities from FDI and remittances, the possible positive effects of FPI are equally not consistent. However, the inconclusiveness of these results means that a different approach could be explored if the effect of FPI and remittance in the non-residential real estate market is to be explored further.

Reading these results together with the causality results in the previous chapter, where all foreign capital inflows were found to influence non-residential investment contingent to the size of the inflows, it become clearer that the influence is not dependent on the channel used except for FDI. For FDI, it appears that a direct channel is most effective than an indirect channel for positive externalities on non-residential investment. Data shows Namibia as one of the African countries whose inflow of FDI has risen drastically since mid -2000s (Ajayi, 2006; Ndikumana and Verick, 2008) but the major concern has been on how to translate these inflows into economic benefits to majority (Ikhide, 2006). These results indicate that funnelling through the financial markets may not achieve much for non-residential investments; instead, investors should be encouraged to make direct non-residential investments.

On FPI, it appears that the investor-friendly policies do not achieve much in the non-residential market (Morisset, 2000). Given that reversal and withdrawal of FPI is a common occurrence in Namibia after the global financial crisis (Brambila-Macias and Massa, 2010). The findings indicate that funnelling FPI through financial markets may not help much either, perhaps, focussing on the amount of inflows would be more beneficial going by the threshold flow results in the previous chapter. Evidence indicating none of the channels to be significant to remittances, is a bit surprising.

It is true that remittances are regarded private household transfers whose direct benefits are expected to be borne by households but financial are supposed to channel this flow for the better of other sectors and economic units (Giuliano and Ruiz-Arranz, 2009). To this regard, it is important that a different line of inquiry is undertaken to investigate the dynamics, size, and nature of remittances in Namibia. It is possible that amount of

remittances received are very small or non-residential investment is solely financed through FDI and domestic borrowing is not common.

5.5.9 Regression Results for the Residential Market of South Africa

Table 5.11 below shows the results for the residential models implemented in a similar way as described above for South Africa. We accept the null hypothesis of the Hansen J-statistic test of orthogonality of instruments and reject the alternative hypothesis that postulates that the instruments are invalidity. We also check for serial correlation after the estimation of each model using Q-statistics. Under this test, the null hypothesis always postulates the absence of serial correlation while the alternative hypothesis states otherwise. The GMM appear to eliminate all possible autocorrelations in all models but in model 1.2, serial correlation is still persistent. Nonetheless, the serial correlation does not seem to significantly inflate or deflate the standard errors and the t-statistics since the results of Model 1.2 appear to agree, to a large extend, with the results of other models regarding the coefficient estimates.

The estimation of the importance of the direct channel indicates that the direct residential investment externalities of FDI and FPI are either negative or insignificant whereas the results of remittances varied only when either a market or GDP-scaled specification is used. Apparently, when capital stock-scaled model is used, the direct impact of remittances appears to be negative and we examine the direct impact under the economy size model, the externalities appear to be positive. All the same, a generalization across all the four models is not possible; hence, none of the foreign capital inflow's results are robust across all specifications.

Nonetheless, when we examine the indirect externalities of the foreign capital inflows through the credit market using the interaction terms, we discover that FDI has significant indirect positive externalities on the residential investment and this evidence is robust across all model specifications. The results for remittances and FPI are not robust although generally negative or insignificant. These inconclusive results are also

witnessed when we estimate the externalities of all three foreign capital inflows via the indirect equity market channel.

Table 5.11: Regression Results for the Residential Market of South Africa

	Model 1.1		Model 1.2		Model 2.1		Model 2.2	
Variable	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error
RESLAG1	1.098***	(0.026)	1.092***	(0.039)	1.424***	(0.117)	1.244***	(0.063)
FDI	-0.017***	(0.006)	-0.001	(0.012)	-0.014	(0.014)	0.014	(0.017)
FPI	-0.009*	(0.005)	-0.023***	(0.008)	0.008	(0.014)	-0.023	(0.018)
REM	-0.091**	(0.041)	-0.050	(0.037)	0.263**	(0.108)	0.562**	(0.265)
FDI*Credit	0.031*	(0.016)	0.011**	(0.005)	0.047*	(0.028)	0.018***	(0.006)
FPI* Credit	0.013***	(0.002)	-0.003	(0.003)	-0.004	(0.006)	-0.008***	(0.003)
REM* Credit	-0.044	(0.191)	-0.120	(0.096)	-0.705***	(0.224)	0.189	(0.151)
FDI*Equity	-0.008*	(0.005)	-0.306	(0.218)	-0.014	(0.008)	-0.580**	(0.245)
FPI* Equity	-0.004***	(0.001)	0.247**	(0.102)	0.001	(0.002)	0.396***	(0.144)
REM* Equity	0.051	(0.059)	6.027*	(3.043)	0.346***	(0.102)	-5.472	(3.396)
Credit	0.003	(0.016)	0.012	(0.009)	0.008**	(0.003)	-0.005	(0.003)
Equity	-0.004	(0.005)	-0.594**	(0.296)	-0.006***	(0.002)	0.095	(0.059)
Adjusted R-sq	0.973		0.979		0.950		0.919	
Instrument rank	22		23		17		17	
J-statistic	4.929		10.825		1.146		1.388	
Prob(J-statistic)	0.840		0.371		0.766		0.708	
Q-Stat	0.635		4.354		0.868		0.340	
Q-Stat (Prob)	0.425		0.037		0.352		0.560	

The table shows coefficient estimates and their associated standard errors for non-residential market models in South Africa. The asterisk ***,** and * indicates significant test statistics at 99%, 95% and 90% level of confidence. FDI, FPI and REM stands for ratios of foreign direct investment, foreign portfolio investments and remittances. This are the values of the foreign capital inflows scaled by capital stock (in model 1.1 and 1.2) and scaled by GDP (in model 2.1 and 2.2), accordingly.

The glaring evidence from the residential model results shows that direct externalities of FDI and FPI into residential real estate market of South Africa are unfavourable. However, when FDI goes through the banking system, the results above provide adequate evidence that indicate significant positive externalities. Other results are inconclusive and require a further analysis.

To practitioners and researchers in housing markets in South Africa, these results indicating that only one channel is important to the housing market is not surprising. This emanates from the current housing policy. In an effort to fulfil political and social needs of South Africans, successive governments in South Africa have rather enthusiastically implemented housing subsidy programs, which appear to have interfered significantly with the efficiency of the housing market. Because the subsidy programs have targeted low-income earners, these have left the majority of middle class South Africans with

either too little income to afford a mortgage loan or too wealthy to benefit from the housing subsidy.

Although this does not interfere with the mortgage market operations, it however discourages foreign investments from the market (see Mayo and Angel's (1993) caution on government market interferences). This could explain why FDI is the only flow with important externalities to the residential investment and the reason that the important externalities are still only possible through the financial markets (i.e., the credit market) and none of the flows have substantial direct externalities that are positive.

5.5.10 Regression Results for the Non-Residential Market of South Africa

The results for the non-residential market model of South Africa are presented in Table 5.11 below. According to the adjusted R-squared, the capital stock-scaled models appear to have a slightly lower fit than the GDP-scaled model, but on the whole, all of the models show a great deal of goodness of fit. In addition, the instruments are sufficient and valid and the J-statistics suggest that the null hypothesis of orthogonality of instruments should be accepted.

However, the Q-statistics indicate that autocorrelation in model 1.1 cannot be eliminated by the optimal GMM but GMM is efficient in the other three models, which eliminated serial correlation entirely. Since the results of model 1.1 diverge materially from the results of other models, we reject the entire results of model 1.1 and base our interpretation on robust results of models 1.2-1.4.

From the results of this analysis, it seem that only FDI has direct positive externalities, robust on the three model specifications, results of FPI indicate statistically unimportant direct externalities while results of remittances are inconsistent; and thus, inconclusive. Regarding the use of indirect credit market channels, we do not establish any robust evidence indicating indirect positive externalities on non-residential investment of any of the three foreign capital inflows. Results for the three foreign capital inflows are inconclusive. On the indirect equity market channel, based on the three model specifications (recall that Model 1.1 has persistent autocorrelation which normally affects

the t-statistics), robust results indicate that remittance have significant indirect positive externalities on non-residential investment.

Table 5.12: Regression Results for the Non-Residential Market of South Africa

	Model 1.1		Model 1.2		Model 2.1		Model 2.2	
Variable	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error
NRESLAG1	0.819***	(0.031)	0.723***	(0.096)	1.219***	(0.203)	0.350	(0.249)
FDI	0.010*	(0.006)	0.049***	(0.017)	0.019*	(0.011)	0.048**	(0.021)
FPI	0.000	(0.005)	0.018	(0.016)	0.011	(0.015)	0.028	(0.018)
REM	0.233***	(0.035)	-2.397***	(0.712)	0.781**	(0.369)	-2.049**	(0.961)
FDI*Credit	0.011	(0.008)	-0.004	(0.004)	0.058***	(0.022)	0.014*	(0.009)
FPI* Credit	-0.011***	(0.002)	0.001	(0.002)	-0.021***	(0.005)	0.006*	(0.003)
REM* Credit	-0.179	(0.122)	0.316	(0.215)	-1.187***	(0.385)	-0.295***	(0.080)
FDI*Equity	-0.005**	(0.002)	-0.335*	(0.203)	-0.020***	(0.007)	-0.768**	(0.355)
FPI* Equity	0.004**	(0.001)	-0.141	(0.103)	0.006***	(0.000)	-0.327***	(0.114)
REM* Equity	0.044	(0.041)	16.822***	(6.162)	0.324***	(0.111)	23.452**	(9.485)
Credit	0.012	(0.010)	-0.026*	(0.017)	0.022***	(0.007)	0.007***	(0.002)
Equity	-0.003	(0.003)	-1.375***	(0.507)	-0.006***	(0.002)	-0.412**	(0.173)
Adjusted R-sq	0.854		0.876		0.921		0.940	
Instrument rank	21		20		19		19	
J-statistic	3.889		5.534		3.508		1.635	
Prob(J-statistic)	0.919		0.477		0.622		0.803	
Q-Stat	4.530		0.457		0.932		0.353	
Q-Stat (Prob)	0.033		0.499		0.334		0.552	

The table shows coefficient estimates and their associated standard errors for non-residential market models in South Africa. The asterisk ***,** and * indicates significant test statistics at 99%, 95% and 90% level of confidence. FDI, FPI and REM stands for ratios of foreign direct investment, foreign portfolio investments and remittances. This are the values of the foreign capital inflows scaled by capital stock (in model 1.1 and 1.2) and scaled by GDP (in model 2.1 and 2.2), accordingly.

The results of the indirect equity market externalities of FDI suggest significant negative externalities whereas the results for FPI are inconclusive. Lastly, the credit market on its own appear to have positive impact only when foreign capital inflows are examined under GDP-scaled models, otherwise, the equity market, in the absence of foreign capital inflows, seem to have only negative or insignificant externalities.

In view of previous studies that appeared to support the crowding-out effects of FDI in the short-run by Fedderke and Romm (2006), the findings of this analysis substantiates this finding by indicating that crowding-out is possible only when FDI is funnelled into the non-residential investment via the equity market. Otherwise, the direct channel causes positive externalities. The results on remittances are also clear and support the theory on the role of financial markets in aiding spillovers and easing liquidity constraints by Alfaro *et al.*, (2004) and Giuliano and Ruiz-Arranz (2009).

