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MACROECONOMIC RISKS AND REITs: A COMPARATIVE ANALYSIS

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Abstract

Purpose - The paper provides an investigation of the relationship of macroeconomic risk factors and REITs. The study considers the conditional volatilities of macroeconomic variables on the excess returns and conditional variance of excess returns in developing and developed markets and provides a comparison thereof.

Methodology approach - The study employs three-step approach estimation in the methodology (Principal Component Analysis, GARCH (1,1) and GMM) to estimate the asset pricing model. The preliminary study indicated that there are only two developing economies (Bulgaria and South Africa), as defined by National Association of Real Estate Investment Trust (NAREIT), with REIT indices. We additionally included the United States as the developed economy.

Findings – Our results indicate that the real economy and business cycles (proxied by GDP growth rate and industrial production index), price stability (proxied by the GDP deflator), exchange rates and interest rates do not explain developing country REIT returns represented by Bulgaria and South Africa, as well as in developed markets, represented by the US. However unlike the developing markets, changes in industrial production and inflation are important variables that affect the conditional variance of REIT returns in the US.

Chapter 1: Background to Study

Real Estate Investment Trusts (REITs) have progressively become recognised and accepted as a mainstream route for investors into real estate investment. REITs sanction real estate investment indirectly, through the purchase and sale of liquid securities and offer access to high value, and illiquid real estate assets. REITs have excessively become admired due to corporate tax relaxations[1] and auxiliary opportunities for global diversification in real estate (Paskelian, Hassan and Huff, 2011). According to the National Association of Real Estate Investment Trusts (NAREIT) [2], since the introduction of REITs in the United States (US), more than 30 countries have implemented the REIT regime.

Real estate has increasingly become a topic of interest in developing economies and accordingly, the interaction of its risk-return dynamics and macroeconomic factors (Liow, Ibrahim and Huang, 2006). Based on the work of Chen, Roll and Ross (1986), researchers have provided ample evidence of the influences of macroeconomic variables on asset prices, which further provided the foundation to investigate the interactions of the macro-economy and various asset classes on the stock market. Given that the listed real estate sector is supported by an underlying physical asset that is highly reliable on capital availability and cash flow patterns, macroeconomic risk factors are highly important in the development of listed real estate and the implementation of its risk management strategies.

According to Chen, Roll and Ross (1986), macroeconomic variables such as the industrial production growth, expected and unexpected inflation, interest rate and term structure are systematic sources of risk that are significantly priced and directly affect stock market returns. Similarly, Fama and French (1989) also found that macroeconomic risks are systematic risks and more importantly are affected by business cycles. Consistent with the results of Chen, Roll and Ross (1986), the more recent study of Kuwornu and Owusu-Nantwi (2011) found that macroeconomic

1 The principal of tax dispensation is that, investors are taxed as if they are direct investors to the immovable property, albeit that they collectively

2. NAREIT is a trade association that represents U.S. Real Estate Investment Trusts (REITs) and listed real estate companies. The association provides comprehensive industry data on the performance of the industries respectively. The organisation can be accessed at https://www.reit.com/nareit

variables such as inflation, exchange rate and interest rates are significantly priced in stock market returns.

These results provide evidence that macroeconomic variables are prudent risks to be considered in stock market returns. In the real estate literature, earlier research indicated that there is a relationship between macroeconomic variables and variations in real estate returns. Chan, Hendershott and Sanders (1990) investigated the impact of expected inflation, unexpected inflation, industrial production and changes in the risk and term structure of interest rates on equity REIT returns. The study found that changes in the risk and term structures and unexpected inflation drive both real estate and stock market returns. McCue and Kling (1994) found that prices, nominal rate, outputs and investment all significantly influence real estate returns. Particularly, variations in equity REITs are largely influenced by nominal interest rates.

More recent REITs studies have focused on how macroeconomic risk factors and the sensitivity of returns to these factors can vary over time. Asset pricing models suggest that the expected excess returns of securities are related to how sensitive they are to the current state of the economy. This sensitivity is expressed through the beta coefficient which represents a state variable and it is further allocated a "price", the risk premium. Thus, fluctuations in returns are attributable to changes in the beta or changes in the risk premium. (Ferson and Harvey, 1991)

Karaloyi and Sanders (1991) found that the stock market risk premium is significant in explaining the predictable variations in stock returns; the bond market risk premiums are significant in capturing the predictable variation in bond returns. However, the study found that both the stock market and bond market premiums explain a small portion of the predictable variation in REIT returns. The study further found that changes in the risk premium of the economic risk are more prevalent in the variation of returns than the changes in the beta of returns in response to the economic risks.

More recently, Liow, Ibrahim and Huang (2006) investigate the impact of the conditional volatilities of macroeconomic risks on the expected risk premia on property stocks and the conditional volatility of the risk premia. The study found that the expected risk premia and the conditional volatility of the risk premia on property stocks are time-varying and are dynamically linked to the conditional volatilities of

macroeconomic risks. The study also found that the impact of the macroeconomic risk in terms of direction and significance are different across markets, thus presenting diversification opportunities.

The relationship of macroeconomic factors and REITs have been researched extensively in the US, UK and more recently in Asian-Pacific countries; however, limited literature is available for developing economies due to the recent implementation of the REIT regime in these economies. Developing economies are largely characterised by high returns and low correlations of returns with developed economies. Subsequently they provide potential diversification opportunities and foreign investment attraction. However, developing economies are also characterised by large fluctuations in returns which casts doubt to the efficiency and accuracy of the valuation of investment opportunities in these environments.

This study follows the view point of Liow, Ibrahim and Huang (2006) that, the expected risk premium and the conditional volatility of the risk premium is linked to the conditional volatility of macroeconomic variables; however, the study is limited to REITs in lieu of property stocks. Additionally, Liow, Ibrahim and Huang (2006) highlight that the significance and direction of the relationship might be expected to vary across countries, hence presenting diversification opportunities.

The study focuses on establishing the impact of macroeconomic risk factors on the expected returns of REITs, the expected risk premia and conditional volatility of the risk premia. Additionally, the study compares these results between a developed economy such as the US and a panel of developing economies, with an emphasis on the South African and Bulgarian market[3].

3 Following a preliminary study that was conducted on the availability of REIT Indices, only South Africa and Bulgaria remained in the sample for emerging markets. The preliminary study is outlined in the methodology.

Chapter 2: Historical Developments

2.1 United States REITS

In the year 1960, The US was the first country to form REITs. Primarily, the introduction of REITs were purposed to provide an opportunity to all investors to invest in large-scale, diversified portfolios of income-producing real estate. The REIT model also provided access to previously inaccessible capital to real estate principals and developers. As per the US REIT Act, a REIT is defined as a corporation, trust or association which is required to uphold the following standards; the management of the corporation is to be held through by one or more trustees or directors, beneficial ownership is evidenced by transferable shares or transferable certificates of beneficial interest, the corporation is also treated as a domestic corporation for taxation purposes provided it is not a financial institution or an insurance company.[4]

As outlined by the US Securities and Exchange Commission (SEC)[5], REITs generally fall into three categories namely, equity REITs, mortgage REITs and hybrid REITs. Real estate assets owned by REITs may include office buildings, shopping malls, apartments, hotels, resorts, self-storage facilities, warehouses, and mortgages or loans. Equity REITs typically own and operate income-producing real estate and mortgage REITs provide loans to real estate owners and operators either directly in the form of mortgages or other types of real estate loans, or indirectly through the acquisition of mortgage-backed securities. Hybrid REITs typically are companies that implement the strategies of both equity REITs and mortgage REITs.[6]

The distinguishing factor between listed real estate companies and REITs is that, REITs must acquire and develop real estate with the purposes of operating them as part of the investment portfolio as opposed to reselling them post-development. To qualify as a REIT, the company must hold majority of its assets, 75 per cent in real estate, cash items and government securities, and distribute 90 per cent of its taxable income annually to shareholders in the form of dividends.

4 This information was obtained from NAREIT and can be accessed https://www.reit.com/nareit

5 The SEC is a government commission created by congress to regulate the securities market and protect investors. The statues administered by the SEC are designed to promote full public disclosures and protect the investing public against fraudulent and manipulative practices in the securities market.

6 This information was obtained from the SEC and can be accessed at https://www.sec.gov/answers/reits.htm

During the period of 1969 to 1974, NAREIT indicates that the US REITs industry assets increased from approximately 1 billion US dollars to more than 21 billion US dollars. This was mainly driven by the engagement of mortgage REITs in land development and construction financing. Globally, the REIT model was expanding as Europe passed the first legislation of REITs in 1969 and The Netherlands followed shortly after in 1971. [7]

Tax reforms of the REIT model in the following years further popularised REITs as an attractive investment class. Firstly, without being able to avoid corporate-tax, REITs would be considered an unattractive investment in comparison to alternative ways of investing in real estate, such as non-corporate private real estate companies. The legislation also allowed partners to defer their capital gain when they exchange their interest in single piece or portfolio of real estate for an interest in an entire portfolio of a REIT, thereby providing a tax-efficient manner of portfolio diversification.

REITs have attracted foreign investment into US real estate by providing two specific tax advantages. Firstly, REITs earn inactive income from real estate in the form of rental income and mortgage interest (for mortgage REITs), which is normally taxed at a 30 percent rate for a normal active trade or business. The legislation allows REITs to convert this passive income into dividends that are free of withholding tax, or subject to reduced rates, in treaty countries for non-US-governmental investors such as, sovereign wealth funds and government funds; provided that the investors are not majority shareholders of the REIT.[8]

Secondly, the legislation allows for foreign investors, not limited to any treaty jurisdiction, to be exempt from capital gains tax in a domestically (US) controlled REIT. This provides the platform for investors to make decisions based on investment factors in lieu of tax-efficiencies.

In 2013, the market capitalisation of REITs in the US had reached a value of over 600 billion dollars. US REITs began gathering public interest in the early 1990's when many REIT funds began to go public. The structure allowed investing in corporate real estate with the advantages of investing in a comparatively liquid asset – a publicly traded

7 This information was obtained from NAREIT and can be accessed at https://www.reit.com/nareit

8 This information was obtained from NAREIT and can be accessed at https://www.reit.com/nareit

stock. The PNC institutional investment report (2014)[9] outlined that REITs returns are attributable to changes, cycles and trends of macroeconomic conditions. The report indicates that GDP and interest rates played a crucial role in this period. It has been suggested that commercial real estate has generally been a lagging indicator to economic growth and subsequently, historically, in times of accelerating GDP growth, REIT performance has generally been positive. This has been attributed to the perception that that REITs stand to benefit from an expanding US economy because the earnings exposures are essentially domestic.

The PNC institutional investment report (2014) also indicates that the tapering of quantitative easing discussions in the US raised questions of the impact of interest rates on REITs; however, the report suggests that REITs are more dependent on economic growth than interest rate sensitivity. Additionally, exchange rate volatility is outlined to also pose a major risk on investment. Developing economies' currencies have been impacted due to the expectations of increasing US interest rates. This further poses the risk of investment funds exiting these developing economies and returning to developed economies that would potentially be offering higher returns.

Bloomberg[10] suggests that a fall in growth might be expected with REIT returns. The report suggests that the recovering economy and low interest rate of the US since the recession have attributed to increasing yields of REITs, subsequently; higher interest rates can make REIT dividend yields less attractive in comparison to other securities such as bonds.