These results indicating positive remittance externalities via an indirect equity market channel are outstanding because they provide the only evidence for a significant indirect equity market channel. Perhaps, the fact that the equity market[26] in South Africa has many listed property companies and real estate investment trusts (REITs) than any other equity market in Africa could explain why only South Africa has a positive indirect equity market channel. It seems that for the equity market to be an important channel, more listing of real estate companies is necessary.

5.6 Summary of Country-by-Country Results

This chapter examined the channels through which foreign capital inflows affect residential and non-residential real estate investments in five African countries. In particular, the role of financial markets, specifically, equity and credit markets, and the relationship between investments and foreign capital inflows, were examined. According to the theories of spillover effects and financial liberalization, the role of financial markets in ensuring efficiency of foreign capital markets is highly acknowledged. These are christened by McKinnon (1973) terming financial markets as the necessary absorptive capacity that enables the efficacy of spillover effects of foreign capital inflows.

Similarly, from empirical models developed in chapter three, theoretical frameworks and previous studies, the role of financial markets in enabling productive outcomes from foreign capital flows is to provide much needed long-term funds to domestic investors. Evidently, this would foster the spillover effects or, for those with little interaction with MNCs, they would be able to get the necessary capital to fund real estate investments.

Therefore, foreign capital would impact real estate investments directly or indirectly through the financial markets. We formulated a simple regression model to analyse these two types of effects by using the interaction terms between each foreign capital inflow and a proxy of credit or equity market development. We ran models in which the investments and foreign capital inflows were either scaled by capital stock of the respective market or by GDP, as a check for robustness.

[26] This market is called the Johannesburg Stock Exchange (JSE)

In addition, we used the credit to private sector-to-GDP ratio as proxy for the banking sector development and either equity market capitalization-to-GDP or the equity market turnover-to-equity market capitalization ratios as proxy for the stock market development. This meant that for each of the five countries, namely, Botswana, Kenya, Morocco, Namibia and South Africa, we estimated four models. The results varied from country to country and from residential market to non-residential market. Below, we recall the conclusive results, the ones that provide robust evidence.

In the residential market of Botswana, the robust results indicate that a direct channel of FDI and an indirect channel through the credit market of remittances are most effective for significant positive externalities on residential investment. On the non-residential market of Botswana, the robust results indicate that in the absence of developed banking (credit) system, only FDI causes positive externalities on non-residential investments. On top of this, the indirect credit market channel of remittance also causes positive externalities on residential investments. Therefore, these results uphold that FDI would be effective in causing positive outcomes only when funnelled directly into both kinds of the real estate markets whereas remittances would need a strong banking sector for positive externalities on residential market but its role in the non-residential market is unclear.

In Kenya, robust results indicate that FDI and remittances are effective via an indirect credit channel while FPI has direct positive externalities on residential investments. In non-residential market, the robust results indicate that positive externalities are favoured when FDI and remittances are funnelled through the credit channel, results for FPI and all other channels are unsettled. Therefore, on the whole, a developed banking sector is important for positive externalities of FDI and remittances on both types of real estate investments; otherwise, in the absence a developed banking sector, the real estate investment outcomes of these two flows are unfavourable. Only FPI seem to favour a direct channel into the residential market, even though, in the non-residential market, the outcomes of FPI are not clear.

In Morocco, the direct channel of FDI and the indirect channel of FPI through the credit market are effective for positive externalities on residential investment. In the non-residential market, it appears that only the FPI is able to cause positive externalities directly, when funnelled via the financial markets, none of the foreign capital inflow appears to provide consistent results that suggest that there are positive externalities. These results speak more about the nature of the crowding-out effect, established by the causality tests, which seem to be independent of the channel of impact. The role of the financial markets, especially the credit market, is only limited to FPI in the residential real estate market.

In the estimation of the channels of foreign capital flows into the residential market of Namibia, the results suggest that only FPI has direct positive externalities on residential investment whereas FDI and remittances appear to cause positive externalities only when funnelled through the credit market. In the non-residential market, it appears that only FDI has significant direct positive outcomes on non-residential investments. Otherwise, the estimates of the indirect channels through the financial markets do not provide any robust evidence of any indirect positive non-residential investment externalities of any of the inflows. In Namibia, it seems that financial markets, and the credit market in particular, are only important to the residential market, the non-residential market appear to favour direct real estate investments rather than through capital via the financial markets.

The estimation of the channels used by foreign capital inflows in South Africa showed that the inflows have unfavourable direct externalities, but through the credit market channel, FDI has significant positive outcomes. In the non-residential market, it appears that FDI has positive externalities, directly, without being funnelled through the financial markets while the indirect channel of remittances through the equity market also causes positive externalities on non-residential investments. All other results were inconclusive or do not suggest favourable outcomes to the non-residential investments. Therefore, in both markets, we have sufficient evidence to say that FDI can have positive externalities;

either indirectly in the residential market via the credit market or directly in the non-residential market.

To this end, it appears that in every country, a developed credit market is important for positive externalities of at least one foreign capital inflow. This underscores the importance of a developed credit market in African countries where the equity markets are relatively smaller or non-existing. Between the two markets, it appears that the credit market is more important in African countries for funnelling foreign capital inflows into investments than the equity market. In some specific markets, it is evident from above results that a direct impact is still possible for positive investment outcomes. For instance, FDI in the residential markets of Botswana and Morocco, FDI in the non-residential market of Botswana, Namibia and South Africa, FPI in the residential market of Kenya and Namibia and FPI in the non-residential market of Morocco.

However, for a flow such as remittances, no positive externalities are possible unless funnelled through a financial market. This is well document in the entire five countries. Perhaps being a private household transfer explains why financial intermediaries are important for enhancing important externalities of investment from such flow. With the exception of South Africa, the credit market seems to be most favourable for funnelling remittances.

According to extant statistics and data on remittances into Africa, the volume of remittances appears to have grown over the years and appear to exceed FDI in some years. This is already a reality in some countries such as Kenya where remittances far outstrip FDI as a type of foreign capital inflow. Following the results above, these countries will achieve positive investment growths only when they encourage remittances to be channelled through the credit market. As such, developing their credit markets should be a matter of priority.

CHAPTER SIX

CONCLUSION, POLICY IMPLICATIONS, AND RECOMMENDATIONS

6.1 Introduction

In this chapter, we present a brief discussion of the findings of this study, in view of the purpose we had set out to pursue and how these findings contribute to the literature on liberalization, international capital flows and real estate markets development, among other areas. The implications of our findings help us to derive recommendations for stakeholders in the areas of cross-border capital flow, investments, and real estate markets development, which are presented together with identified areas of future studies necessary to build upon the contributions made by this study.

6.1.1 A Recap of the Study's Hypothesis

As explained in the first chapter, we set out to examine two main objectives regarding foreign capital inflows and real estate markets in Africa. It is generally believed that a national real estate market is a very important economic sector, essential for economic and social development because real estate is part of a nation's fixed capital stock and the growth of a real estate market can stimulate growth in several markets and other sectors of the economy (i.e., serves as a major driver of economic development).

Despite these clear benefits, Africa's real estate markets have been left behind by markets elsewhere (i.e., regions of the world) in terms of growth rate, size, and attractiveness, for a myriad of reasons. Apparently, among the major hindrances is that available real estate finance is inadequate to stimulate sufficient demand and investments.

In this study, we proposed that allowing and encouraging foreign capital inflows into African countries would stimulate growth of domestic markets including the real estate market. On that score, our first research objective sought to establish the effects of foreign direct investments, remittances, and foreign portfolio investment flows on the growth of real estate markets in Botswana, Kenya, Morocco, Namibia and South Africa.

It was expected that such foreign capital inflows would produce positive externalities to the recipient sector/market, and based on the theory of economic spillover (Caves, 1974), the credit and equity markets can act as conduits or channels through which foreign capital inflows foster investments in both residential and non-residential real estate markets. Based on this, our second and last research objective sought to examine whether domestic credit and equity markets serve as channels through which cross-border capital flows affect real estate markets in the selected African countries.

Below, we recall our findings in respect of these two key objectives/questions of the study, especially stressing the extent to which these findings meet the objectives of the study. Our discussion is, therefore, organised in terms of the research objectives (questions).

6.2 The Effect of Foreign Capital Inflows and Real Estate Markets

This objective was examined in two chapters. In Chapter Three, we first develop a structural investment model that captures the functional relationships between real estate investments and foreign capital inflows. The values of residential and non-residential fixed capital investments are used as a proxy of a real estate market's growth. The structural investment model is then estimated using panel data regression methods.

Given that a panel regression is only able to identify general associations, we sought to establish cause-and-effect relationship separately. In Chapter four, we estimated a time-series analysis of causality, using the unrestricted vector autoregressive regression (VAR) model as well as supplemented it by the Bai-Perron threshold test to address key pitfalls of VAR models. The following key findings are presented as per the chapter in which they were analysed.

6.2.1 Associations between Foreign Capital Inflows and Real Estate Investments: Chapter Three

In this chapter we identified associations between foreign capital inflows and real estate investments in a panel of five countries: Botswana, Kenya, Morocco, Namibia and South

Africa. We analysed the data using pooled regression, fixed effect (FE) and random effect (RE) models. We implemented the entire three models for both residential and non-residential markets. To estimate the pooled data, we used the feasible generalised least square (FGLS) method to address persistent autocorrelations and heteroscedasticity. On the other hand, to estimate the FE and RE models, we implemented the efficient iterated generalized method of moments (GMM) that utilized iterated weights and panel-corrected standard errors.

The results for the residential market estimations indicate that FDI has a positive associations in the later periods after receipt, the impact multiplier or asociations in the earlier periods are not clear. The results for FPI are unclear but for remittances, we concluded that initial association is negative, but after a lapse of one quarter, the associations are positive, then again, beyond three quarters from quarter of inflow, the association is statistically insignificant. In other words, the associations between remittances and residential investments are short-lived.

This evidence appear to agree with much of the existing statistical data on sectorial distribution of FDI where housing is often identified as a beneficiary of FDI and remittances in Africa but there is little empirical evidence that links housing investments and foreign capital inflows (Obeng-Odoom, 2010; Ross, 2011; Stephens, 2003). However, similarly motivated studies, such as Fedderke and Romm (2006) focusing on economic growth and FDI, established favourable long-run FDI effects and unfavourable short-run effects in South Africa.

In contrast, empirical analyses on remittances do exist in some countries. Kagochi and Kiambigi (2012) in Kenya, Panin *et al.*, (1993) in Botswana, and Lartey (2011) in Namibia are examples of studies focused on remittances. The general finding of these studies is that remittances play a substantial investment role in these African countries. This conclusion clearly supports our findings.

The results of the non-residential market models provided sufficient evidence which shows that FDI and remittances do not result in any favourable outcomes on the non-

residential market in the initial periods, but in the later periods, the effects are significant and positive. The results concerning associations of FPI and non-residential investments are inconclusive.

This evidence is supported by the statistical data on sectorial distribution of FDI, showing that a substantial amount of FDI end up in the manufacturing, financial services, trade, tourism and manufacturing sectors of most Africa countries (see UNCTAD (2003) in Botswana and Mwega and Ngugi (2006) in Kenya, among others). However, very few studies have analyzed and produced empirical evidence that link non-residential investments to FDI inflows in Africa.

On the other hand, remittances are rarely examined in terms of non-residential investments. Perhaps, since remittance is a private transfer that is mostly meant for households, few researchers have investigated its association with commercial or industrial real estate investments. Therefore, these findings provide a unique foundation for further studies in non-residential investments and foreign capital inflows, not only in Africa, but beyond.