9 PNC is an institutional asset management company that provides investment management and administrative services to corporations. The investment outlook report can be accessed at https://content.pncmc.com/live/pnc/institutionalinvestments/institutional-insights/IO_0614_II.pdf

10 Bloomberg is a financial news and information provider, including real-time and historical price data, financial data, trading news and analyst coverage and this can be obtained at http://www.bloomberg.com/news/articles/2015-08-07/interest-rates-are-already-hurting-mortgage-reit-etfs

Figure 1: Macroeconomic variables and US REIT returns

Source: Bloomberg and The World Bank

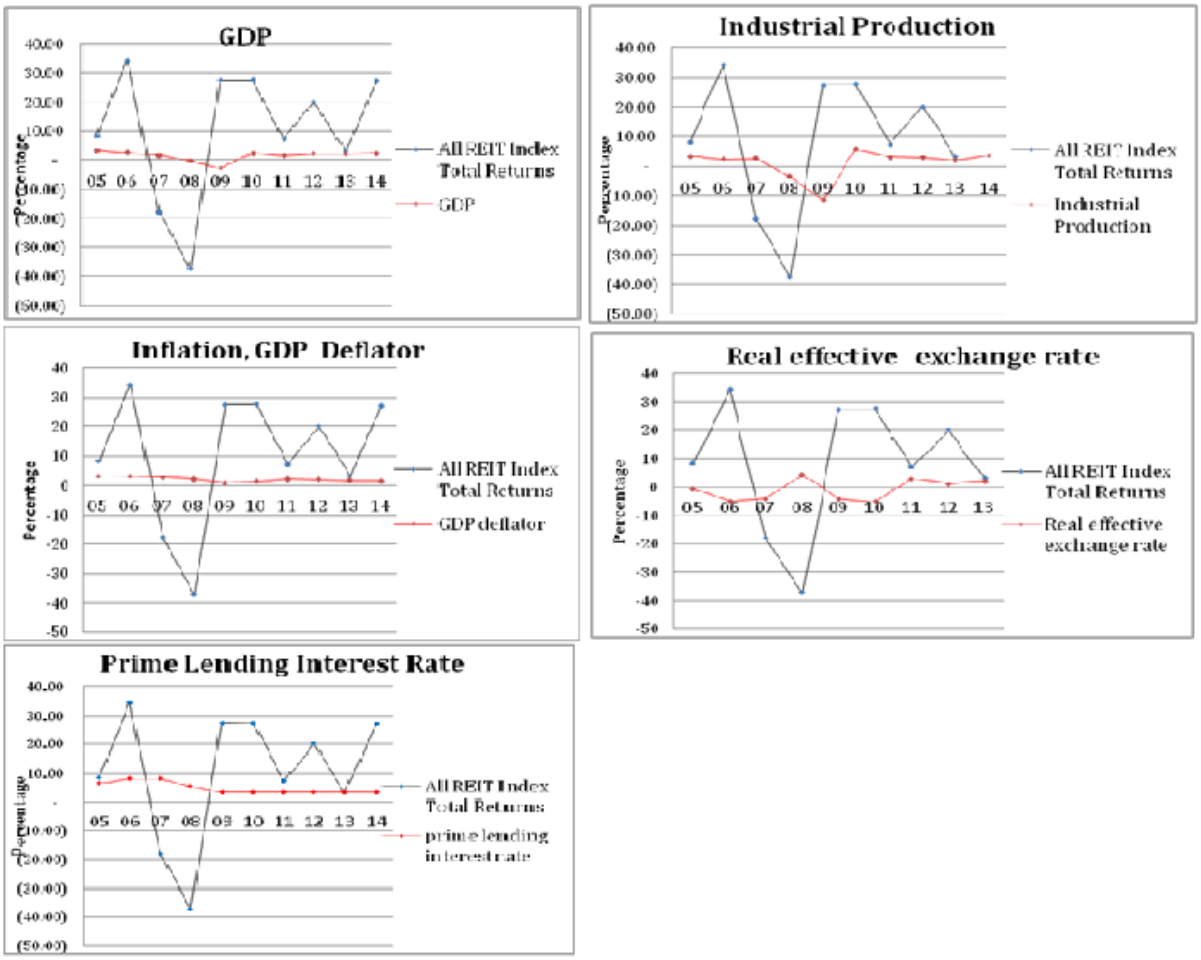


Figure 1 indicates the All REIT index juxtaposed against macroeconomic variables from the period 2005 to 2014. These variables include the change in GDP, the change in industrial production, the change in actual inflation, the prime lending interest rates and the change in the real effective exchange rate.

Figure 1 indicates that REITs have indicated a similar declining trend with the change in GDP from the year 2005 to 2008; this is in support of the above view that suggests that REITs could potentially benefit from an expanding economy and could potentially be disadvantaged by a contracting economy. Contrastingly in 2009, a negative correlation is noted between the GDP and REIT returns, where the GDP is declining and the REIT returns are increasing. A similar relationship trend is identified with the change in industrial production. The All REIT index plotted against inflation indicates no

consistent trend .The direction and significance of these relationships therefore needs to be determined empirically.

A change in the exchange rate is expected to appreciate or depreciate the local currency and therefore is expected to impact on returns for foreign investors. The figure generally indicates a negative correlation between the real exchange rate and REIT returns. The relationship will be determined empirically.

Prime lending interest rates are expected to be a source of risk as they directly influence the financing of property and development. The decrease of interest rates favoured REIT returns as they increased in 2006 and in 2007, the following increase in interest rates in the years after was accompanied by a severe decline in REIT returns. REITs appeared to have been negatively correlated with prime lending interest rates in this period thereafter an inconsistent relationship is identified. The relationship is therefore necessary to determine empirically.

2.1 South African REITs

The South African National Treasury's[11] report (2008) provided SA's justifications for implementing the REITs model. The report indicates that the regulatory framework and requirements in the property sector were too restrictive and detrimental to the South African market competing internationally. Additionally, the report also recognised the inconsistent treatment of the two types of listed real estate vehicles that existed, mainly due to legal forms and governing regulatory legislation.

The SA listed real estate previously consisted of Property Unit Trusts (PUTs) Property and Loan Stocks (PLS). PUTs are considered companies that hold a portfolio of investment grade properties that is typically held in the form of a trust, whereas a PLS differs from the legal form of a PUT, in that it is considered a company. Both forms derive their income from holding a property portfolio and are similar in respect to

11 The South African National Treasury manages national economic policy and is responsible for SA's national government finances and preparing the national annual budget; this information was obtained from the report " Reforming the listed property sector in South Africa" and can be accessed at http://www.treasury.gov.za/public%20comments/REITS%20discussion%20document.pdf

paying out the bulk of their annual income to investors, however there are underlying differences in their structures that lead to different treatment of the forms[12].

Firstly, the main differences relates to the method of capitalisation for shareholders of a PLS. The PLS company allows an investor to purchase a linked unit that is formed of one part equity and one part debenture, whereby the debenture portion generates income at a variable rate for the shareholder. Secondly, PUTs are subject to regulatory requirements as imposed by the Johannesburg Stock Exchange (JSE)[13]; however they are more crucially governed by the Registrar of Collective Investment Scheme – An arm of the Financial Services Board (FSB)[14]. This indicates the fragmented nature of the market which further promotes investor uncertainty.

According to South Africa's National Treasury's report (2008), foreign investment shareholding contributed only 1 percent of the total shares outstanding[15]. The Outlined differences provided challenges in the growth of the South African listed real estate sector and thus the reforming of regulation and legislation was essential. The real estate sector also experienced tax uncertainty due to the uninformed regulatory regime of the two forms of entities.

Under the tax legislation, PUTs and PLSs were treated differently. The legal form of a PUT is a vesting trust, and subsequently it is required to distribute all of income earned on underlying property to its unit holders. This means effectively, PUTs that own property directly effectively have no taxable income. The same principal applies in terms of capital gains tax when the PUT sells immovable property. The gain attributable to the unit holder is only recognised on the disposal of the participatory interest of the unit holder rather than the sale of immoveable property. [16]

12 The information on South African REITs, including statistics, was obtained from the South African National Treasury's report , "Reforming the listed property investment sector in South Africa". This can be accessed at
http://www.treasury.gov.za/public%20comments/REITS%20discussion%20document.pdf

13 The JSE is the largest stock exchange in Africa and primarily provides a market where securities can be traded freely under a regulated procedure

14 The FSB is the South African government's financial regulatory agency that is responsible for the non-banking financial services industry in SA

16 The information on the tax legislation of PUT and PLS companies was obtained from the South African National Treasury's report, "Reforming the listed property investment sector in South Africa". This can be accessed at
http://www.treasury.gov.za/public%20comments/REITS%20discussion%20document.pdf

Where PUTs own property indirectly through ownership of shares of a fixed company, the fixed company is not exempt from tax on its rental income but receives a tax deduction on all dividends paid out to its shareholders from the rental income. Furthermore, the dividends paid out by the PUT would be susceptible to secondary company tax; however, this is not applicable as the taxable dividends accrue to the unit holders. In terms of capital gains, fixed property companies are subject to capital gains tax on the realised sale of property, and the dividends declared from the capital gains are not tax deductible for the company. However, dividends paid from capital gains are taxable for the PUT.

PLS companies are regarded as companies in terms of the Companies Act for income tax purposes with an applicable tax rate of 29 percent. Due to the fact that these companies can issue debentures, the interest accrued by the company is a tax deductible expense. These companies usually pay off most of their profits in the form of the interest linked to the debenture and subsequently are left with little taxable income.

For PLS companies that directly own property earn rentable income and are subject to taxable income after debenture interest. The dividends paid out are not tax deductible for the company, however, secondary company tax is payable at the rate of 10 per cent on the net dividends distributed. In contrast to PUTs, the capital gains realised from the sale of fixed property is subject to be taxed at an effective rate of 14.5 percent. Moreover, secondary company tax is applicable should dividends be distributed.

Where a PLS company owns property indirectly through shares in a subsidiary, the capital and income structure is effectively the same due to the subsidiary being a PLS company. Capital gains tax is still applicable when disposing of immovable property at subsidiary level.[17]

Both forms benefit from the same income tax treatments; however, the South African Regulatory Services (SARS)[18] raised concerns that the high level of debenture interest payments made to shareholders may form part of dividends rather than interest. This effectively placed PLS companies in the same position as PUTs; however, without the

17 The information on the company structure of PUT and PLS companies was obtained from the South African National Treasury Report, "Reforming the listed property sector in South Africa". This can be accessed at
http://www.treasury.gov.za/public%20comments/REITS%20discussion%20document.pdf

18 SARS is the tax-collecting agency of SA, with main responsibility being collection of tax and ensuring compliance with tax laws

regulatory oversight and regulation of the Financial Services Board (FSB) designed to protect investors.

REITS were formally introduced in SA in April, 2013. The introduction of the REIT regime addressed the regulation issues and amended the taxation framework. As outlined by the JSE regulation rules, the implementation of REITs promotes investor protection, ensures prudent management practices without compromising on transparency and governance.[19]

The KMPG tax and legislation report (2013)[20] outlines the amended tax legislation that accompanied REITs. REITs are exempt from capital gains tax in respect of owned immovable property disposal, shares in another REIT or shares in a controlled property company. The REIT shareholder is only then susceptible to capital gains tax only when the shareholder disposes of their shares.

The report also outlines that interest distributions from a REIT or controlled property company are however re-classified as taxable dividends for South African residents, but they remain exempt from tax for foreign investors. This was particularly addressed to encourage foreign investment. The regulation is reformed such that REITs are now subject to the REIT legislation particular to that country, the Companies Act as well as the Collective Investment Schemes Control Act. The consensus in the regulation aimed at improving investor protection.

In comparison to the US REIT structure outlined in the introduction, SA provides a similar REIT structure with a few differences. In both countries, REITs can be internally and externally managed, a minimum of 75 percent of the funds must be invested in real estate, they are permitted to develop and make foreign investments. The notable difference in the structure is that SA REITs are subject to a gearing limit of 60 per cent whereas, US REITs have unlimited gearing. SA REITs are also subject to distributing 75 percent of their income to investors while US REITs are imposed with a heavier restriction of 90 percent income distribution.

19 This information was obtained from the JSE REIT presentation. This can be accessed at https://www.jse.co.za/content/JSEPresentationItems/REITs.pdf

20 This information was obtained from the KMPG tax and legislation report, "South African REITS – what are the tax implications?". This can be obtained at http://www.kpmg.com/za/en/issuesandinsights/articlespublications/tax-and-legal-publications/pages/south-african-reits-tax-implications.aspx

As outlined by the African Economic Outlook report (2015)[21], SA forms part of the countries that were affected by the global financial crises. 2014 marked the slowest year of growth since the global financial crises with GDP recording only 1.5 percent; however the current projections indicate recovery in the macroeconomic environment based on improvements in the global economy and the country's successful implementation of major government projects and new investment plans.

The report further outlines the performance of the sectors. The performance of sectors such as the manufacturing sector was marked as a constraint on growth due to disruptions caused by labour unrests and currency volatility. Better performance was seen amongst sectors such as financial services, agriculture, real estate, forestry and fisheries. The steady decline of the manufacturing sector contrasts with the expansion of the services sector as SA moves towards a more knowledge-based economy that focuses on technology, e-commerce, retail and financial services.

In promoting price and financial stability, the South African Reserve Bank has since increased interest rates twice to curb inflation that resulted from the depreciation of the South African rand. The depreciation was mainly driven by negative sentiments of developing economies currencies due to the tapering of quantitative easing by the US. The increase in interest rates affected investments which were structurally low.[22]

Barriers to investment and development have further been associated with infrastructure bottlenecks, electricity and transport, however, according to the African Economic Outlook report (2015), the South African government aims to overcome the persistent infrastructure gaps and directly stimulate the country's economy as it plans to spend ZAR 827 billion. Furthermore, in supporting the private sector the government plans on boosting the trade and investment environment for companies aiming at undertaking business in SA through simplification of tax and foreign exchange frameworks.

21African Economic Outlook Report, "South Africa 2015". This can be accessed from http://www.africaneconomicoutlook.org/fileadmin/uploads/aeo/2015/CN_data/CN_Long_EN/South_Africa_GB_2015.pdf

22 This information was obtained from the African Economic Outlook Report, "South Africa 2015". This can be accessed from http://www.africaneconomicoutlook.org/fileadmin/uploads/aeo/2015/CN_data/CN_Long_EN/South_Africa_GB_2015.pdf

The World Bank's report (2014) [23]ranked SA as the 43rd easiest country to do business in globally out of 189 countries. SA is supported by its financial sector that is globally regarded stable and well regulated. According to the World Economic Forum report (2014)[24], SA is ranked seventh of a 144 countries in financial market development. Growth forecasts in the country are expected to rebound largely due to gradual global economic recovery and stronger demands from developing economy partners.

Jones Lang Lasalle's report (2015)[25], analyses REITs performance from capital gains perspective and profitability perspective. REITs represent a physical asset, however, the susceptibility of REITs to investor sentiments is also noted due to the fact REITs are a securitized asset that is traded on the stock exchange. Globalisation and technology have led to integration amongst global economies. Subsequently speculative portfolio inflows have been a concern for emerging economies as the local stock exchanges have partly been volatile.

However, major concerns have been raised when the United States announced the tapering of the quantitative easing programme in 2013. The local stock market has since then experienced some volatility.

According to the report, the quantitative easing programme, as set by the European central bank, is less likely to have the same effect of portfolio inflows in SA due to the fact that it only constitutes 8 percent of the US's initial programme. Moreover, investor confidence has been challenged for the SA environment largely due to labour unrest, electricity supply issues, rating agencies' downgrade and a generally weaker growth prospects. However, REITs have continued to show an attractive investment class for their own value more than being carried by the market.

23 This information was obtained from The World Bank Report, "Doing Business 2014". This can be accessed from http://www.doingbusiness.org/~/media/GIAWB/Doing%20Business/Documents/Annual-Reports/English/DB14-Full-Report.pdf

24 This information was obtained from the World Economic Forum report, "The global competitiveness report 2014/2015". This can be accessed at http://passthrough.fw-notify.net/download/714600/http://www3.weforum.org/docs/WEF_GlobalCompetitivenessReport_2014-15.pdf

25 JLL is a professional services and investment management company that specialises in real estate , the report, "On investing in REITs: drivers of capital gain vs drivers of profitability" This can be accessed at http://propertywheel.co.za/wp-content/uploads/2015/06/On-investing-in-REITs-drivers-of-capital-gains-vs-drivers-of-profitability-June-2015.pdf

The Broll report (2015)[26], highlight that SA's listed real estate was largely supported by capital markets 2014 and forecast that the sector will be geared in similar manner for 2015. The SA listed property sector recorded 26 percent in returns comparable to the trading historic yield of approximately 7 percent.

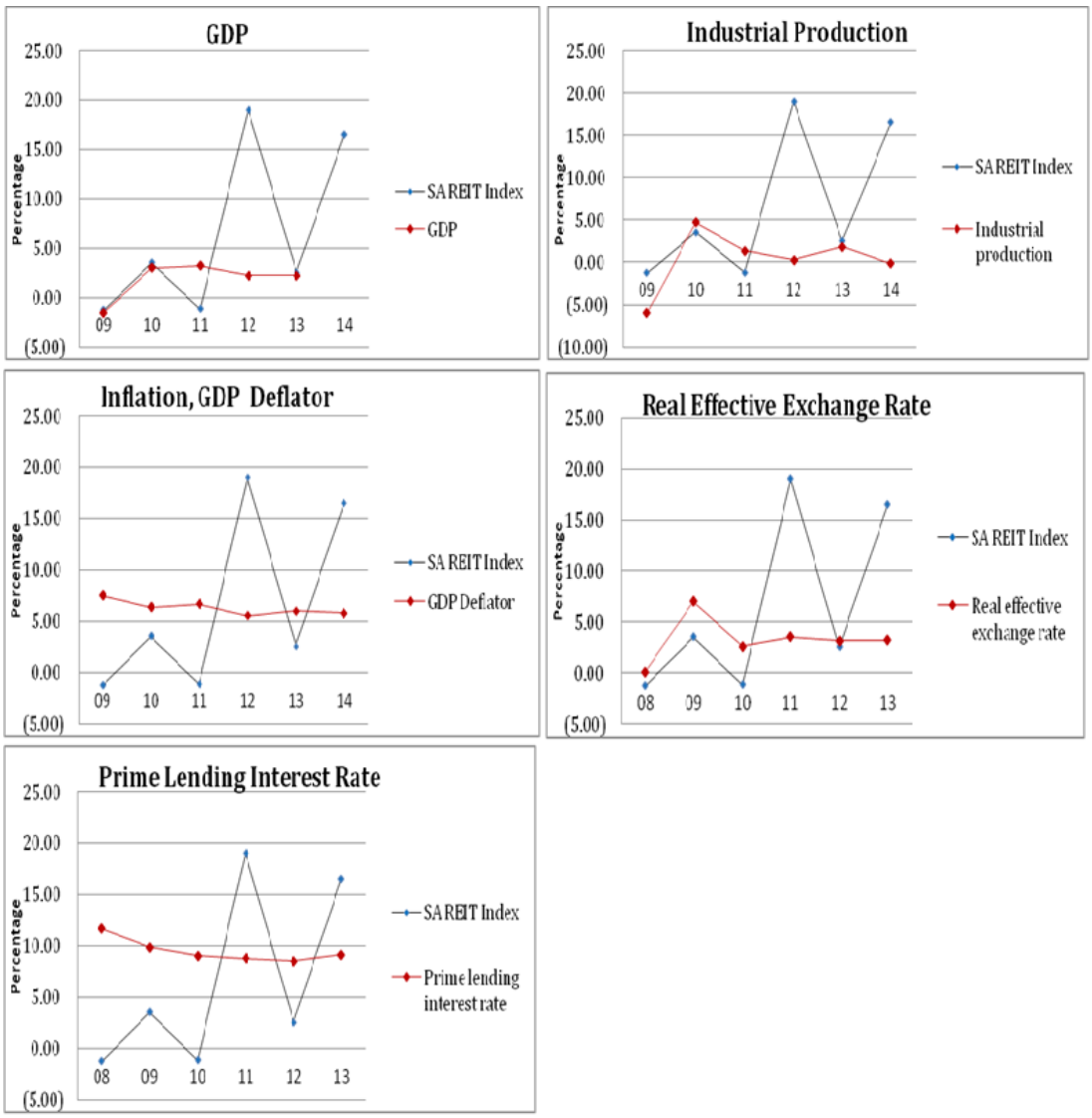
Figure 2 indicates the relationship of SA REIT returns against the various macroeconomic variables. The SA REIT return index reported a negative return in 2009. This could be attributable to the global financial crises of 2008. From 2010 to 2014, the index has reported positive returns with the exception of 2011. The change in GDP was negative in 2009 similar to the REITs.

In 2010, the GDP was at its maximum of 3.21 percent for this period, thereafter, a gradual decline is reported for the remaining years, and however, it remains a positive change. Similar to the REIT returns. The change in industrial production was negative beginning of 2009. 2010 was also the maximum change in industrial production that reached 4.71 percent in this period. The graph also indicates a gradual decline from 2010 to 2012 where the change in industrial production was at a positive minimum of 0.285 percent, while REITs reported a 19 percent maximum return for the period. A consistent trend cannot be identified and the relationship needs to be determined empirically.

26 This information was obtained from Broll's report, "The Broll Report 2014/2015". This can be accessed at http://www.broll.com/assets/uploads/documents/2015/04/The_Broll_Report_2014-2015.pdf

Figure 2: Macroeconomic variables and SA REIT returns

Source: Bloomberg and The World Bank



The change in inflation began at the peak of 7.5 percent for this period and indicates a gradually declining relationship until 2012. There is an increase the change in inflation for 2013 only and 2014 closes off with a slightly lower change. We also view a similar relationship with the prime lending interest rate. A gradual decline is reported from a peak of 11 percent in this period to 8.50 percent in 2013 and thereafter an increase in the change of inflation.

The real effective interest rate indicates a similar trend with SA REIT returns from the period 2009 to 2014, however the changes in the REIT index appears to be more

volatile than the changes in the real effective exchange rate. The relationship of these variables to the SA REIT returns remains to be tested empirically.