We note that the tests in this chapter fail to clarify the exact association between FPI and the two types of real estate investments. Previous studies on some the countries in this panel, for example Morisset (2000) and Bekaert and Harvey (2000), indicate that FPI has a significant associations with investments. It is important to acknowledge that panel regression analysis on its own does not infer causality unless backed by theory and causality tests. Therefore, we proceeded to undertake causality tests for each country, separately, in order to understand the underlying causal relationships that are likely to vary from country to country and from market to market.

6.2.2 Causality Tests: Chapter Four

We used VAR models, and given that a major weakness of VAR and any other linear regression model is the assumption of constant parameters, we incorporated the Bai-Perron structural-breaks test by hypothesising a break along the volume or size of capital inflows. Therefore, we first estimated a set of VAR models and then the Bai-Perron test.

In summary, the threshold capital flow test results and in conjunction with the VAR results for the residential real estate markets of Botswana suggest that the effects of FDI and FPI on residential investments are contingent on time and size while effects of remittances are governed by size only. In the non-residential market, we found that the nature of the effects of each of the three foreign capital inflows on non-residential real estate investment is contingent on the size of the inflow.

These results are in support of existing statistics (United Nations Conference on Trade and Development (2003) and Siphambe (2006)) as well as previous studies such as Ahmed and Mmolainyane (2014) and De Santis and Lührmann (2009) on FPI and Panin *et al.,* (1993) on remittance. The findings also provide new insights with regard to FDI because most previous studies such as Ahmed and Mmolainyane (2014), Delgado *et al.,* (2014), Durham (2004) and Kim and Li (2014) maintain that the net effect of FDI on investment and economic growth is either negative or only contingent on absorptive capacity. Our findings indicate that the effect is dependent on time and size in the residential market and on size only in the non-residential market.

The results of the Kenyan residential market models are unclear and, are thus considered yield inconclusive effects of FDI on residential investment. We established that the effects of FPI are size-dependent and time-varying whereas the effects of remittances are only size-dependent. The FDI results appear to concur with existing statistics that cite Kenya among less attractive FDI destinations because as a country, Kenya lacks natural mineral resources (Mwega and Ngugi, 2006; Ndikumana and Verick, 2008). It also supports findings of previous studies such as Demir (2009) on FPI and Kagochi and Kiambigi (2012) on effects of remittances.

However, our findings bring in new understandings regarding the impact of size and time of the inflows. On the other hand, the results of the non-residential real estate market in Kenya provide evidence suggesting positive effects of FDI, negative effects of FPI and size-dependent effects of remittances on non-residential investment. While results on FPI and remittances are still in support of previous studies cited above, the new finding

regarding FDI supports the work of Uddin *et al.*, (2013) who argue that the economic role of FDI in Kenya is through the total factor productivity channel.

In Morocco, the two tests of causality provide evidence which when interpreted together indicates that the effects of FDI on residential investment in Morocco is size-dependent, the effect of FPI is not clear and the effect of remittances is only time-dependent. On the other hand, the results of the non-residential market suggest that FDI has no statistically significant effects on non-residential investment; FPI has time-varying effects while remittances have size-dependent effects.

These findings provide very important evidence indicating that negative effects of FDI in the residential market are only possible when amount of FDI inflow is beyond certain threshold amount, after which the effect may be positive, which provides a better understanding of the supposed crowding-out effects established by previous studies such as Haddad and Harrison (1993) and Abdelhafidh (2013).

However, in the non-residential market, the previous evidence of crowding-out is highly supported. Concerning the time-varying effects of remittances, our findings are in conformity with existing statistics although little empirical studies have been done in this aspect. Compared to other developing countries, apparently, Morocco has the highest immigrant population in developed countries and receives among the highest remittances compared to other African countries (De Haas, 2006; Mohapatra and Ratha, 2011; World Development Indicators, 2011).

In both residential and non-residential markets of Namibia, we found that the effects of FDI, FPI and remittances are mainly dependent on the size of the inflows received. This supports the notion that policies also matter. Nevertheless, possible crowding-out effects for FDI and reversal effects of FPI were also established by Ikhide (2006) and Brambila-Macias and Massa (2010), respectively.

This being the case, the findings of this study provide a better insight by suggesting that the nature of the effects is guided by the amounts of inflows. This way, significant crowding-out effects of FDI and reversal effects of FPI are limited to only some levels of

inflows. Regarding the persistent of positive effect of remittances, evidence provided here is supported by previous work of Lartey (2011), where Namibia was one of the countries in his sub-Saharan panel.

In South Africa, the residential market results suggest that the effects of FDI and the effects of remittances on residential investments are governed by the size of the inflows received, the results of the effects of FPI are inconclusive. The results on FDI appear to support the findings of Fedderke and Romm (2006) who established a complementarity relationship between FDI and domestic investment only in the long-run, meanwhile the results on remittances are in agreement with existing statistics on migration and remittance inflows (Adams and Page, 2005; Maphosa, 2005).

In the non-residential market, the results of the effects of FDI on non-residential investment are inconclusive, however, we found that the effects of FPI are statistically insignificant whereas the effects of remittances are governed by the amount of remittances received. This evidence on remittance is in line with the findings of Geyer *et al.*, (2011) who found a substantive number of new entrepreneurs and informal business start-ups in some settlements in South Africa that identify remittances from relatives abroad to be their main impetus.

All in all, we found that foreign capital inflows have a significant effect on the growth of real estate markets through their impacts on real estate investments. However, the nature of effects varied from country to country and from residential to non-residential markets. That being the case, a general view applicable to all markets and countries cannot be formed from these results. However, an important emerging trend is that the size of foreign capital received appears to play a significant role in determining whether a specific foreign capital inflow exerts desirable or undesirable effects on the residential or non-residential investments. Some estimates of the effects of foreign capital inflows are largely inconsistent.

Again, we found the effect of some flows to be significantly negative which is against the *a priori* expectations. In this regard, it was important that we explore the channels

through which the foreign capital inflows impact real estate investments to clarify the inconclusive effects and provide more insight on how the effect of a foreign capital inflow would be negative on real estate investment. This was explored through the tests required to answer our second research question.

6.3 The Conduits of Foreign Capital Inflows: Chapter Five

In this chapter, we examined the important channels through which each foreign capital inflow is funnelled for positive externalities on real estate investments. Once again, we performed a country-by-country and market-by-market analyses. We formulated a set of interactive regression model and estimated each for every market using the optimal-weighted GMM estimator.

In the residential market of Botswana, we found that a direct channel of FDI and an indirect channel through the credit market of remittances are most effective for significant positive externalities on residential investment. On the non-residential market of Botswana, we found that in the absence of developed banking (credit) system, only FDI causes positive externalities on non-residential investments. On top of this, the indirect credit market channel of remittance also causes positive externalities on residential investments.

In Kenya, we established that FDI and remittances are effective via an indirect credit channel while FPI has direct positive externalities on residential investments. In the non-residential market, we found evidence that positive externalities are favoured when FDI and remittances are funnelled through the credit channel, results for FPI and all other channels are unsettled.

In Morocco, we found that the direct channel of FDI and the indirect channel of FPI through the credit market are effective for positive externalities on residential investment. In the non-residential market, it appears that only the FPI is able to cause positive externalities directly, when funnelled via the financial markets, none of the foreign capital inflow appears to provide consistent results that suggest positive externalities.

In the estimation of the channels of foreign capital flows into the residential market of Namibia, we found that only FPI has direct positive externalities on residential investment whereas FDI and remittances appear to cause positive externalities only when funnelled through the credit market. In the non-residential market, it appears that only FDI has significant direct positive outcomes on non-residential investments. Otherwise, the estimates of the indirect channels through the financial markets did not provide conclusive evidence.

In the residential market of South Africa, our findings indicate that all foreign capital inflows have unfavourable direct externalities, but through the credit market channel, FDI has significant positive outcomes. In the non-residential market, it appears that FDI has positive externalities, directly, without being funnelled through the financial markets while the indirect channel of remittances through the equity market also causes positive externalities on non-residential investments. All other results were inconclusive or do not suggest favourable outcomes to the non-residential investments.

It appears that for every country, a developed credit market is important for positive externalities of at least one foreign capital inflow. This underscores the importance of having a developed credit market in African countries where the equity markets are relatively smaller, underdeveloped or non-existing. Between the two markets, it appears that the credit market is more important in African countries for funnelling foreign capital inflows into investments than the equity market.

Although a direct impact is still possible for positive investment outcomes of FDI and FPI, it appears that for remittances, no positive externalities are possible unless funnelled through a financial market. This is well documented in the entire five countries.

This evidence is in agreement with the assertions of McKinnon (1974) who insists that financial markets are 'necessary and sufficient' conditions to nurture positive foreign capital externalities. Our findings are also in agreement with Alfaro *et al.,* (2004) and Giuliano and Ruiz-Arranz (2009) who established that financial markets are part of the

local conditions (adoptive capacity) that enable positive externalities of foreign capital inflows, without which, externalities would be negative or insignificant.

6.4 Policy Implications

The theory of financial liberalization and the work of its adherents highlight the importance of opening the capital account in order to stimulate domestic savings, investments and economic growth. From the empirical equations derived in this study, and theoretically speaking, the role of foreign capital inflows in financing domestic investment is apparent.

A further empirical analysis of the structural model in the selected five African countries provided proof that FDI and remittance have constructive positive effects on real estate investments despite possible unfavourable externalities in the initial periods after their receipt. In a way, these findings support the arguments by McKinnon (1973) and Shaw (1973), and provide new evidence on the association between real estate markets in Africa and international capital flows.

For that reason, for African countries to realise a greater real estate investment, fast-track the growth of their real estate markets, and enhance the attractiveness of their real estate markets to domestic and foreign investors, there is an urgent need to encourage the inflow of foreign capital. This emerges from two stylised facts from the discussions and results of this study: domestic savings, and by extension of domestic credit, are insufficient and very low for sustainable growth and development, and foreign capital inflows have significant positive externalities on real estate markets in Africa.

Therefore, it may not be sufficient to remove the capital mobility restrictions only but policies that encourage huge amounts of inflows should also be implemented. This may include having investment sensitive policies aimed at making the business environment friendlier and attractive to foreign investors, such as those implemented in Namibia around 1997 (see Morisset (2000)), eliminating uncertainties which are likely to hinder portfolio investors because previous studies have indicated a higher sensitivity of FPI to

uncertainties. This could explain why portfolio investments have undesirable effects in Kenya and Botswana.

In Botswana, it is important that Botswana puts in place policies that attract direct investments into real estate markets and, on top of that, develop its banking sector beyond the current predominantly foreign-owned (Kayawe and Amusa, 2003). In addition, Botswana should also address the uncertainties of investment fundamentals and running cost of labour, to nurture positive outcomes of FPI.

However, addressing the cost-efficiency of labour may not be a short-run fix; it may require a long-term commitment and behavioural change to address the prevalence of HIV/AIDs. But in the short-run, we believe the government can adopt insurance policies to safeguard investors from losses related to payroll uncertainties. This could discourage reversals and encourage positive effects of foreign portfolio investments whether by direct or indirect channel.

In Kenya, policies that will encourage direct foreign investment into real estate markets and the *diaspora* to use financial institutions to remit money as opposed to using unofficial means will be helpful. According to a survey by World Bank (2011b), only half of Kenyan remittances are sent through the official means. Given the established efficacy of remittances, it will be worthwhile for policymakers to structure policies that encourage remittances to go through the banking system.