2.3 Bulgarian REITs

Bulgarian REITs (BG REITs) take the legal form of a public joint-stock company and are governed by the Special Purpose Investment Companies Act (SPICA). The regime was formally introduced in 2004 and is regulated by the Bulgarian Financial Supervision Commission (FSC). The REITs are entitled to invest in real estate and limited property rights in real estate, construction works and improvements, mortgage-backed bonds and services companies for their own needs.[27]

According to the PWC Report[28], the distinguishing factor of Bulgarian REITS relative to US REITs lies in the fact that BG-REITs may not be involved in the management and maintenance of acquired real estate, performance of constructions and improvements as well as the collection of amounts resulting from acquired receivables. The REITs may investment in services companies themselves but they are subject to limitations.

BG-REITs are limited to investing only in real estate that is located in Bulgaria. Similar to US REITs, BG-REITs are not subject to corporate taxation and are further obliged to distribute 90 percent of their profits as dividends. Dividends are subject to a 5 percent withholding tax for any investors, except European investors. Furthermore, capital gains tax is not charged on the sale of securities if it is made in the regulated market of securities, whereas a tax rate of 10 percent is applicable if the sale is made somewhere else.

The Bulgarian shareholder requirements also entail that thirty percent of the capital is to be owned by an institutional investor. In terms of foreign investment, foreign REITs that invest in Bulgarian REITs are subject to 10 percent withholding tax,

Bulgaria forms a part of the Eastern European region and subsequently has been affected by the Greek crises, whereas Greece is the third largest investor in Bulgaria.

27 The following restrictions are placed on REIT investments; the REITs are not permitted to invest more than 10 percent in mortgage bonds and in service companies, the investment undertaken shall not be part of a legal dispute and the investment must be located in Bulgaria.

28 The PWC's report, Worldwide REIT regimes can be accessed at http://www.pwc.com/gx/en/asset-management/assets/pwc-reits-2011-optimised.pdf

Furthermore political factors have since weighed on the Bulgarian stock market. Nevertheless, a steep decline in interest rates in 2014 highlighted the initiative to reform the market and created a positive environment for higher risk appetite investors. The market is also supported by capital inflows from local pension and mutual funds as well as foreign frontier institutional investors (Rizov, 2004).

Rizov (2004) indicates that the systematic analysis of the Bulgarian real estate market is scarce, however previous research indicates that the market itself is largely driven by three main factors namely; demand which is in turn influenced by the population and standard of living, government regulations that may potentially influence the decision of market players and the country's accession to the European Union (EU). The study suggests that Bulgaria's accession to the EU will positively impact real estate investment; furthermore, the impact is expected to vary over the different sectors. This is based on the viewpoint that an EU accession is an important anchor in sound macro-economic and structural policies.

Bulgaria effectively formed part of the EU in January 2007, where the Bulgarian State undertook the commitment to adopt and implement the policy of free movement of capital. The implementation of the policy effectively erased the prohibition of foreign individuals and legal entities to hold ownership of land in Bulgaria. The introduction of this policy increased the number of Bulgarian real estate companies, however, shortly after the introduction; the market was affected by the global financial crises (Rizov, 2004). According to the PWC report (2012)[29], the subsequent consequences of the financial crises increased scanty investment, cession and delay of projects, decrease of profit levels of the bank due to writing off bad debts.

The US Department of state report[30] takes an optimistic view in the future prospects of Bulgaria. The report states that the Bulgarian state offers a favourable foreign investment regime. As a new member of the EU, Bulgaria has gained significant access to EU funds that has assisted and contributed to the growth of the economy. The report however outlines the challenges that are still a barrier to entry for investment in this

29 This information was obtained from the PWC report, "Real Estate going global- Bulgaria". This can be accessed at http://www.pwc.fr/assets/files/pdf/2013/07/Global_real_estate/2012_bulgarie.pdf

30 This information was obtained from the US Department of State report, "2014 Investment Climate Statement". This can be accessed at http://www.state.gov/documents/organization/227132.pdf

market. The limitations on foreign control are associated with a sluggish government bureaucracy, poor infrastructure, corruption, frequent changes in the legal framework, lack of transparency and weak enforcement of the judicial system. [31]

Figure 3 indicates the Bulgarian REIT index annual returns juxtaposed against macroeconomic variables from 2008 to 2014.

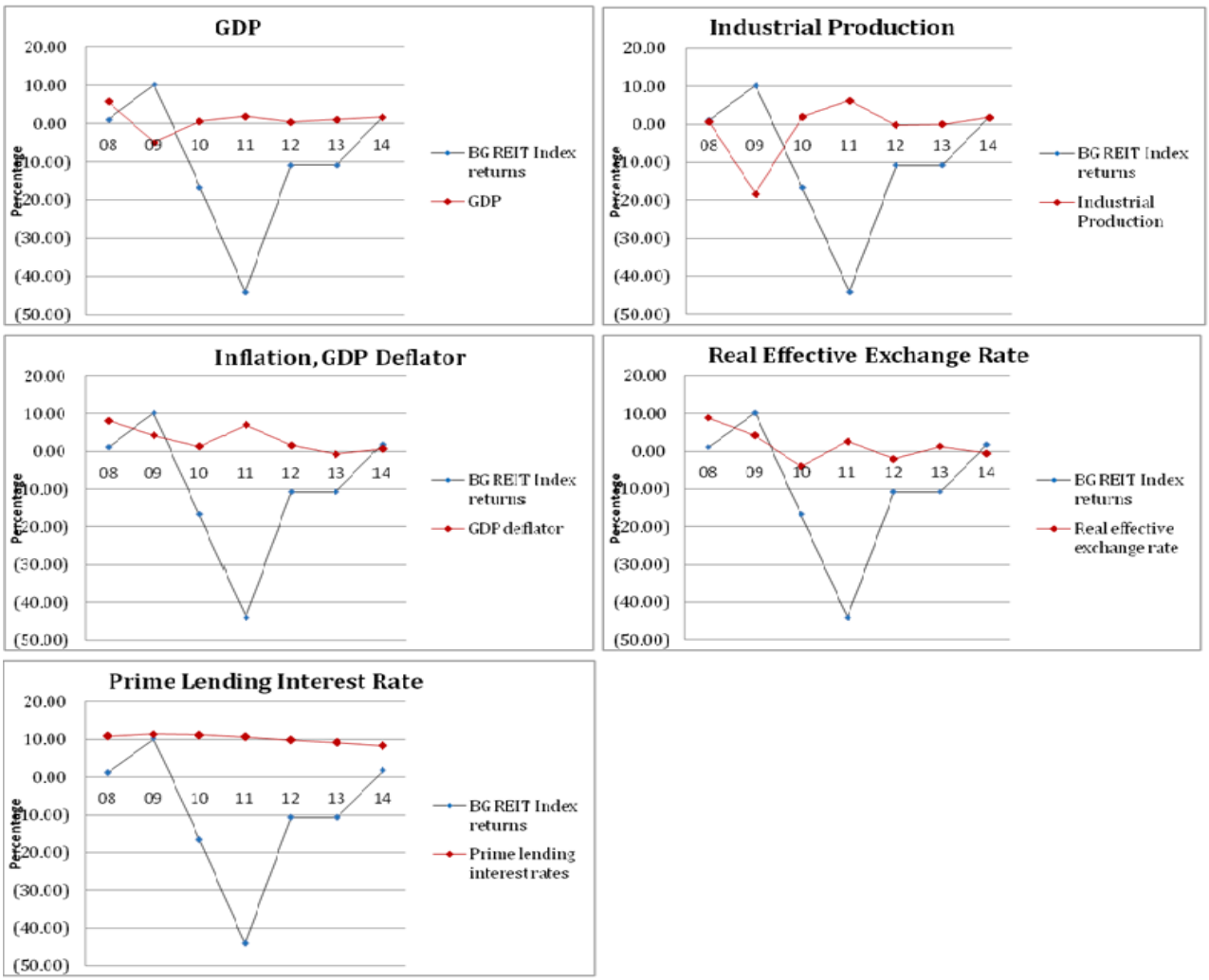
The graphs indicate a negative relationship trend between the change in GDP and the BG REIT indices between 2009 and 2013. REIT returns were negative in this period, while the growth of GDP recovered from a negative growth into positive growth. The same relationship is found with BG REIT and the growth in industrial production.

The graphs indicate no consistent trend between change in inflation and change in the real effective exchange rate. The relationship between these variables and BG REITs need to be determined empirically .The prime lending interest rate indicates a slowly declining slope over this period; however the REIT returns remained negative between 2010 and 2013. In 2014, the BG REIT index reported a positive return with the interest rate being at its lowest of 8.25 percent. This relationship still remains to be tested empirically.

31This information was obtained from the US Department of State report, "2014 Investment Climate Statement". This can be accessed at http://www.state.gov/documents/organization/227132.pdf

Figure 3: Macroeconomic variables and Bulgarian REIT returns

Source: Bloomberg and The World Bank



2.4 Global economy and REITs

The global financial crises affected listed securities across all asset classes. Listed real estate also suffered, with investors and the finance in questioning their 'safe haven' assumptions. Despite this, some countries have recovered better and provided superior returns than others.

In 2008, great volatility was seen in the REITs market, with the biggest market of REITs, the US, recording a loss of approximately 22 percent. In this period the correlation of REIT stocks and the overall market was also increasing and REITs could no longer be considered as a counter-cyclical diversification play in property.

The global economy is still recovering from the global financial crises; however positive results were indicated in 2014 as the economy continued to expand.

According to the United Nations report (2015)[32], developed economies have shifted on a slightly lower path of economic growth compared to the pre-crisis level and have experienced volatile movements in their quarterly GDP growth rates in 2014. Developing economies however, have become more divergent and have experienced a large deceleration. This has been suggested to be particularly attributable to country specific challenges such as structural imbalances, infrastructure bottlenecks, increased financial risks and ineffective macroeconomic management. Additionally these countries have appeared vulnerable to the tightening of global financial conditions.

The outlook also indicates that there is an expectation for major developed economies, such as the US, to improve in growth due to the support of monetary policies. However concerns have also been raised that the risks associated with economy relate to the volatility of the financial market, which may further adversely impact the real economy. Global macroeconomic variables have been volatile since the global financial crises as economies implement policies in attempt to recover. Global inflation has remained subdued, however have elevated in developing economies while some developed economies such as the Euro area faces possible deflation as a downside risk. Among the developing countries, Africa's overall momentum in growth is expected to continue as supported by private consumption and investment. [33]

Developing economies have benefitted from international capital flows; however, this has been on a moderate downturn since 2013, triggered by the tapering of the US quantitative easing. However, among different types of capital flows, portfolio equity flows have increased into developing economies such as, Brazil, Indonesia, Mexico, South Africa and Turkey, relative to the sharp decline experienced in 2013.

Currency volatility has been a topic of discussion since the appreciation of the US dollar. With a few exceptions, emerging market currencies also weakened notably against the

32 This information was obtained from the Unite Nations report, "Global economic outlook 2015". This can be accessed at http://www.un.org/en/development/desa/policy/wesp/wesp_archive/2015wesp_chap1.pdf

33 This information was obtained from the Unite Nations report, "Global economic outlook 2015". This can be accessed at http://www.un.org/en/development/desa/policy/wesp/wesp_archive/2015wesp_chap1.pdf

dollar in the last quarter of 2014. The volatility of currencies reflects renewed concerns on the short-term outlook of emerging economies.

Many developing economies face challenging macroeconomic environments, as weakness in their domestic economy interact with financial external vulnerabilities. The main risk that have been noted in developing economies are associated with potential negative feedback loops between weak activity in the real sector, reversals of capital inflows, tightening of domestic financial conditions and the global economy. The volatility of the determinants of the macroeconomic environment globally might be expected to impact on investment values across all asset classes.[34]

2.5 Research problem and purpose

The extent of the interdependency of economic forces verified by the financial crises has resulted in greater attention being placed on linkages between the real economy and financial markets. Developing economies are largely associated with economic variations which can potentially hinder domestic growth and foreign investment. The volatility of the macroeconomic factors are associated with asset price fluctuations, unstable discount rates and risk premiums which further have an implication on the risk perception of investors (Bansal et al., 2012).

The growing implementation of REITs in developing economies has indicated a growing importance for the real estate market in developing economies. According to the Ernst and Young report (2014)[35], REIT IPO's peaked globally at more than 20 billion US dollars in 2013 and raised a further 6.8 billion US dollars in the first half of 2014. As per NAREIT, developing economies that now form part of the REIT regime since the introduction of REITs in the US include, Bulgaria, Hungary, Ireland, Israel, Kenya, South Korea, Malaysia, Mexico, Pakistan, Philippines, South Africa, Taiwan, Thailand, Turkey and United Arab Emirates.

34 This information was obtained from the Unite Nations report, "Global economic outlook 2015". This can be accessed at http://www.un.org/en/development/desa/policy/wesp/wesp_archive/2015wesp_chap1.pdf

35 This information was obtained from The Ernst and Young report, "Global perspectives 2014 REIT report". This can be accessed as http://passthrough.fw-notify.net/download/406260/http://www.ey.com/Publication/vwLUAssets/EY-global-perspectives-2014-reit-report/$File/EY-global-perspectives-2014-reit-report.pdf

Moreover, developing economies have provided investors with opportunities for international portfolio diversification. Because international portfolio diversification strategies are based on the principal of low correlations in business cycles of different economies, a clear appreciation of the role of emerging markets' REITs in international portfolio diversification is not possible without understanding the relationship between the risk and return dynamics of REITs and volatility in key macroeconomic variables that underlie business cycles.

The objective of this study is to analyse the relationship between the macroeconomic risks and REITS risk-return dynamics, in major developing economies relative to developed economies. The study specifically considers the conditional volatilities of macroeconomic variables on the returns, the expected risk premium and the conditional volatilities of the risk premium of REITS in the US as the benchmark developed economy and two developing economies – South Africa and Bulgaria.

The significance and direction of macroeconomic risks play a significant role on the overall impact of REIT returns, and further has implications on investors risk perceptions, international diversification and hedging strategies for portfolio managers. The extension of this literature to developing economies will also be beneficial to policy makers in establishing the impact that macroeconomic policies could potentially have on this asset class.

2.6 Research questions

i) What are the implications of fluctuations of macroeconomic variables on the returns of real estate investment trusts in emerging markets?

ii) Are the implications identified in (i) above different between emerging and advanced real estate markets?

2.7 Research significance

According to the Broll[36] report, the South African real estate sector delivered a total return of 26 percent to investors in the last quarter of 2014. When compared to the

36 Broll Property Group is one of Africa's leading commercial property services companies with operations in Ghana, Indian Ocean Islands, Kenya, Malawi, Namibia, Nigeria and Rwanda and provides real estate services in other African countries.

historical forward yield of approximately 7 percent, the year indicated a favourable environment for the South African listed real estate sector of the capital markets. According to the South African association of REITs (SAREIT), the implementation of REITs and the associated tax dispensation advantages have resulted in continued growth of the listed property sector.

The risks associated with investing in developing economies such as African markets are constantly being highlighted. PWC's report (2015)[37] argues that the main risks in the environment are associated with political instability, unstable government policies, exchange rate volatilities and social instabilities.

This study will provide useful insights of the impact of macroeconomic risk factors on REITs in emerging economies, particularly South Africa. The study will assess how macroeconomic risk factors impact REITs in developing economies relative to developed economies. Given that REITs are a fairly a recent implementation in many developing economies, the study will provide an important contribution to the limited knowledge of REITs and their interaction with the macroeconomic environment of that country respectively.

2.8 Research structure

The purpose of the study is to investigate the impact of macroeconomic risks on the risk and returns of listed REITs. The study aims at understanding the relationship between the macro-economy and listed REITs in a developing economy and a panel of developing economies.

The research comprises of five chapters. Chapter one of the research provides the background to the topic, including an outline of the problem statement, research questions and research significance and structure. Chapter two will provide an extensive literature review. The literature review briefly reviews the concept of securitisation in relation to real estate and examines financial integration and diversification as a basis for understanding how the integration of economies affects investments globally. We further extend the literature onto macroeconomic variables

37 This information was obtained from PWC's report, "Real estate Building the future of Africa". This can be accessed at https://www.pwc.co.za/en/assets/pdf/real-building-the-future-of-africa-brochure-2-mar-2015.pdf

and asset pricing models to identify macroeconomic risks that have been concluded as significant in literature. The macroeconomic risks considered are the growth in Gross Domestic Production (GDPG), the growth in Industrial Production (INDPG), the change in Inflation (INFLC), the change in the Real Effective Exchange Rate and the Prime Lending Interest Rate (PRLINR). Lastly, we review literature on the time-varying nature of risk premiums, their conditional variance, as well as the conditional variance of the macroeconomic risk factors.

Chapter three outlines the overall methodology. The chapter begins by outlining the preliminary study undertaken for the research as well as a discussion on the sample and data characteristics. The limitations of the study are stated in this section and this is then followed by the discussion of the theoretical framework of the methodology.

Chapter four will provide the empirical results of the study as well as the data analysis and discussion. Chapter five will provide the conclusion and future recommendations of studies relative to the research topic.

Chapter 3: Literature Review

3.1 Financial integration and diversification from real estate

Securitisation is the process of pooling illiquid assets or certain types of assets with the intention of creating interest-bearing securities. The interest and principal payments are passed through to the purchasers of the securities (Jobst, 2008). Prior to the financial crises, a number of financial institutions engaged in securitisation as a method of excluding certain asset holdings off their balance sheets with the intention of transferring credit risk to other financial institutions such as banks, insurance companies and hedge funds. In this method, securitised assets were less costly to these financial institutions as a result of a different set of rules being applicable to these assets by financial regulators. Financial institutions thereby derived the economic benefits of diffusing risk concentrations and reducing systematic vulnerabilities by spreading out credit risk exposures (Jobst, 2008).

Illiquidity, indissolubility and inflexibility have been the core underpinning traditional criticisms of direct real estate investment. These concerns have been a catalyst in the

range of real estate investment vehicles that have been developed over the years. The introduction of real estate securitisation effectively was able to introduce tradability and liquidity, greater investment flexibility with the ability to react quicker to market conditions as well as diversification of risk in terms of geographical spread and property type (Newell and Fife, 1995).

Potential disadvantages that are noted in real estate securitisation include thin trading of shares, lack of establishment in trading markets, price volatility and lack of directional control over management of the real estate asset. Additionally, specific real estate securitisation is further dependent on different legal structures, tax regimes and economic circumstances that prevail across countries. However, the use of real estate securitisation has received considerable attention in the financial sector as it introduced a viable option to small and large investors (Newell and Fife, 1995).

Bardhan, Edelstein and Tsang (2008) investigate whether diminishing trade and investment boundaries across the globe, as a result of economic and financial integration has had an impact on trade and financial market activities. The study highlights that global integration in financial and economic activities might be expected to impact real estate returns. REITs, particularly, have become popular amongst portfolio managers and investors due to their liquidity, transparency and tax-related transaction costs. However, contrasting views are highlighted regarding the benefits arising from international securitized real estate holdings.

The issues surrounding international diversification is concerned with integration amongst markets and the subsequent diminishing benefits of diversification when these markets are similarly affected by the same economic and financial stimuli. If markets are integrated, the incentive to diversify internationally diminishes (Schindler, 2009). According to the standard model of modern portfolio theory suggested by Markowitz (1959), low international correlation across markets is the basis of portfolio diversification.

International investments can reduce risks of investment portfolios in markets that are not perfectly correlated. The growing implementation of REITs in emerging markets provides potential diversification benefits for real estate investment portfolios. This is

corroborated by the common viewpoint that emerging markets have been identified as partially segmented from global capital markets (Bansal et al., 2012).

Previous studies have scrutinized the benefits of international diversification of real estates in mixed-portfolios. Chiang, Tsai and Sing (2013) investigated whether REITs provided good diversification benefits, in lieu of equity, during the period of the financial crises in Asian markets. The study found a positive correlation between REITs and the stock market ex-post the sub-prime mortgage crises and a further increase in the correlation between the two assets classes thereafter. Furthermore, the study finds that correlation coefficients appear to be greater than in expected normal times.

Lang and Scholz (2015) investigate a similar concept by examining the role of systematic risk factors on the returns, as well as, market, size and liquidity factors of REITs and equities on a Pan-European level. The study finds that the impact of systematic risks on the factors, as well as risk-adjusted returns, differ significantly across these markets and contrastingly, the overall market seem to be equivalent, which suggests that real estate may not be defensive.

In contrast to the above, Fei, Ding and Deng (2010) investigate the correlation of REITs with other financial assets, with the underlying risks being macroeconomic factors in the US market. The study makes use of autoregressive heteroskedastic models and finds that correlations amongst REITs, direct real estate and equity returns are time-varying and there is little asymmetry in the conditional correlations. The study further indicates that correlations differ amongst the type of REIT and thus potential mixed-asset portfolio diversification is possible.

The above studies indicate the contrasting evidence of real estate as a defensive asset class in a mixed portfolio. More recently, real estate studies have focused on international diversification strategies for property portfolios (Ellis, Wilson and Zurbruegg, 2007).

Schindler (2009) investigates the correlation structures of listed real estate and REITs and their implication on portfolio management. The study covers 14 markets of Australia, Hong Kong, Japan and Japan in the Pacific area, Belgium, France, Germany. Italy, the Netherlands, Sweden, Switzerland and the UK in Europe, and Canada in the

USA. The study provides empirical evidence of low correlations between these countries and suggests that there possible diversification benefits, however using the mean-variance optimization, correlation as a measure of diversification is limited due to non-normal distributions of returns and increasing correlation coefficients in downward phases.

While Schindler (2009) investigated diversification in relatively developed economies, Ooi and Liow (2004) outline the importance of exploring diversification opportunities in developing economies. The study reinforces that there is more scope for risk diversification in developing economies, which are generally considered as segmented, in comparison to developed economies that are considered integrated with global capital markets. The study investigates the risk-adjusted performance of property-related stocks in seven stock markets of East Asia: Hong Kong, Indonesia, Malaysia, Singapore, South Korea, Taiwan and Thailand. The findings indicate that macroeconomic factors are dominant factors in the risk-adjusted performance of real-estate.

3.2 Macroeconomic variables and asset pricing

Asset pricing models describes how expected return varies over different assets and over time. This implies that because not all assets are equally risky, certain assets will require a risk premium to ensure some investors are willing to hold them. The Capital Asset Pricing Model (CAPM) has been widely known as the standard form of asset pricing. The model is based on the model of portfolio choice developed by Markowitz (1959). The model is based on the assumptions that investors are risk averse and they are only concerned about the mean and variance of a one-period investment return. This implies that investors create mean-variance efficient portfolios by expecting to minimise variance of a portfolio, given the expected return and maximise expected return, given the variance (Fama and French, 2004).