Furthermore, deepening and expanding local banking services would be important to harness positive externalities, not only from remittances but from FDI, as well. Besides, for positive effects from FPI, it is essential that uncertainties associated with political violence, macroeconomic policies, and now terrorism, be addressed proactively.

In Morocco, it appears that several foreign capital flows have significant impact on real estate investments but the indirect channel is not very important, except for FPI in the residential market. However, the direct channel of FDI and FPI is important in the residential and non-residential markets, respectively. Based on these findings, it will be

important for Morocco to focus primarily on direct investments, and thus, only encourage the credit channel of FPI in order to avoid significant crowding-out effects.

In Namibia, it will be beneficial for policymakers to ensure that more foreign capital inflows are encouraged and support the expansion of the banking sector. Arguably, the policies implemented to attract foreign investors in the late 1990s need to be reinforced to increase foreign capital inflows. These policies should, at the same time, encourage the expansion of the banking sector to ensure that the little FDI and remittances received goes through the banking system.

In South Africa, for generating more growth of the real estate markets, the government should encourage banks to expand their mortgage portfolio and encourage foreigner participation in commercial and industrial real estate investments. In addition, for positive effects of remittances, policies should be formulated with an intention of encouraging more remittances from the South Africans in *diaspora* by motivating them to invest in real estate through the equity market. Regarding the government-led subsidies programmes, it will be important to ensure that the structure of this programmes do not discourage private investors from accessing the lower- and middle-income-earners who make up the largest segment of the housing market.

For the most effective indirect channel, the credit market channel emerged as the most effective financial market channel, through which positive externalities to the real estate market are possible. The role of the equity markets as a channel was not well established in most countries apart from in South African non-residential market. That having been said, it will be important for policy in each country to encourage remittances through the banking system as well as expand credit advances to real estate players. This policy endeavour could take the form of mortgage lending to the demand side or provision of construction finance to the supply side of the market. There are various impediments to credit in each country and addressing such hurdles will be a vital step toward developing vibrant real estate markets in Africa.

6.5 Recommendations for Further Studies

The intention in this work was to include many if not all African countries in the sample, but only five had sufficient data for this kind of study. Countries' statistical data compilation agencies, such as the central banks and bureaus of statistics, should support research on real estate markets by collecting and disseminating higher frequency data on residential and non-residential markets. Indicators such as the number of new starts, price levels, investment amounts, foreign participations, profitability, and general real estate indices would be important data for future and more probing studies.

The question of the effect of foreign capital inflows on real estate investment has been answered in general. Although the VAR findings have several mixed or inconclusive outcomes, the threshold flow test helped in filling in most of the gaps. However, the roles of distinct financial markets and the nature of FDI and FPI externalities are not very clear in some markets, for example Morocco and South Africa. It will be useful to undertaken to establish whether crowding-out effects prevail in the real estate markets of these countries. This could be modelled in a different way from the type of estimation models used in this study, with attendant results compared to the results found here.

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APPENDIX I: THE EMPIRICAL STRATEGY

Introduction to Empirical Tests

Our empirical approach in the estimation of the empirical investment equations (15) and (16) are twofold: first, we run linear regressions in a multi-country enquiry using panel data empirical techniques to estimate associations, we then follow up with causality tests giving consideration to structural breaks and channel analysis. In this chapter, we begin by looking at the panel regressions only. The causality and structural breaks tests are examined in the next chapter while the analysis of significant channels is pursued in the fifth chapter. The panel data estimation in this chapter is, however, accompanied by an examination of panel unit roots among series as a pre-requisite test to the panel regression in order to avoid pitfalls of spurious regression results.

Panel Regression Model Specifications

In the multi-country analysis, we utilize a panel data analysis methodology, where the countries are the cross-sections or individual units. Hsiao (2005) and Baltagi (2005) encourage the use of this approach because it allows for a precise estimation of both macro-dynamic and micro-dynamic effects. Furthermore, panel regression can also reduce the severity of multicollinearity in a rational distributed lag model due to the use of inter-individual and inter-time differences in the explanatory variables. In addition, they argue that panel regression allows for identification of initially unidentifiable models; mitigates effects of *omitted variable* bias due to measurement errors or unobserved variables, and it controls for individual heterogeneity (Baldagi, 2008; Griliches and Hausman, 1986; Hsiao, 2005).

In addition to the panel modelling, we specify a distributed lag model (DLM) because most authors are of the view that financial time-series, especially investment-related data, naturally exhibit a lag phenomenon. They argue that the lag phenomenon in investment could be traced to habitual inertia or indecisiveness (for example, a decision by economic agents on whether capital flows received are transitory or permanent), delivery lag, implementation delay and contractual obligations that may drag implementation of new

investment (Almon, 1965; Eisner, 1960; Jin and Han, 2011; Koyck, 1954). The DLM also helps to uncover the long and short-run effects or associations of international capital flows on real estate investments.

The distributed lag models are particularly useful in situations where there is a prevalence of time lapses between the moment of exogenous shocks and firm's investment decision. In a more simplified form, and using more conventional symbols for quick understanding, we specify equation (15) as:

$$y_{it} = \alpha + \boldsymbol{x}'_{\boldsymbol{it}}\boldsymbol{\beta} + \in_{it} \qquad i = 1, \dots, N; \;\; t = 1, \dots, T \qquad (42)$$

Lower cases of original variables in equation (15) are used here to indicate that all series from this point have been modified appropriately to remove unit roots. This means that variables in equation (42) are stationary forms[27] of their counterparts in the previous equations. Furthermore, i denotes the country, t denotes the time of the observation, y_{it} is the scalar regressand and in this case $Y_{it} \equiv \left(\frac{I}{K}\right)_{it}$ hence y_{it} is the stationary form of Y_{it}, $\boldsymbol{x}_{\boldsymbol{it}}$ is a $k \times 1$ vector of regressors in their stationary form, but $\boldsymbol{x}_{\boldsymbol{it}}$ is primarily made up of all explanatory variables together with the lags of international capital flows. α is the scalar intercept, $\boldsymbol{\beta}$ is $k \times 1$ vector of partial coefficients of k explanatory variables and $\in_{it}$ is the error term. In the language of dynamic modelling, the coefficient of the current value of each explanatory variable is called the impact multiplier, whereas the coefficients of the lags are called the interim multipliers, but total effect of each explanatory variable, also called the long-run equilibrium effect is customarily obtained by summing up all the coefficients for each variable.

Although distributed lag models are useful in investment analysis, Asteriou and Hall (2011) argue that a drawback of DLMs is that they suffer from severe multicollinearity

[27] Stationarity and associated unit root tests are explained in details in appendix I for panel data and in section 4.2 for time series. Fortunate for this chapter, scaling variables using capital stock (later with GDP) eliminated unit root from all series. That having been said, series in the equation 17 are about similar to the series in equations (14) - (16) only that in equation (17), and as a matter of convention, unit root has been removed from the series; and hence the lower case symbols to imply stationary series.

because of close relationships between the lags. Moreover, a large number of lags and long lag lengths cause a considerable loss of degrees of freedom. And so, it is possible that equation (17), as stated out above, could be indeterminable or produce coefficients that are inefficient.

Econometric literature provides several ways of dealing with DLM challenges and its accompanying extended lags. The majority of these remedial methodologies impose *a priori* structure on the form of the lag expected. Koyck's (1954) geometric transformation has been hailed for its ingenious way of dealing with infinite lags and for cases in which the appropriate lag length is unknown (Erdal *et al.,* 2009). However, current reviews indicate that the Koyck transformation is devoid of theoretical foundation; and it is therefore, *ad hoc* and has a very restrictive assumption of geometrically declining coefficients (Nowak-Lehmann *et al.,* 2011).

Alternatively, Almon (1965) suggested application of the 'Weierstrass' mathematical theorem in a polynomial distributed lag (PDL) as an alternative approach to the DLM's multicollinearity problem. Polynomial distributed lag is one of the structured finite distributed lag methods; it imposes a polynomial distribution to the coefficients but the maximum lag length must be set *a priori*. According to Almon (1965), the 'interpolation distribution' assumes that coefficients of each variable, that is, $\boldsymbol{\beta}$ in equation (17), can be estimated from polynomials with a lag length (h). For instance, the polynomial expansion of coefficients for FDI-to-capital ratio and its lags can be written as:

$$\beta_{1h} = \emptyset_0 h^0 + \emptyset_1 h^1 + \cdots + \emptyset_r h^r \qquad (43)$$

Where β_1 is the coefficient of FDI-to-capital ratio (recall from equation (15)), h is the chosen maximum lag length such that $h = 0,1, \ldots, r$ and r is the degree of the polynomial, hence, β_{10} is the coefficient of the current value of FDI-to-capital ratio and β_{11} is the coefficient of FDI-to-capital ratio lagged by one period. In this case, the FDI-to-capital ratio with its lags can be written as:

$$\sum_{h=0}^{q} \beta_{1h} \left(\frac{fdi}{K}\right)_{it-h} = \sum_{h=0}^{q} (\emptyset_0 h^0 + \emptyset_1 h^1 + \cdots + \emptyset_r h^r) \left(\frac{fdi}{K}\right)_{it-h} \qquad (44)$$

Here, q is the longest or maximum lag length to be used in the model. Alternatively:

$$\sum_{h=0}^{r} \beta_{1h}\left(\frac{fdi}{K}\right)_{it-h} =$$

$$\emptyset_0 \sum_{h=0}^{q}\left(\frac{fdi}{K}\right)_{it-h} + \emptyset_1 \sum_{h=0}^{q} h^1\left(\frac{fdi}{K}\right)_{it-h} + \ldots +$$

$$\emptyset_r \sum_{h=0}^{q} h^r\left(\frac{fdi}{K}\right)_{it-h} \qquad (44')$$

And if we define $F_{0it} = \sum_{h=0}^{q}\left(\frac{fdi}{K}\right)_{it-h}$; $F_{1it} = \sum_{h=0}^{q} h^1\left(\frac{fdi}{K}\right)_{it-h}$ then in the same way $F_{hit} = \sum_{h=0}^{q} h^r\left(\frac{fdi}{K}\right)_{it-h}$ and equation (44) becomes:

$$\sum_{h=0}^{q} \beta_{1h}\left(\frac{fdi}{K}\right)_{it-h} = \emptyset_0 F_{0it} + \emptyset_1 F_{1it} + \cdots + \emptyset_r F_{rit} \qquad (45)$$

If the same transformation is applied to the whole of equation (42), then new variables can be formed (e.g. F_{0it}, F_{1it}, ..., and F_{rit}). In addition, instead of estimating β's in equation (42) we estimated $\emptyset$'s from which β's can then be computed together with their variance, standard errors and confidence limits. In compact form, we can write the new model for estimation as:

$$y_{it} = \alpha + \boldsymbol{w}'_{\boldsymbol{it}}\emptyset + \in_{it} \qquad i = 1, \ldots, N; \;\; t = 1, \ldots, T \qquad (46)$$

Where $\boldsymbol{w}$ is a $k \times 1$ vector of the constructed variables and $\emptyset$ is the vector of their coefficients while α and $\in_{it}$ are scalars of the intercept and disturbance term respectively. Davidson and MacKinnon (1991) advise that before applying the PDL, the maximum lag length (q) could be determined by starting with the highest length possible and reducing it systematically according to the model fit; that is, the one with the highest R-squared or minimum information criteria. Moreover, the degree of the polynomial can be chosen by examining the level of significance of additionally constructed variables.