The CAPM model presents an application to the market portfolio of the relationship between the expected return and the portfolio beta that holds in any mean-variance efficient portfolio. This implies that the risk of an asset is measured by the covariance of an asset's return with the market return. The implications that follow is that, this model entails that the expected return of an asset should be linearly related to an asset's

covariance with the return of the market portfolio, the beta. Furthermore, it implies that no other variable has any explanatory power. The model has been criticised in its ability to fully capture systematic risks that affect asset returns.

Alternatively, asset pricing is implemented through factor models. Factor models of security returns decompose the random return on each of a cross-section of assets into factor-related and asset-specific returns. Factor models can be differentiated between characteristic-based, macroeconomic, and statistical factor models. In characteristic based models, the factor betas are linked to the characteristics of securities such as company size or industry categories. Statistical factor models are based on identification of covariances alone and are not specifically tied to any external data sources. Macroeconomic factor models are linked to the innovations in observable economic time series such as inflation and unemployment (Connor and Korajczyk, 2009).

A common statistical tool used in an attempt to understanding what factors lead to movement in asset return is the Principal Component Analysis (PCA). The method was originally developed as a data reduction technique where major sources of variance in data could be parsimoniously represented by a smaller set of statistical factors. The method therefore allows the identification of underlying factors that explain co-movements in stock returns. The factors identified therefore become linear combinations of the observed variables originally placed in the data and are statistically independent to each other. However; the PCA is a statistical technique that identifies factors that do not necessarily have any economic interpretation, however one approach to making the factor decomposition more interpretable is to rotate the statistical factors in order to ensure that the rotated factors are maximally correlated with pre-specified macroeconomic factors. Therefore this can be specifically applied to a group of macroeconomic factors that are considered crucial in the determination of asset returns (Liow, Ibrahim and Huang, 2006).

The Asset Pricing Theory (APT) was formed by Ross (1976) as an alternative asset pricing model that is based on the assumptions of a perfectly competitive and frictionless market. The principal surrounding this model states that the returns for an asset can be predicted through a multifactor model and that there are sufficient

securities in the market such that firm-specific risks can be diversified away and therefore considered idiosyncratic. The model implies that assets are equivalent in all economically relevant aspects and should have the same market price, such that there are risk-free profits made by investors by exploiting security mispricing. Ideally a well-functioning security market will not allow for persistent arbitrage opportunities, such that there will be pressures on the prices to adjust and eliminate the risk-free profits. Therefore since firm-specific risks are unsystematic and can be diversified away, investors should be compensated for systematic risk that cannot be diversified (Ross, 1976).

The APT model has been subject to a number of empirical testing due to its ease of assumptions and implications. In comparison to the CAPM, the APT model allows more than one factor to explain the return generating process. Secondly due to the no arbitrage condition, equilibrium is characterised by the linear relationship between each asset's expected return and its common factor loadings.

An earlier study of Lehmann and Modest (1988) noted that the underlying assumptions of the APT model are associated with difficulties in its implementation. Firstly, investigators must have a strategy of measuring common factors. Factor analysis has been used as an alternative to measure common factors implicitly on small cross-sections in lieu of using maximum-likelihood methods that require large cross-sections. However, the alternative method has the potential of yielding imprecise estimates and can potentially affect the ability to prove the puzzling anomalies associated with the CAPM model.

Furthermore, the absence of riskless arbitrage opportunities implies that the APT model should precisely price most assets with negligible error; however it does not price all assets arbitrarily well. These conditions further make it difficult to test the APT without making further assumptions since all assets may not be priced well.

Chen, Roll and Ross (1986) is often referred to for standard macroeconomic risk factors in asset pricing. Macroeconomic determinants cover a broad range of macroeconomic variables; however, previous literature indicates guides to systematic factors that are considered highly relevant. The macroeconomic variables discussed for REITs are consistent with previous literature that has investigated these variables in relation to

property stocks. Given that REITs differ from listed real estate in their tax-structure and property-holding requirements, macroeconomic factors become particularly prevalent to understand. In the following sections, we review key literature that has examined some of these relationships in various markets.

3.3 Gross domestic production growth and Industrial production growth

Bilson, Brailsford and Hooper (2001) highlight the widely accepted view that, current stock levels are positively related to real economy activity levels, as measured by industrial production and gross domestic production. This is further supported by the notion that returns are a function of future cash flow streams, which in turn are dependent on future economic activity. Industrial production considers the manufacturing sector of a country, including manufacturing, mining, and electrical and gas sectors etc. Moreover, industrial production contributes towards the GDP of a country hence making it essential towards the movement of the real economy.

Lapodis (2009) investigates the interaction of REITs, the stock market and the real economy in the US market for the period 1971 to 2007. The study highlights the importance of the real estate sector to financial stability and economic policies in light of the 2008 financial crises that originated from a sharp downturn in the prices of primary real state. Subsequently this caused a reduction in listed real estate returns. Findings indicate that REITs display similar characteristics to the movements of the stock market and industrial production growth. The implications are that investors and portfolio managers need to be cognisant of changes in policies that impact the real economy and how these will affect the movement of real estate stocks.

Developing economies are characterised as fast growth economies that offer higher risk and return relative to developed economies. These markets have further been characterised as good locations for foreign investments (Bilson et al., 2012). Additionally, Ladekarl and Zervos (2004) indicate that the investability of emerging markets is highly impacted by their macroeconomic conditions and political environment stability. Therefore, the interaction of real estate and movements of the economy becomes crucial. The importance of the interaction is further enforced, given the view that policy prescriptions suitable for advanced economies are not necessarily applicable or feasible for developing economies.

3.4 Inflation

The relationship between listed real estate and inflation has received considerable attention in the financial literature. Chatrath and Liang (1998) investigate REITs as a possible inflation hedging tool. The study finds that REITs are not inflation hedging tools in the short-run; instead, they provide inflation-hedging abilities in the long-run. This relationship is however eradicated when inflation is proxied by the T-Bill rate and further tests of co-integration. Chan, Hendershott and Sanders(1990) in an investigation of the impact of macroeconomic risk factors on the risk and returns of equity REITs, also finds a negative correlation between inflation with excess return thus confirming that real estate is not a good hedge against inflation.[38]

Liu, Hartzell and Hoesli (1997) consider the relationship of real estate securities and inflation and suggest that security design differences may account for the relationship between inflation and real estate. The study investigates if real estate securities continue to act as a perverse hedge in foreign countries, relative to the US, given the security design differences. The real estate securities examined include, country-specific property trusts, real estate mutual funds which are similar in the nature to REITs, as well as stocks of real estate operating or development companies.

The study highlights that given that different designs of real estate are not all good proxies for underlying real estate, their structure may affect their expected behaviour as an inflation tool. The study finds that foreign countries yield similar results, relative to the US; real estate securities do not provide a good hedge against inflation, specifically property trusts. In general, the above studies indicate that real estate is not a good inflation hedge. Payne (2003) investigates shocks to macroeconomic state variables and REITs, in the US markets. The study finds that unexpected shocks to inflation have an insignificant impact on excess returns amongst REITs.

In contrasts with these studies, Liow, Ibrahim and Huang (2006) finds that the conditional volatility of unexpected inflation is significant in variations of real estate returns, however it varies across listed real estate in the Asian-Pacific markets in terms

38 An inflation hedge instrument is an asset that is able to provide protection against the decrease of a value in currency, such that when inflationary pressures arise, the asset increases in value. The negative correlation of an asset with inflation implies that the asset will decrease in value when inflationary pressures arise, and thus the asset is not considered an inflation hedging instrument.

of direction. The study thus suggests that there are potential diversification opportunities in international markets. Overall, there are contrasting opinions on the impact of inflation across real estate markets. More specifically, the impact of inflation on REITs is not well researched, specifically for emerging economies.

3.5 Interest rates

Earlier studies of Chen, Roll and Ross (1986) indicate that interest rates, through the channel of the discount rate in valuation methods, form part of macroeconomic risks that are significantly priced in the stock market. This theory provides the base justification for the inclusion of interest rates in macroeconomic factors that are expected to induce variations in returns of REITs.

Particular attention has been placed on interest rate spreads. Changes related to the spread of interest rates denote changes in the yield curve which provides useful indicators of business cycle movements (Brooks and Tsolacos, 2001). Previous studies such as Chan, Hendershott and Sanders (1990), Ling and Naranjo (1997), Liow, Ibrahim and Huang (2006) and Ito (2013) have generally supported the significance of the interest rate factor in REIT pricing.

Liow and Huang (2006) investigate the interest rate sensitivity of securitized real estate in the East Asian countries, following the Asian financial crises, using the arbitrage pricing theoretical model. The study finds that property stocks are sensitive to the unanticipated movement in long-term interest rates; however market and industry movements exhibit stronger influences than that of the interest rate on the sector.

Brooks and Tsolacos (2001) investigate the proportion in variations of property returns that are particularly attributable to interest rates and interest rate spreads in the UK market. The study finds that there is a relationship between real estate stocks and interest rates in the long-term; however, long-term interest rates do not appear to cause variations in returns. Furthermore, the study finds that short-term interest rates and the interest rate spread do not cause significant variations in real estate returns.

Liow, Ibrahim and Huang (2006) indicate that interest rates may be expected to impact real estate returns through cash flow patterns, discount rate as well as debt servicing

which further impacts the net income. The study employs the conditional volatility of the prime lending interest rate as a proxy for interest rate movements. The study finds the impact differs across the Asian-Pacific markets, where returns are either positively or negatively related to the conditional volatilities of the prime lending interest rate.

3.6 Foreign exchange rate

Foreign exchange rate risk is an important part of international investments. Exchange rate exposure links stock market returns and exchange rate changes. Specifically, it predicts an impact of foreign exchange rate risk on stock prices Korhenen (2015). Under the purchasing power parity principal, exchange rates adjust to reflect inflation levels, thus upholding the law of one price. This would imply that the exchange rate will not be separately priced. Should there be deviations from the purchasing power parity; the exchange rate risk is priced to the extent that it must be borne by the investor.

Bansal et al. (2012) investigates the impact of money supply, goods prices, real activity and exchange rates on equity returns in emerging markets. The study finds that the exchange rate is the most influential macroeconomic variable. Exchange rate exposure is expected to be an equally important risk for real estate due to the fact that investing in international real estate exposes investors to multiple currencies with differing volatilities.

Thomas and Lee (2006) investigate the role of exchange rate exposure in the European real estate markets prior to and after the introduction of a single-currency. The study investigates whether asset holding and weights of an international real estate portfolio using exchange rate adjusted returns are essentially the same or different from those based on unadjusted returns. The results indicate that exchange rate exposure is significant in explaining excess returns than unadjusted returns. Furthermore the study indicates that the differences in portfolio compositions are reduced after the introduction of a single-currency. Prior to the introduction of the single-currency, investors needed to incorporate foreign exchange rate risk expectations into international investment strategies unless they are fully hedged or are using an exchange rate overlay program and after the introduction of the single currency in European markets, foreign exchange rate risk was eliminated.