Accordingly, the degree should be increased sequentially from two onward (Asteriou and Hall, 2011; Gujarati, 2003). Nevertheless, to estimate equation (42), we need to make assumptions about the structure of the error term covariance matrix and the way α and $\boldsymbol{\beta}$ varies with respect to i and t. In the words of panel data analysis, these assumptions

determine whether the model in (42) above would be a pooled, fixed-effect or random-effect model.

The Pooled Feasible Generalized Least Square Method

The new model formed in equation (46) is a simple static model, likely to meet all assumptions of classical linear regression (CLRM), and most importantly, free from multicollinearity problem. We can assume that all explanatory variables are exogenous or at least weakly exogenous and uncorrelated with the error term. If so, then model (46) can be consistently estimated using pooled ordinary least square (OLS) regression. A pooled model also called a 'constant-coefficient model' is a restrictive model where the coefficients and intercept are assumed to be constant across time and countries, and therefore, the OLS estimator is sufficient for estimating the pooled model. Generally speaking, a pooled OLS estimator is where data is stacked over individuals (i) and across time (t) into one long regression panel with NT observations, estimated using OLS.

Cameroon and Trivedi (2005) advise that before pooling data, one should perform a test for poolability, which by its formation, tests a null hypothesis stating that heterogeneity effects are insignificant. All the same, it is unlikely, especially in financial economics where many variables have significant effects on market equilibrium, to find that all regressors are uncorrelated with the error term. Cameroon and Trivedi (2005) argue that almost certainly, the errors in most models are not independent and identically distributed (IID). In addition, they argue that the OLS variance matrix is most likely inappropriate since errors are correlated over t. In such eventuality, Cameroon and Trivedi (2005) suggest that the standard errors (SE) will be greatly biased downwards and should not be reported, instead, a panel-corrected SE should be used.

In the setting out of equation (15), serial correlation and heteroscedasticity cannot be ruled out because (1) several unobserved variables were omitted (Baltagi, 2005), (2) the research set-up was in countries whose markets are characterized with inefficiencies and liquidity constraints which are associated with serial correlation (Wang, 2009); and (3) poor data collection and correction methods are known to induce serial correlation in

time series (Cameroon and Trivedi, 2005). In such circumstances, Cameroon and Trivedi (2005) advise that a pooled feasible generalized least square (GLS) will be consistent and fully efficient as long as the structure of the composite error term is correctly specified. Therefore, the pooled feasible GLS can as well be used to estimate model (15).

We specify a pooled model by first recalling from equation (15) where the composite error term $\in_{it}$ in the pooled model is potentially serially correlated and/or heteroscedastic because of the omission of some of the explanatory variables, among other causes. As such, valid statistical inferences require an estimator that controls for these factors. Also recall that after the PDL transformation we formed equation (46) above. Now, if we stack observations over time and over individuals, we can form a pooled model. This model can be written as:

$$\boldsymbol{y} = \boldsymbol{\alpha\iota_{NT}} + \boldsymbol{x\beta} + \in = \boldsymbol{z\delta} + \boldsymbol{u} \qquad (47)$$

If K denotes the total number of explanatory variables, and N the total number of countries while T the sum of all observations, then $\boldsymbol{y}$ is a $NT \times 1$ matrix of the dependent variable, $\boldsymbol{x}$ is an $NT \times K$ matrix of all explanatory variables, $\in$ is a $NT \times 1$ matrix of disturbances. Moreover, $\boldsymbol{\alpha}$ is a scalar and $\boldsymbol{\beta}$ is $K \times 1$ matrix of slope coefficients, whereas $\boldsymbol{\iota_{NT}}$ is a vector of ones of dimension NT. To simplify further, we put all of the parameters together and all the regressors together such that $\boldsymbol{z} = [\boldsymbol{\iota_{NT}}, \boldsymbol{x}]$ and is $NT \times (K+1)$, $\boldsymbol{\delta} = [\boldsymbol{\alpha}, \boldsymbol{\beta}]$ is $(K+1) \times 1$ parameter vector.

Since u_{it} and u_{is} are seemingly correlated, the unconditional covariance matrix of the error terms, denoted as $\boldsymbol{\Omega}$ and defined as $\boldsymbol{\Omega} = \boldsymbol{E}(\boldsymbol{uu'})$ will not be diagonal since some off-diagonal elements in $\boldsymbol{\Omega}$ will be non-zero. Although $\boldsymbol{\Omega}$ will still be a positive definite matrix, it will be non-singular because $\boldsymbol{\Omega} \neq \boldsymbol{\sigma I}_{NT}$ instead $\boldsymbol{\Omega} = \boldsymbol{\sigma C}$ where $\boldsymbol{C}$ is a $NT \times NT$ positive definite matrix. A generalized least square (GLS) estimator of $\boldsymbol{\delta}$ can be obtained by simply transforming equation (47) to remove the correlation and then applying OLS to the transformed equation. However, in our case, and as is common in practice, the covariance matrix $\boldsymbol{\Omega}$ is unknown, and therefore, $\boldsymbol{C}$ is equally unknown. For this reasons, a feasible GLS (FGLS) estimation proceeds in the following way.

We replace the unknown matrix $\boldsymbol{\Omega}$ with its consistent estimator such that $\text{plim}_{N\to\infty}\,\hat{\boldsymbol{\Omega}} = \boldsymbol{\Omega}$ and the dimension of $\hat{\boldsymbol{\Omega}}$ does not depend on sample size. We do this in the usual way by obtaining OLS estimate of $\boldsymbol{\delta}$ (which we denote $\hat{\hat{\boldsymbol{\delta}}}$ to avoid confusing it with the FGLS estimate). Then using $\hat{\hat{\boldsymbol{\delta}}}$ we obtain an estimate of the error term $\hat{\hat{\boldsymbol{u}}}$ from which we estimate $\hat{\boldsymbol{\Omega}}$ as $\hat{\boldsymbol{\Omega}} = \hat{\hat{\boldsymbol{u}}}\,\hat{\hat{\boldsymbol{u}}}'$ where $\hat{\hat{\boldsymbol{u}}} = \boldsymbol{y} - \boldsymbol{z}\hat{\hat{\boldsymbol{\delta}}}$. Woodridge (2002) demonstrates that this estimate is consistent when under an assumptions that $\boldsymbol{z}$ consists of only random variables, and that $\boldsymbol{\Omega}$ is a positive definite but non-singular matrix and the mean of the error terms conditional to the $\boldsymbol{z}$ is zero.

Then we transform equation (47) to conform to the conditions of the Gaussian-Markov theorem by using a $NT \times NT$ triangular matrix $\boldsymbol{\Psi}$ that satisfies the equation:

$$\hat{\boldsymbol{\Omega}}^{-1} = \boldsymbol{\Psi}\boldsymbol{\Psi}' \tag{48}$$

Where $\boldsymbol{\Psi}'$ is the transpose matrix of $\boldsymbol{\Psi}$, such that:

$$\boldsymbol{\Psi}'\mathbf{y} = \boldsymbol{\Psi}'\mathbf{z}\boldsymbol{\delta} + \boldsymbol{\Psi}'\mathbf{u} \tag{49}$$

In this case, the pooled feasible GLS estimator of δ is found as:

$$\hat{\boldsymbol{\delta}} = (\boldsymbol{z}'\boldsymbol{\Psi}\boldsymbol{\Psi}'\mathbf{z})^{-1}(\mathbf{z}'\boldsymbol{\Psi}\boldsymbol{\Psi}'\mathbf{y}) = \left(\mathbf{z}'\hat{\boldsymbol{\Omega}}^{-1}\mathbf{z}\right)^{-1}\left(\mathbf{z}'\hat{\boldsymbol{\Omega}}^{-1}\mathbf{y}\right) \tag{50}$$

Woodridge (2002) and Davidson and MacKinnon (1991) caution that feasible GLS estimates, although consistent and asymptotically equivalent to GLS estimates have poor finite sample properties. However, in pooled data regression, Cameroon and Trivedi (2005) indicate that the estimates will still be consistent despite sample size limitations since $\hat{\boldsymbol{\Omega}}$ is always assumed to be consistent for $\boldsymbol{\Omega}$ in the pooled feasible GLS.

One-Way Error Component Model

Since most African countries in our sample[28] have unique political environments, economic conditions, cultural backgrounds, historical experiences, resources and attitudes towards real estate investment, the effects of such variables are likely to vary from country to country. In panel analysis, such variables are called 'unobserved individual-specific effects' or 'unobserved heterogeneity'. In the presence of the unobserved effects, the model in (42) can also be rewritten as:

$$y_{it} = \boldsymbol{x}_{\boldsymbol{it}}'\boldsymbol{\beta} + \mu_i + \varepsilon_{it} \qquad i = 1, \dots, N; \;\; t = 1, \dots, T \qquad (51)$$

with

$$\in_{it} = \mu_i + \varepsilon_{it}$$

Where μ_i denotes the time invariant individual-specific effects that accounts for unobserved heterogeneity, whereas ε_{it} represents all other variables affecting y_{it} that varies between countries and over time. At this point we can use some sets of assumptions to specify either a fixed effect model or a random effect model.

In a *fixed effect* (FE) *model*, we assume that μ_i and ε_{it} have asymptotic characteristics, such that $Cov(\mu_i, \boldsymbol{x}_{\boldsymbol{it}}) \neq 0, Cov(\varepsilon_{it}, \boldsymbol{x}_{\boldsymbol{it}}) = 0, \; Cov(\mu_i, \mu_j) = 0$ for i ≠ j, $var(\varepsilon_{it}) = \sigma_\varepsilon^2$. If that is the case, then ε_{it} is a pure white noise and uncorrelated with each other or any other explanatory variable while μ_i is correlated with the explanatory variables. Alternatively, we can specify a *random effect* (RE) *model*, whose only difference with the FE model is the assumption that the unobserved heterogeneity (μ_i) is not related to any regressor, thus $Cov(\mu_i, \boldsymbol{x}_{\boldsymbol{it}}) = 0, E(\mu_i) = 0, \; Cov(\mu_i, \boldsymbol{\varepsilon}_{\boldsymbol{it}}) = 0,$ for $i \neq j, var(\varepsilon_{it}) = \sigma_\varepsilon^2, var(\mu_i) = \sigma_\mu^2, \; E(\varepsilon_{it}) = 0$. And so, μ_i is a pure stochastic disturbance, uncorrelated with each other, and uncorrelated with the explanatory variables for all i and t.

[28] Our sample consists of five African countries from three major regions. In the Southern Africa, we included Botswana, Namibia and South Africa while Kenya represents the East African region and Morocco stands in for the Northern Africa.

The assumptions of a RE model may seem as unrealistic in an economic or financial analysis (Cameroon and Trivedi, 2005) because, in reality, unobserved variables for any economic model are many. However, it is also important to understand the simplicity of the FE model's assumptions makes it attractive to only those who wish to establish causation under weak assumptions (Cameroon and Trivedi, 2005). Another weakness is that a FE model is a conditional analysis where prediction or utility of the estimates only applies to the sample used, whereas RE model, as a marginal analysis, is a population-averaged analysis (Matyas and Sevestre, 2008). Nevertheless, for an informed choice between a fixed and random effect models, we use an empirical test called the Hausman test of specification.

Either way, if the FE model is the appropriate model, and in the absence of heteroscedasticity and serial correlation in the error term, the within estimator, also called the fixed-effect estimator, can be exploited to produce consistent coefficients. However, as explained above under pooled OLS, heteroscedasticity and serial correlation cannot be ruled out entirely, and thus, we use the generalized method of moments that utilizes weights which correct for the twin problems of heteroscedasticity and serial correlation.

The Generalized Method of Moments

The moment based estimators; in particular, the general moment method (GMM), derive model parameters by equating sample moment conditions to unobserved population moments with similar statistical population distribution. Where functional form or residual distribution cannot be explicitly expressed, GMM has proven to be a powerful tool to navigate towards consistent and unbiased parameter estimates (Wang, 2009). In this study, and based on previous studies on investment behaviours, a possibility of serial correlation and heteroscedasticity cannot be ruled out. In the event that serial correlation and heteroscedasticity are present and persistent, traditional estimators that rely heavily on orthogonality and spherical principles will not only be inconsistent and inefficient but also biased. However, with panel GMM, efficient, consistent and unbiased estimates are possible because GMM can utilise different classes of weighting matrices and

heteroscedasticity and autocorrelation consistent (HAC) estimators to run the models (Cameroon and Trivedi, 2005).

GMM is a moment-based estimator. A moment is defined as a continuous function of a random variable (i.e. $g(.)$) (Johnson and Dinardo, 1984). The method of moments (MM) proceeds from this premise by making a basic assumption that population moments or a function of the population moments can be estimated by corresponding sample moments or function of moments. To put this differently, GMM is based on the orthogonality principle conditions, such that for a given model of certain parameters and variables with zero expectation of the true parameters, an estimation of the true parameters can be done using orthogonality conditions of a given sample. Considering equation (42), in the matrix form, it is written as:

$$\boldsymbol{y_i} = \boldsymbol{X_i\beta} + \in_{\boldsymbol{i}} \tag{52}$$

The orthogonality conditions can be stated as $\boldsymbol{E}(g(\boldsymbol{y_i}, \boldsymbol{X_i}, \boldsymbol{\beta}) = \mathbf{0}$ where $g(.)$ is a continuous function of the data $(\boldsymbol{y_i}, \boldsymbol{X_i})$ and the parameters $\boldsymbol{\beta}$. This is same as the usual orthogonality condition in OLS that is commonly stated as $\boldsymbol{E}(\boldsymbol{X_i'}, \in_{\boldsymbol{i}}) = \mathbf{0}$, where $\in_{\boldsymbol{i}} = \boldsymbol{y_i} - \boldsymbol{X_i\beta}$. Suppose there exists $T \times J$ matrix of instruments $\mathbf{Z_i}$, where $J \geq k$, and k is the number of regressors that fulfil the J moment conditions of $\boldsymbol{E}(\boldsymbol{Z_i'}, \in_{\boldsymbol{i}}) = \mathbf{0}$, then the GMM estimator proceeds by estimating $\widehat{\boldsymbol{\beta}}$ that minimizes the weighted quadratic moment conditions with respect to $\widehat{\boldsymbol{\beta}}$ (note that $\widehat{\boldsymbol{\beta}}$ would be the one that sets the sample moments to zero i.e. $(\boldsymbol{Z_i'}, \in_{\boldsymbol{i}}) = \mathbf{0}$)). Symbolically, we can state that:

$$\mathrm{Q}_N(\boldsymbol{\beta}) = \mathbf{g}'.\mathbf{W_N}.\mathbf{g} = \left[\sum_{i=1}^{N} \boldsymbol{Z_i'} \in_{\boldsymbol{i}}\right]' \mathbf{W_N} \left[\sum_{i=1}^{N} \boldsymbol{Z_i'} \in_{\boldsymbol{i}}\right] \tag{53}$$

Where, N is the number of countries in the sample and $\mathbf{W_N}$ is the weighting matrix. Algebraic manipulation of equation (53) gives:

$$\widehat{\boldsymbol{\beta}} = arg\,min\, Q_N(\boldsymbol{\beta}) \tag{54}$$

This yields:

$$\widehat{\boldsymbol{\beta}} = \left[\left(\sum_{i=1}^{N} \boldsymbol{X}_i' \boldsymbol{Z}_i\right) \boldsymbol{W}_N \left(\sum_{i=1}^{N} \boldsymbol{Z}_i' \boldsymbol{X}_i\right)\right]^{-1} \left[\left(\sum_{i=1}^{N} \boldsymbol{X}_i{}' \boldsymbol{Z}_i\right) \boldsymbol{W}_N \left(\sum_{i=1}^{N} \boldsymbol{Z}_i' \boldsymbol{y}_i\right)\right] \quad (55)$$

Where $arg\,min$ implies global minimization operation. In equation (55) above, we have assumed that $\boldsymbol{W}_N$ is the most popular weight that is consistent and most efficient asymptotically. When optimally chosen, the minimized value of equation (55) will be asymptotically distributed as chi-square with degrees of freedom equivalent to $J - k$. When the model is just identified, that is, $J = k$, then $\boldsymbol{Z}_i = \boldsymbol{X}_i$ hence, equation (55) collapses into the ordinary pooled OLS. Otherwise, in over identified models where $J \geq k$, panel GMM can still produce even more efficient estimates (Cameroon and Trivedi, 2005).

A fact that sets GMM apart is that a under certain identifiability and regularity conditions of the model, whatever the choice of the sequence of the weight matrices, provided that it converges (that is when there is no significant change in the estimates derived from one iteration to another), the GMM estimator $\widehat{\boldsymbol{\beta}}$ will converge in probability with the true population parameters $\boldsymbol{\beta}$ and the GMM estimator will be asymptotically normally distributed. Moreover, serial correlation, cross-correlation and heteroscedasticity are taken into account by forming a White-type robust weight matrix and panel-robust standard errors (Cameroon and Trivedi, 2005; Wang, 2009).

Generally speaking, panel GMM is either implemented as a two-step efficient GMM or an iterated efficient GMM. Two-step efficient GMM starts with an arbitrary positive definite and symmetric matrix as the weight matrix, then after global minimization, a new weight matrix is calculated by taking into consideration all data over different individuals and time. On the other hand, the iterated efficient GMM repeats the above two steps over and over until convergence is obtained. That explains why iterated efficient GMM is often preferred and this is why it was chosen for this study to estimate the FE and RE models.

Only a slight adjustment is needed to estimate a FE or RE model, noting that either way, the individual-specific effects (μ_i) is a random variable but independent of $\boldsymbol{x}_{it}$ in a RE model but correlated with $\boldsymbol{x}_{it}$ in a FE model. If instruments $\boldsymbol{Z}_i$ exist that satisfies

$\boldsymbol{E(Z_i', \in_i) = 0}$ or simply $\boldsymbol{E\left(Z_i', (\mu_i + \varepsilon_{it})\right) = 0}$, then the above procedure will enable consistent estimation of all regression parameters. Otherwise, if instruments $\boldsymbol{Z_i}$ exists that satisfy $\boldsymbol{E(Z_i', \varepsilon_{it}) = 0}$ only, then only a FE model can be consistently estimated and often after necessary model transformation to eliminate the individual-specific effects.

The Hausman Specification Test

As clearly put above, choice of the most appropriate model is important because the consistency of the coefficients' estimates i.e.$\widehat{\boldsymbol{\beta}}$, depend on whether a fixed effect estimator or random effect estimator is used. The Hausman Test is an asymptotic chi-square based test that focuses on the squared difference between a consistent estimator, often in the alternative hypothesis, and an efficient estimator under the null hypothesis (Holly, 1982). According to Hausman (1978), in terms of stochastic model specification, the two most important conditions are the assumption of orthogonality (i.e. that $E(\varepsilon_{it}) = 0$ and so the error term is IID) and the assumption of spherical variance (i.e. that $var(\varepsilon_{it}) = \sigma_{\varepsilon}^2$), The collapse of these two conditions leads to bias and loss of efficiency, respectively. Hausman acknowledges that in estimation techniques, much attention should be given to detection of the failure of the orthogonality assumption rather than the failure of the spherical assumption. He developed a test that compares estimates of a consistent estimator to those of an efficient estimator.

In the choice between FE and RE model, RE model is assumed to be fully efficient hence the true model with $\mu_i \sim IID\left[0, \sigma_{\mu_i}^2\right]$ and uncorrelated with the explanatory variables and $\varepsilon_{it} \sim IID\left[0, \sigma_{\varepsilon_{it}}^2\right]$ whereas FE model is the consistent model analysis (Cameroon and Trivedi, 2005). As a result, the test statistics are computed as:

$$H = (\widetilde{\boldsymbol{\beta}}_{RE} - \widehat{\boldsymbol{\beta}}_{FE})' \left[\widehat{\boldsymbol{\sigma}}^{\boldsymbol{2}}_{\widetilde{\boldsymbol{\beta}}_{FE}} - \widehat{\boldsymbol{\sigma}}^{\boldsymbol{2}}_{\widetilde{\boldsymbol{\beta}}_{RE}}\right]^{-1} (\widetilde{\boldsymbol{\beta}}_{RE} - \widehat{\boldsymbol{\beta}}_{FE}) \quad (56)$$

Where $\widehat{\boldsymbol{\beta}}_{RE}$ is a vector of coefficients under the RE model while $\widehat{\boldsymbol{\beta}}_{FE}$ is a vector of the coefficients under FE model and $\widehat{\boldsymbol{\sigma}}^{\boldsymbol{2}}_{\widetilde{\boldsymbol{\beta}}_{RE}}$ as well as $\widehat{\boldsymbol{\sigma}}^{\boldsymbol{2}}_{\widetilde{\boldsymbol{\beta}}_{FE}}$ are their respective variances. The superscript sign of -1 implies the Moore-Penrose pseudo inverse.

The test statistic is asymptotically chi-square. The null hypothesis states that the unobserved individual-specific effects are uncorrelated with regressors. Therefore, a large value will indicate that fixed effects prevail while a small value suggests the presence of random effects. However, in the presence of heteroscedasticity, the RE estimates will not be fully efficient since μ_i and ε_{it} will not be IID. Given such circumstances, the term $\left[\widehat{\boldsymbol{\sigma}}^{\mathbf{2}}_{\widehat{\boldsymbol{\beta}}_{FE}} - \widehat{\boldsymbol{\sigma}}^{\mathbf{2}}_{\widetilde{\boldsymbol{\beta}}_{RE}}\right]$ in equation (51) above, will be replaced with a more general term $\left[\widehat{\boldsymbol{\sigma}}^{\mathbf{2}}_{(\widehat{\boldsymbol{\beta}}_{FE}-\widetilde{\boldsymbol{\beta}}_{RE})}\right]$ in the computation of the test statistic.

Test for Stationarity

Asteriou and Hall (2011) and Koops (2006) caution that reasonable inferences from a macroeconomic time series data analysis are attainable only when such series is stationary, otherwise, the regression is spurious. As mentioned above, only the stationary form of variables is included in the estimation methods discussed above.

Two conditions are necessary for a stochastic process to be stationary. First, its mean and variance should be constant over time, and secondly, covariance between its values in two time periods should depends on the lag length only and not on the actual time of covariance determination (Gujarati, 2003). As such, most financial time-series are non-stationary, they have a varying underlying growth rate and their mean and/or variance are continually rising. These make generalization of results based on a study of a single time span unrealistic.