Ellis, Wilson and Zurbruegg (2007) investigate potential risk reduction resulting from international diversification benefits and the role of the exchange rate in US, UK and Australian markets. The study finds that although international diversification may reduce the overall risk of a portfolio, risk-adjusted returns are maximised only when stocks are performing at similar levels in all markets. The study also finds that, when faced with added foreign exchange rate risk, investors may be worse off by holding a well diversified portfolio of domestic value stocks.

Korhenen (2015) investigates the national stock market exchange rate exposure in a time- varying content in sixteen industrialised countries over the period 1973 to 2011. The study argues that foreign exchange rate exposure is time-varying and particularly depends on the long-run co-movement between stock markets and exchange rate markets. The findings indicate an inconsistent relationship between the stock market and nominal effective exchange rate. The study also presents new evidence that the national foreign exchange rate exposure of stock markets is related to the co integration of stock prices and effective exchange rates.

Addae-Dapaah and Loh (2005) examines the advantages and disadvantages of holding portfolio of real estate in emerging economies than developed economies with the underlying risk being the exchange rate. The study is based on the notion that emerging economies' real estate markets have significantly experienced growth and offer better returns than developed economies. The study finds that although exchange rate volatility generally had an adverse impact on international investment risk and return, the impact is not statistically significant between emerging economies and developing economies at a 5 % significance level. However, in the long-term, the study finds that relative to developed economies, emerging economies are more susceptible to currency fluctuations. Furthermore the study provides evidence that emerging economies real estate portfolios provide a higher return at any given risk level than a corresponding portfolio in developed economies.

Liu and Mei (1998) investigates the extent to which the January dummy, the T-bill, the spread between the long term and short term rate and the dividend yield of an equally weighted portfolio can predict equity stocks and real estate related stocks. The study attempts to discover which portion of return is responsible for international

diversification benefits by considering both an unhedged strategy for exchange rate risk and a hedged strategy. The study finds that the variables indicate a co-movement in the expected returns of stocks and real estate stocks due to possible market integration and therefore little diversification benefits are noted when using both a hedged or unhedged strategy. The study then suggests that diversification benefits arise from the unexpected portion of returns, particularly related to currency movements. The results indicate that real estate related stocks offer better diversification returns in comparison to equity stocks when considering both a hedged and unhedged strategy.

The study of currency volatility has been well documented for stocks; however limited studies have investigated this within the real estate context. Additionally, emerging economies have been largely characterised with volatile currency movements. Therefore exchange rate movements become important to understand within listed real estate in these markets.

3.7 Volatility of macroeconomic variables

Bansal et al. (2012) investigated the impact of macroeconomic volatility on asset prices. The study placed focus on the impact of macroeconomic variables on consumption and asset prices, given the notion that consumption has an impact on human capital and return to equity, whereas asset prices will reflect a risk premium that explains the variation of excess returns associated with different asset classes. The study is based on three factors that are regarded as sources of risk, namely, cash flows, the discount rate as well as volatility risks. The study finds that ignoring volatility risks results in a bias of news that affect consumption as well as a bias of the discount factor that will affect asset prices. The study further concludes that high volatility states of economic conditions are associated with increased risks, low economic growth and high risk premiums of an asset. Supported by the financial theory, this implies that booms and busts that have occurred in the real estate sector might have been backed by the variations of certain macroeconomic factors

Bollerslev and Zhou (2006) follow the theory that the variance risk premium of an asset is a systematic factor according to APT. The study investigates the predictability of stock returns that is explained by the variance risk premium based on the assumption that the variance risk premium is a proxy for risk aversion for portfolio managers. The

study finds that the time-varying risks and risk aversion explains the variations in return thus implying that the booms and busts are explained by the variance risk premium. The study concludes that a high variance risk premium signals high risk aversion in the economy which further leads to consumption decreases and investments moving from more risky assets to less risky assets and hence leads to variations in expected excess returns.

In real estate literature, Karaloyi and Sanders (1998) study the variation of economic risk premium and the predictability of stock, bonds and REIT returns. This study builds on the theoretical framework that states that asset returns are not only related to risk premiums that are associated with changing macroeconomic risks over different business cycles but they are also affected by the sensitivities of the assets to the macroeconomic variables that can vary over time. The study finds that stock and bond market risk premiums are significant in determining the predictability of stocks and bonds. For REIT's it is found that both the stock and bond market risk premium capture a small portion of return predictability. The study highlights that the price of the macroeconomic risk is more important than the sensitivity of the asset to the macroeconomic risk itself[39], thus explaining the variations of REITs returns.

Sill (1995) investigates the relationship between macroeconomic variables and the expected returns on stocks. Specifically the study attempts to find the relationship between the first and second conditional moment of stock excess returns to the conditional variances and covariances of a set of macroeconomic variables, namely industrial production, the three month treasury bill, the bond default premium , and the inflation rate as measured by the CPI index. The study finds that industrial production growth, inflation, and the short-term rate help explain the behaviour over time of expected excess returns on stocks.

Following the theoretical framework of Sill (1995), Liow, Ibrahim and Huang (2006) investigate a similar concept of time-varying expected risk premium of real estate stocks associated with macroeconomic risks in the Asian-Pacific region. The study takes into account six economic variables supported by the literature, namely, growth in

[39]An asset's risk premium is considered its price for bearing additionally risk that exceeds a risk-free rate. Karaloyi and Sanders find the variation in the risk premium to macroeconomic factors affects the predictability of the asset's expected return more than the sensitivity of the asset to the macroeconomic factor itself as measured by the beta in the APT model

domestic production, industrial production growth, unexpected inflation, interest rate, money supply and the exchange rate. The study finds that the risk premia and the conditional volatilities of the risk premia are time-varying and dynamically linked to the conditional volatilities of macroeconomic risks. However, the significance and direction of those variables are different across countries which further indicate diversification benefits across those countries.

Payne (2003) investigates the impact of unexpected changes in macroeconomic state variables in the US to the risk premium of the three classifications of REITs, namely, equity REITs, mortgage REITs and hybrid REITs. The state variables included in this study include output, inflation, the term structure, default risk and the federal funds rate. The study finds that unanticipated changes to inflation and default risk are insignificant across all types of REITs. Mortgage and Hybrid REITs are negatively impacted by industrial growth and the federal funds rate, whereas, equity and hybrid REITs are affected by the term structure.

Xiao, Lin and Li (2014) investigate the expected return, time-varying risk and hedging demand of macroeconomic factors in the US REIT market. This study classifies REITs into three portfolios distinguished by size, momentum and book–to-market. The study finds that market risk does not fully account for all the expected returns of REITs when classified in portfolios. The study finds that conditional covariances of expected REIT portfolio returns, with unexpected macroeconomic conditions shifts in inflation rate, de-trended short-term interest rate, and change in the financial market indicators are negatively related. This further suggests an intertemporal hedging demand is possible within these variables and further indicate they are important investment proxies in an investment set. The study however fails to find a similar relationship for the default spread and term spread. This further concludes that the negative association of these systematic risk factors to the expected return can be considered as important proxies for an investment opportunity due to the fact that they are considered priced and should be priced.

The majority of these studies have focused on REITs in developed economies, however to our knowledge little attention has been given to emerging economies, mainly due to data paucity. This study focuses on the emerging markets of South Africa and Bulgaria

and extends by creating a comparison approach between a developed economy such as the US. Additionally, REITs are a fairly new concept in emerging markets and therefore these markets potentially presents new diversification opportunities in these markets.

Chapter 4: Methodology

4.1 Asset pricing models: factor models

The study develops the arbitrage pricing theoretical framework as developed by Ross (1976) to investigate the relationship between macroeconomic variables and expected stock returns. The principal surrounding this model states that the returns for an asset can be predicted by using the same asset and many common risk factors. The model implies that the returns of a portfolio or a single asset can be predicted through a linear combination of independent macroeconomic variables and theoretical market factors or security specific indices:

$$R_{it} = E_{t-1}(R_{it}) + \sum_{j=1}^{k} \beta_{ij} F_{jt} + \varepsilon_{it} \qquad i = 1,2,3,\dots,n; k < n \qquad (1)$$

Where R_{it} is considered the return on asset i in period t, $E_{t-1}(R_{it})$ is the expected return given all the information availed to investors set from period *t-1*; β_{ij} (j = 1,2,3...k) are factor loadings which represent the sensitivities of the returns of asset i to the zero-mean common factors, F_{jt}. Subsequently, β_{ij} informs the investor how much an asset's return goes up when the factor is one unit higher than expected. ε_{it}, the residual term is considered the idiosyncratic risk that influences individual firms or particular industries- and therefore can be substantially mitigated or eliminated using adequate diversification. The residual terms are further considered to be uncorrelated with each other. k Is the number of factors under consideration and n is the number of assets considered.

Following Liow, Ibrahim and Huang (2006), under the assumption that the returns on a benchmark portfolio (*M*), which the returns of security i can be compared to, can be described by the same factors that explain returns on security *i,* it can be indicated that the expected return and the variance can be written as;

$$E_{t-1}(R_i) = \lambda \left[\alpha_{Mi} + \sum_{j=1}^{k} \sum_{w=1}^{k} \beta_{ij} \beta_{Mw} h_{jwt-1} \right] = \delta_{Mi} + \sum_{j=1}^{k} \sum_{w=1}^{k} \beta_{ij} \beta^{*}_{Mw} h_{jwt-1} \quad (2)$$

$$VAR_{t-1}(R_i) = \alpha_{ii} + \sum_{j=1}^{k} \sum_{w=1}^{k} \beta_{ij} \beta^{*}_{Mw} h_{jwt-1} \quad (3)$$

where $\lambda = E_{t-1}(R_{Mt})/Var_{t-1}(R_{Mt})$ and represents the ratio of the conditional expectation of the excess return of the benchmark portfolio to the conditional variance of the benchmark portfolio ; $\delta_{Mi} = \lambda \alpha_{Mi}$, $\beta^{*}_{Mw} = \lambda \beta_{Mw}$ and h_{jwt-1} represents the covariance between returns on systematic factors, w, and returns on security i.

Equation 2 and 3 indicate that the expected excess returns and the conditional covariance of the excess returns are a function of the conditional variances and covariances of the economic factors. Equation 2 can be estimated through the Generalised Method of Moments (GMM) of Hansen (1982). The GMM estimation procedure requires observable macroeconomic risk variables and a set of instruments.

The study employs a three-step estimation approach. First, the principle component analysis is applied to a set of macroeconomic variables to obtain orthogonal variables. Secondly, the GARCH model is estimated using the retained principle components to obtain the conditional variances. The estimated conditional variances are then square rooted to obtain the conditional covariances. Both the conditional variance and covariances are then used as instruments in the GMM estimation.

4.2 Principal Component Analysis (PCA)

The study employs the Principal Components Analysis (PCA) to extract factors from identified macroeconomic variables. The PCA is a multivariate technique that analyses a set of observations represented in a data table. The observations represent possible inter-correlated variables. The PCA method enables minimisation of the observation by extracting important information from the data table and representing it as a new set of orthogonal variables called principal components. The resultant principal components can be used to describe the relationship between the original variables and similarities between observations. The method is desirable in factor analysis as it can eliminate

problems of multicollinearity between homogemeneous variables (Abdi and Williams, 2010).

The first retained principal component obtained has the largest variance, the second retained principal component has the second largest variance is orthogonal to the first retained principal component. Subsequently, all the other retained principal components are obtained in a similar method. The desired principal is the statistical independence between the retained principal components.