To test for the unit root in panel data, Levin *et al.,* (2002) modified the Dickey-Fuller (DF) and the augmented Dickey-Fuller (ADF) tests by Dickey and Fuller (1979). Their model is based on the assumption of cross-sectional independence, which means that it allows for fixed effects, individual deterministic trends and serially correlated errors. According to Levin *et al.,* individual time-series tests in small samples have limited power against the alternative hypothesis. For this reason, one can do a more powerful panel unit root test by following their procedure. The null hypothesis of their test states that each individual series has a unit root; therefore:

$$\Delta Y_{it} = \rho Y_{it-1} + \sum_{L=1}^{pi} \theta_{iL} \Delta Y_{it-L} + \alpha_{mi} d_{mt} + \varepsilon_{it} \quad (57)$$

Where d_{mt} is the vector of deterministic variables and α_{mi} is the corresponding vector of coefficients for model $m = 1,2,3$ while pi is the lag length. Since pi is unknown, they suggest a three-step procedure. In the first step, a separate ADF regression is performed for each individual in the panel (in this case, for each country) to generate two orthogonalized residuals. One should choose an appropriate lag length (pi) using t-statistics of $\hat{\theta}_{iL}$ then use it is used to generate orthogonalized residuals. To generate residuals, the following two equations should be estimated:

$$\Delta Y_{it} = \sum_{L=1}^{pi} \pi_{iL} \Delta Y_{it-L} + \omega_{mi} d_{mt} + e_{it} \quad \text{to get residuals } \hat{e}_{it} \quad (58)$$

$$Y_{it-1} = \sum_{L=1}^{pi} \gamma_{iL} \Delta Y_{it-L} + \varphi_{mi} d_{mt} + v_{it-1} \quad \text{to get residuals } \hat{v}_{it-1} \quad (59)$$

The residuals are then normalized to control for heterogeneity by computing $\tilde{e}_{it} = \hat{e}_{it}/\hat{\sigma}_{\varepsilon i}$ and $\tilde{v}_{it-1} = \hat{v}_{it-1}/\hat{\sigma}_{\varepsilon i}$ where, $\hat{\sigma}_{\varepsilon i}$ is the standard error from the ADF, for each $i = 1, .., N$.

In the second step, we obtain the long-run and short-run standard deviations (SD) then compute the ratio of long-run to short-run standard deviations under the null hypothesis of a unit root.

In the third step, the test statistics are computed by running a pooled regression:

$$\tilde{e}_{it} = \rho \tilde{v}_{it-1} + \tilde{\epsilon}_{it} \quad (60)$$

Here, the null hypothesis is $H_0: \rho = 0$ which is then tested using conventional t-test statistics. Interestingly, one can elect to include extra exogenous variables, individual-specific fixed effect constants, trends or common constants. Although Levin *et al.*, (2002) suggest that this test is more appropriate than the standard panel unit root test for moderate sample sizes of $10 < N < 250$ and $25 < T < 250$, Baltagi (2005) and Asteriou and Hall (2011) find the cross-sectional independence to be limiting.

In response, Im *et al.,* (2003) proposed a test that addresses the restriction of a common ρ for all individuals and allows for a heterogeneous coefficient of Y_{it-1}. In the presence of serial correlation, they proposed averaging the individual ADF tests computed in equation (57) under the Levin *et al.,* test guidance but the null hypothesis should states that each series contains a unit root (H_0: $\rho = 0$) against an alternative that some (but not all) individual series have unit root. Both the Levin *et al.,* and Im *et al.,* tests are used in testing panel unit root for this study and only stationary series are included in the panel analysis

APPENDIX II: A BRIEF EXPLANATION OF THE INSTRUMENTAL VARIABLE GMM ESTIMATOR

Formally speaking, a variable z is called an instrument or instrumental variable for a regressor x in a scalar estimation equation, $y = \beta x + u$ only when z satisfies two conditions: z is uncorrelated with the error u and z is correlated with the regressor x (Cameroon and Trivedi, 2005). In finite samples, Cameroon and Trivedi (2005) emphasized that z must be strongly, rather than weakly correlated with the regressor x for a consistent estimation. To them, an instrument is invalid if it fails to hold the first condition and irrelevant if it fails the second condition.

Nevertheless, if one decides to use instruments to eliminate endogeneity, it is imperative that the 'rules of order' conditions are strictly adhered to besides ensuring that the instruments are valid. The 'rules of order' condition demands that the number of instruments J must be at least equal the number of independent endogenous variables r. Usually, when $J = K$, the model is said to be just-identified, when $J < K$, the model is under-identified and when $J > K$ the model is over-identified. Therefore, 'rules of order' conditions require the model to be either just-identified or over-identified. A simple notation for a multivariate linear regression model such as in equation (40) above, can be written as:

$$y = \boldsymbol{x}'\boldsymbol{\beta} + u \qquad (61)$$

Where $\boldsymbol{x}$ and $\boldsymbol{\beta}$ are $K \times 1$ vectors matrices of regressors and coefficients, respectively.

Suppose there exists a $J \times 1$ vector of instruments $\boldsymbol{z}$ such that $\boldsymbol{z}$ is (1) uncorrelated to u (2) correlated with covariate matrix $\boldsymbol{x}$ and (3) strongly and not weakly correlated with covariate matrix $\boldsymbol{x}$, then $\boldsymbol{x}$ and $\boldsymbol{z}$ may as well share some components. Since exogenous regressors in $\boldsymbol{x}$ meet the above conditions, they may as well be valid instruments of themselves. In our case, control variables will easily be components in both vectors $\boldsymbol{x}$ and $\boldsymbol{z}$. We can then partition $\boldsymbol{x}$ into $\boldsymbol{x} = [\boldsymbol{x}_1' \; \boldsymbol{x}_2']$, where $\boldsymbol{x}_1$ consists only of endogenous variables and $\boldsymbol{x}_2$ has exogenous variables only. In such a case, a valid instrument vector $\boldsymbol{z}$

could be partitioned into $\boldsymbol{z} = [\boldsymbol{z}_1' \; \boldsymbol{x}_2']$ hence $\boldsymbol{z_1}$ should have at least as many instruments as endogenous variables therein.

To estimate model (40) under the GMM estimation using valid instruments, there must be J moment conditions that are satisfied by K parameters in the K-dimension matrix $\boldsymbol{\beta}$. Specifically, the orthogonality moment conditions, from the above equation (40) can be written as:

$$E[\boldsymbol{z_i}(y - \boldsymbol{x}'\boldsymbol{\beta})] = 0 \tag{62}$$

In compact matrix form, we can write equation (63) as $\boldsymbol{y} = \boldsymbol{X\beta} + \boldsymbol{u}$ and $y - \boldsymbol{x}'\boldsymbol{\beta}$ is equal to the error term $\boldsymbol{u}$. If $\boldsymbol{Z}$ is the $N \times J$ instrument matrix, then it still holds that the ith row will be $\boldsymbol{z_1}$ vector of instruments; and therefore, $\sum_i [\boldsymbol{z_i}(y_i - \boldsymbol{x}'_i\boldsymbol{\beta})] = \boldsymbol{Z}'\boldsymbol{u}$ and the GMM estimates of $\boldsymbol{\beta}$ are obtained by minimizing the GMM objective function as:

$$Q_N(\boldsymbol{\beta}) = \left[\frac{1}{N}(\boldsymbol{y} - \boldsymbol{X\beta})'\boldsymbol{Z}\right] \boldsymbol{W}_T \left[\frac{1}{N}\boldsymbol{Z}'(\boldsymbol{y} - \boldsymbol{X\beta})\right] \tag{63}$$

Where $\boldsymbol{W}_T$ is possibly a stochastic (random), symmetric, positive-definite $J \times J$ square matrix termed the weighting matrix because it gives different weights to various moment conditions. Normally, the weighting matrix is the inverse of the long-run covariance matrix; therefore, the first-order conditions of the objective function can be rearranged to give the solution for the GMM estimator in the linear instrumental variable (IV) model (Doris *et al.*, 2011; Windmeijer, 2005).

$$\widehat{\boldsymbol{\beta}}_{GMM} = [\boldsymbol{X}'\boldsymbol{Z}\boldsymbol{W}_T\boldsymbol{Z}'\boldsymbol{X}]^{-1}\boldsymbol{X}'\boldsymbol{Z}\boldsymbol{W}_N\boldsymbol{Z}'\boldsymbol{y} \tag{64}$$

In the just-identified set-up, when $J = K$, $\boldsymbol{X}'\boldsymbol{Z}$ above forms an invertible square matrix, hence, the first portion of equation (64) can be decomposed such that $[\boldsymbol{X}'\boldsymbol{Z}\boldsymbol{W}_T\boldsymbol{Z}'\boldsymbol{X}]^{-1} = (\boldsymbol{Z}'\boldsymbol{X})^{-1}\boldsymbol{W}_T{}^{-1}(\boldsymbol{X}'\boldsymbol{Z})^{-1}$ and hence the GMM IV estimator in equation (64) collapses to:

$$\widehat{\boldsymbol{\beta}}_{IV} = (\boldsymbol{Z}'\boldsymbol{X})^{-1}\boldsymbol{Z}'\boldsymbol{y} \tag{65}$$

Equation (65) is the usual IV estimator, which indicates that irrespective of the choice of the weighting weight $\boldsymbol{W}_T$, when the model is just identified, the GMM estimator is equals

to the ordinary IV estimator (GMM is often regarded as a generalized estimation method and other estimators are simply special cases of the GMM estimation for this reason). By simply dropping some of the instruments to ensure that the resultant model is just identified, Cameroon and Trivedi (2005) demonstrated how a simple IV estimator could also be used in over-identified models. Nonetheless, this approach leads to a loss of efficiency, which GMM is specially meant to achieve.

However, in practice, when the model is over-identified and endogenous bias exists, optimal-weighted GMM (also called a two-step GMM estimator) and two-stage least-squares (2SLS) (also called one-step GMM estimators) estimators are used, although the former is most efficient (Cameroon and Trivedi, 2005). Therefore, for an over-identified model, the optimal GMM estimator is represented as:

$$\widehat{\boldsymbol{\beta}}_{OGMM} = [(\boldsymbol{X}'\boldsymbol{Z})\boldsymbol{W}_T(\boldsymbol{Z}'\boldsymbol{X})]^{-1}(\boldsymbol{X}'\boldsymbol{Z})\boldsymbol{W}_T(\boldsymbol{Z}'\boldsymbol{y}) \qquad (64')$$

The major difference, however, between 2SLS and optimal GMM estimator is the choice of the weighting matrix. In this regard, the optimal GMM is also called two-step GMM because the initial step involves a choice of sub-optimal weighting matrix after which a second operation is undertaken, based on the first-step's estimate of $\widehat{\boldsymbol{\beta}}$, and using more information from the sample, to obtain an optimal weighting matrix. Actually, the weighting matrix can be updated for specified number of times (usually two times), until convergence is achieved (iterate to converge) or continuously. The alternative is the 2SLS estimator, also called the generalized instrumental variable (GIV) estimator whereby the coefficient matrix $\widehat{\boldsymbol{\beta}}_{2SLS}$ is obtained in one step and no updating of the weighting matrix is needed (Cameroon and Trivedi, 2005).

Since the optimal-weighted GMM estimator is implemented in this chapter, it is important to emphasise that the choice of the weighting matrix $\boldsymbol{W}_T$ should be 'optimally' selected to address likely heteroscedasticity and autocorrelation. This necessary requirement is well demonstrated by Hansen (1982) and later by Gospodinov *et al.*, (2012), where they show that the choice of $\boldsymbol{W}_T$ affects the asymptotic distribution of the GMM sample moment conditions, hence the efficiency of the GMM. In the literature,

the heteroscedasticity and autocorrelation consistent (HAC) weighting matrix is a HAC estimator of the long-run covariance matrix based on the initial estimate of $\widehat{\boldsymbol{\beta}}$ (Andrews, 1991; Smith, 2005; Zeileis, 2004). Therefore, to estimate equation (62), we instrument endogenous variables, and employ the optimal GMM using HAC weighting matrix to address any possible heteroscedasticity and autocorrelation.

APPENDIX III: DERIVIATION OF THE STRUCTURAL MODEL

The value function can as well be written as:

$$V_t = R_t + \beta_{t+1}^t + \lambda_t\left[\left(1-\delta\right)K_{t-1} + I_t - K_t\right] + \gamma_t\left(B_t^* - B_t\right) + \phi B_t + \eta_t R_t \tag{66}$$

The first order conditions of this equation are:

$$\frac{\partial V_t}{\partial R_t} = 1 + \eta_t = 0 \tag{67.1}$$

$$\frac{\partial V_t}{\partial I_t} = \ 1 + \eta_t \ \frac{\partial R_t}{\partial I_t} + \lambda_t = 0 \tag{67.2}$$

$$\frac{\partial V_t}{\partial K_t} = \ 1 + \eta_t \ \frac{\partial R_t}{\partial K_t} + \beta_{t+1}^t \frac{\partial R_{t+1}}{\partial K_t} - \lambda_t = 0 \tag{67.3}$$

$$\frac{\partial V_t}{\partial K_{t-1}} = \lambda_t \ 1-\delta \ = 0 \tag{67.4}$$

$$\frac{\partial V_t}{\partial B_t} = \ 1 + \eta_t \ \frac{\partial R_t}{\partial B_t} - \gamma_t + \phi = 0 \tag{67.5}$$

$$\frac{\partial V_t}{\partial B_{t-1}} = \ 1 + \eta_t \ \frac{\partial R_t}{\partial B_{t-1}} = 0 \tag{67.6}$$

We can rearrange equation (67.3) to show the value of the capital accumulation constraint λ_t as:

$$\lambda_t = \ 1 + \eta_t \ \frac{\partial R_t}{\partial K_t} + \beta_{t+1}^t \frac{\partial R_{t+1}}{\partial K_t} \tag{68}$$

Then replace into equation (67.4), hence;

$$\frac{\partial V_t}{\partial K_{t-1}} = \ 1-\delta \ \ 1 + \eta_t \ \frac{\partial R_t}{\partial K_t} + \ 1-\delta \ \beta_{t+1}^t \frac{\partial R_{t+1}}{\partial K_t} \tag{69}$$

In the same way, we can insert equation 67.2 into equation (67.4) as:

$$1-\delta \ \ 1 + \eta_t \ \frac{\partial R_t}{\partial I_t} + \frac{\partial V_t}{\partial K_{t-1}} = 0 \tag{70}$$

Since equation (69) and equation (70) are equal, we can equate them to give

$$-\beta_{t+1}^t \frac{\partial R_{t+1}}{\partial K_t} = \ 1 + \eta_t \left[\frac{\partial R_t}{\partial I_t} + \frac{\partial R_t}{\partial K_t}\right] \tag{71}$$

But when we examine the optimal solutions relating the debt level in equation (67.1) and equation (67.6), $\eta_t = -1$ contradicts the inequality condition in the equation (67.5) as well as in the optimal condition of equation (67.6), since $\frac{\partial V_t}{\partial B_{t-1}}$, which represents the tax shield of debt, can never be equal to zero when the amount of debt is still outstanding. For this reason, we apply the Kuhn–Tucker theorem and state the Karush–Kuhn–Tucker (KKT) optimality condition that $\eta_t \geq 0$, hence constraint (67.5). Therefore, $\frac{\partial V_t}{\partial R_t} = 1$ and $\frac{\partial V_t}{\partial B_t} = 1 - \gamma_t + \phi = 0$ since $\frac{\partial R_t}{\partial B_t}$ =1 from first order conditions of (67.4), with respect to B_t.

Furthermore, if we take forward equation (67.4), we get:

$$\frac{\partial V_t + 1}{\partial K_t} = \lambda_{t+1}\ 1 - \delta\ = 0 \tag{72}$$

Whereas equation (67.2) becomes:

$$\frac{\partial V_{t+1}}{\partial I_{t+1}} = \ 1 + \eta_{t+1}\ \frac{\partial R_{t+1}}{\partial I_{t+1}} + \lambda_{t+1} = 0 \tag{73}$$

And replacing λ_{t+1} in equation (73) into (74) we get

$$\frac{\partial V_{t+1}}{\partial I_{t+1}} = -\ 1 - \delta\ \ 1 + \eta_{t+1}\ \frac{\partial R_{t+1}}{\partial I_{t+1}} + \lambda_{t+1} = 0 \tag{74}$$

Going back to the envelop theorem solution in equation (71), we can rewrite $\frac{\partial R_{t+1}}{\partial K_t}$ using observable values since:

$$\frac{\partial R_{t+1}}{\partial K_t} = \frac{\partial R_{t+1}}{\partial V_{t+1}} \times \frac{\partial V_{t+1}}{\partial K_t} \times \frac{\partial V_t}{\partial B_t} \times \frac{\partial B_t}{\partial R_t} \times \frac{\partial R_t}{\partial V_t} \tag{75}$$

$$\frac{\partial R_{t+1}}{\partial K_t} = -\ 1 - \delta\ \ 1 + \eta_{t+1}\ \frac{\partial R_{t+1}}{\partial I_{t+1}}\ 1 - \gamma_t - \phi \tag{76}$$

Hence the Euler equation (71) becomes:

$$1-\delta \quad 1-\gamma_t-\phi \;\; \beta_{t+1}^{t}\left[\left[\frac{\partial R}{\partial I}\right]_{t+1}\frac{1+\eta_{t+1}}{1+\eta_t}\right]=\frac{\partial R_t}{\partial I_t}+\frac{\partial R_t}{\partial K_t} \tag{77}$$

Computations for equation (73)

$$\left(\frac{\partial R}{\partial I}\right)_t+\left(\frac{\partial R}{\partial K}\right)_t=(1-\delta)\Omega_t\beta_{t+j}^{t}E_t\left[\left(\frac{\partial R}{\partial I}\right)_{t+1}\right] \tag{4'}$$

$$\left(\frac{\partial R}{\partial I}\right)_t=-b\alpha p_t\left(\frac{I}{K}\right)_t+bc\alpha p_t-p_t^I \tag{6.1}$$

$$\left(\frac{\partial R}{\partial K}\right)_t=\alpha p_t\left(\frac{Q}{K}\right)_t-\alpha p_t\left(\frac{\partial F}{\partial L}\frac{L}{K}\right)_t+b\alpha p_t\left(\frac{I}{K}\right)_t^2-bc\alpha p_t\left(\frac{I}{K}\right)_t \tag{6.2}$$

We add equation (6.1) and (6.2) together, then slot into equation(4′), that is:

$$(1-\delta)\Omega_t\beta_{t+j}^{t}E_t\left[\left(\frac{\partial R}{\partial I}\right)_{t+1}\right]=\alpha p_t\left(\frac{Q}{K}\right)_t-\alpha p_t\left(\frac{\partial F}{\partial L}\frac{L}{K}\right)_t+b\alpha p_t\left(\frac{I}{K}\right)_t^2-bc\alpha p_t\left(\frac{I}{K}\right)_t-$$
$$b\alpha p_t\left(\frac{I}{K}\right)_t+bc\alpha p_t-p_t^I \tag{78}$$

Assuming that all value are realised, we can remove expectations and divide across with the discounting factor on the left to form:

$$\left(\frac{\partial R}{\partial I}\right)_{t+1}=\frac{\alpha p_t}{(1-\delta)\Omega_t\beta_{t+j}^{t}}\left(\frac{Q}{K}\right)_t-\frac{\alpha p_t}{(1-\delta)\Omega_t\beta_{t+j}^{t}}\left(\frac{\partial F}{\partial L}\frac{L}{K}\right)_t+\frac{b\alpha p_t}{(1-\delta)\Omega_t\beta_{t+j}^{t}}\left(\frac{I}{K}\right)_t^2-\frac{b\alpha p_t(c+1)}{(1-\delta)\Omega_t\beta_{t+j}^{t}}\left(\frac{I}{K}\right)_t+$$
$$\frac{bc\alpha p_t}{(1-\delta)\Omega_t\beta_{t+j}^{t}}-\frac{p_t^I}{(1-\delta)\Omega_t\beta_{t+j}^{t}} \tag{79}$$

Then we forward solve equation (6.1) and replace in (79) above:

$$-b\alpha p_{t+1}\left(\frac{I}{K}\right)_{t+1}=\frac{\alpha p_t}{(1-\delta)\Omega_t\beta_{t+j}^{t}}\left(\frac{Q}{K}\right)_t-\frac{\alpha p_t}{(1-\delta)\Omega_t\beta_{t+j}^{t}}\left(\frac{\partial F}{\partial L}\frac{L}{K}\right)_t+\frac{b\alpha p_t}{(1-\delta)\Omega_t\beta_{t+j}^{t}}\left(\frac{I}{K}\right)_t^2-$$
$$\frac{b\alpha p_t(c+1)}{(1-\delta)\Omega_t\beta_{t+j}^{t}}\left(\frac{I}{K}\right)_t+\frac{bc\alpha p_t}{(1-\delta)\Omega_t\beta_{t+j}^{t}}-\frac{p_t^I}{(1-\delta)\Omega_t\beta_{t+j}^{t}}+p_{t+1}^I-bc\alpha p_{t+1} \tag{80}$$

Which then becomes:

$$\left(\frac{I}{K}\right)_{t+1}=-\frac{\alpha p_t}{b\alpha p_{t+1}(1-\delta)\Omega_t\beta_{t+j}^{t}}\left(\frac{Q}{K}\right)_t+\frac{\alpha p_t}{b\alpha p_{t+1}(1-\delta)\Omega_t\beta_{t+j}^{t}}\left(\frac{\partial F}{\partial L}\frac{L}{K}\right)_t-\frac{b\alpha p_t}{b\alpha p_{t+1}(1-\delta)\Omega_t\beta_{t+j}^{t}}\left(\frac{I}{K}\right)_t^2+$$
$$\frac{b\alpha p_t(c+1)}{b\alpha p_{t+1}(1-\delta)\Omega_t\beta_{t+j}^{t}}\left(\frac{I}{K}\right)_t-\frac{bc\alpha p_t}{b\alpha p_{t+1}(1-\delta)\Omega_t\beta_{t+j}^{t}}+\frac{bc\alpha p_{t+1}}{b\alpha p_{t+1}}+\frac{p_t^I}{b\alpha p_{t+1}(1-\delta)\Omega_t\beta_{t+j}^{t}}-\frac{p_{t+1}^I}{-b\alpha p_{t+1}} \tag{81}$$

Now let $\phi_{t+1}=(1-\delta)\Omega_t\beta_{t+j}^{t}\left({}^{p_{t+1}}/_{p_t}\right)$, then:

$$\left(\frac{I}{K}\right)_{t+1} = -\frac{\Phi_{t+1}}{b}\left(\frac{Q}{K}\right)_t + \frac{\Phi_{t+1}}{b}\left(\frac{\partial F}{\partial L}\frac{L}{K}\right)_t - \Phi_{t+1}\left(\frac{I}{K}\right)_t^2 + \Phi_{t+1}(c+1)\left(\frac{I}{K}\right)_t - c(1-\Phi_{t+1}) + \frac{p_t^I}{b\alpha p_{t+1}(1-\delta)\Omega_t \beta_{t+j}^t} - \frac{p_{t+1}^I}{b\alpha p_{t+1}} \quad (82)$$