4.5 GARCH (1,1) Model

The study employs the GARCH (Bollerslev, 1986) financial model as derived from the ARCH (Engle, 1982) model. The model is able to capture heteroskedastic features and volatility pooling in series of financial asset return. Specifically, the model expresses conditional variance through an autoregressive process as a function of only one lagged square error. Thus, conditional variance and excess returns can vary over time (Brooks, 2014).

The GARCH (1,1) model extends on this process by allowing conditional variance to be dependent on more than one lagged square error. The favourability of the GARCH (1,1) has been due to model being able to allow a parsimonious process and avoiding over fitting. Furthermore, the GARCH (1,1) allows an infinite number of lagged square errors to influence the current conditional variance (Brooks, 2014)

We employ the GARCH (1,1) model to estimate the conditional variance in the excess returns and the principal components extracted for each country respectively.

$$\boldsymbol{Y_{j,t}} = \boldsymbol{\mu} + \boldsymbol{\beta_i} \sum_{i=1}^{n} \boldsymbol{Y_{j,t-i}} + \epsilon_{j,t} \quad (4)$$

$$\boldsymbol{h_{j,t}} = \boldsymbol{\alpha_0} + \boldsymbol{\alpha_1 \varepsilon_{j,t-1}^2} + \boldsymbol{\alpha_2 h_{j,t-1}} \quad (5)$$

$$\epsilon_{j,t} | \boldsymbol{\Omega_{t-1}} \sim \boldsymbol{N}(\mathbf{0}, \boldsymbol{h_{j,t}}) \quad (6)$$

Equation 4 and 5 indicate the mean and variance equation for the GARCH (1,1) model respectively. In the mean equation, $Y_{j,t}$ indicates the retained principal component or excess return of the REIT stocks. $Y_{j,t-i}$ represents the optimal autoregressive lags of the retained principal components or the excess returns respectively and $\epsilon_{j,t}$ are the residuals. For the variance equation $h_{j,t}$ represents the conditional variance. The coefficients are defined as follows; α_0 is the constant (time-dependent volatility), $\alpha_1$is considered the ARCH term and α_2 is the GARCH term.

4.6 The Generalised Method of Moments (GMM)

The generalised method of moments (GMM) model developed by Hansen (1982) applicable to linear and non–linear models. The GMM provides an attractive estimation methodology that has been widely used in empirical research (Han and Philips, 2006). The GMM is similar to parameter estimation models such as Maximum Likelihood (MLE); however such models have been criticised for their limitations, whereas the GMM provides more flexibility.

The MLE requires a different test to examine model misspecification when using different asset pricing models, whereas the GMM has incorporated a statistical model misspecification in its distribution theory. Models such as the MLE also require normality distribution of the data, whereas mostly financial asset returns series are considered non-normal. When these conditions are not satisfied, the MLE risks providing biased estimated model parameters. The GMM is thus favourable in this regard as full specification is not needed (Jagannathan, Skoulakis and Wang, 2002)

The application of the GMM requires moment conditions that represent the implications of an asset pricing model. Given data on observed variables, the GMM estimates model parameters such that corresponding sample moments are satisfied as closely as possible

4.1 Sample Selection, data and descriptive statistics

The study will focus on REITs in developing economies as well as the US as the advanced economy. Due to the data paucity of country specific REIT indices in emerging markets, the study will focus on emerging markets with available country specific REIT indices.

A preliminary study was employed on the countries that have implemented REITs as per NAREIT. The US was considered to be the developed economy due to it being the country with the oldest history and the largest market of REITs. As per NAREIT, sixteen countries[40] were initially considered among the emerging economies panel. Firstly, the stock market to GDP was calculated over the period of 2003 to 2013 as a selection indicator from the panel of countries. The stock market to GDP is able to indicate whether a particular market is undervalued or overvalued, whereas a ratio of more than a 100 indicates an overvalued market.

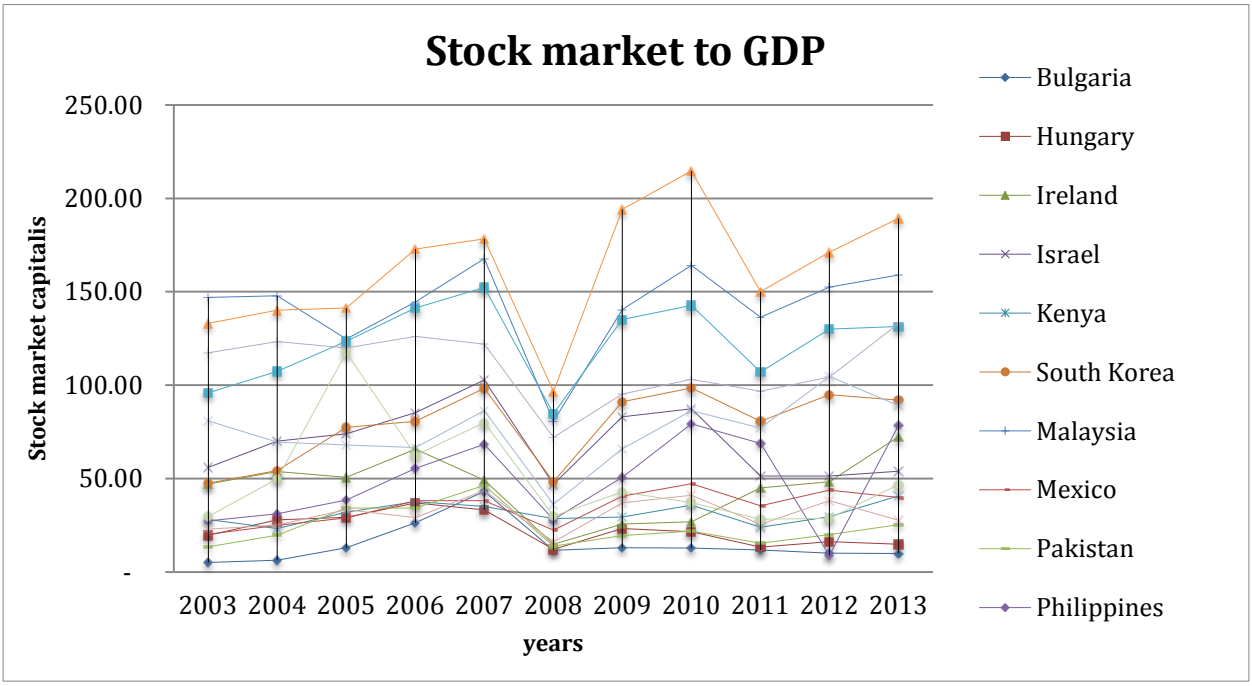
Figure 4 indicates the results obtained from the study. Taiwan, Malaysia, South Africa and the United States appear to be overvalued markets in the period 2003 to 2007. All the markets were affected by the global financial crises in 2008 as all the stock market to GDP ratios declined. Post 2008, Taiwan, Malaysia, South Africa remained overvalued, while the US was on the edge of being undervalued and overvalued over the years.

Secondly, further research was conducted on the availability of the REIT indices of the countries considered in the panel. Due to the unavailability of country-specific REIT indices, only two countries (South Africa and Bulgaria) remained in the sample. The study also includes the US REIT index for comparison purposes.

40 The following countries were initially considered to form part of the emerging economy panel, namely; Bulgaria, Hungary, Ireland, Israel, Kenya, South Korea, Malaysia, Mexico, Pakistan, Phillipines, South Africa, Taiwan, Thailand, Turkey and United Arab Emirates. Amongst these countries only South Africa and Bulgaria had available REIT indices. Additionally, the correlation of South Africa's REIT index was computed against the property index to investigate if the property index could potentially be used as a proxy for REIT index. The correlation was found to be too low.

Figure 4: Stock market to GDP of REIT emerging markets and US

Source: International Monetary Fund (IMF) and The World Bank



The study obtained monthly data from 2005:01 to 2015:12 for the US, and the entire REITs index history for Bulgaria (2007:10 to 2015:12). For South Africa, the REITs markets have formally existed from 2013; however the study considers the period from which the index was back- dated (2009:12 to 2015:12)

The study obtained the monthly data for the following REIT indices: USA (S&P US REITs), South Africa (FTSE/JSE REIT index), and Bulgaria (SOFIA BG REIT index). This data was obtained from Bloomberg.

Table 1 provides a brief description of the REIT indices for each country. The inclusion of these countries provide a good platform to investigate the behaviour of REITs in relation to macroeconomic risks in a developed economy, an emerging economy as well as an emerging economy that is challenged in its policy framework that can potentially influence its macroeconomic risks.

Table 1: REIT indices description across markets

Source: Bloomberg

Market	REIT indices statistics
United States	The S&P US REIT index is a market capitalisation- weighted index with a free-float adjustment. The index was introduced in December 1992 with a base value of 100. The index comprises of 156 constituents with a total market capitalisation of $752,224.25 US million dollars as of 30 October 2015.
South Africa	The FTSE/JSE Real Estate Investment Trust Index is a market capitalisation-weighted index with a free-float adjusted market capitalisation yearly. The REIT regime was introduced post 2013, however the index is back dated using the index methodology to December 2009. The index comprises of 25 constituents with a market capitalisation of $ 32,212.88 million USD dollars as of 30 October 2015.
Bulgaria	The BSE-SOFIA BG REIT index is market capitalisation-weighted index introduced in September 2007. The market capitalisation is free-float adjusted every quarter. The index was computed with a base value of 100 and comprises of 7 constituents with a market capitalisation of $ 510,14 million USD dollars as of 30 October 2015.

Table 2 provides a brief description and justification for the macroeconomic risk factors considered in the study. The macroeconomic variables included in the study are considered to act as proxy of variables that determine the excess return of REITS. These variables have been selected based on the literature review and represent, but not limited to, the macroeconomic risks that impact excess returns of REIT in our study.

Table 2: Macroeconomic variables included

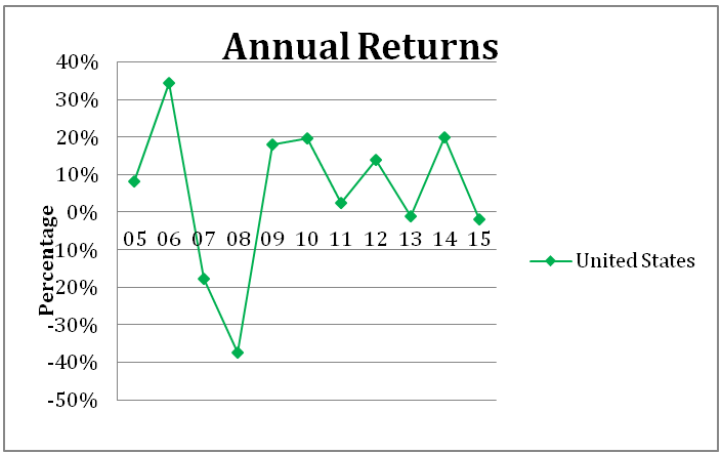
Variables	Macroeconomic factors Description
GDPG	The Gross Domestic Production represents all the 'baskets of goods' produced in an economy, such that this measure is considered the total output of an economy. The inclusion of this variable is based on the theory that economic activity affects cash flow streams which directly affect returns. The study includes the growth rate in GDP.
INDPG	The Industrial Growth Production represents the industry activities of an economy. Similar to the GDP, the inclusion of the variable is based on the same principal of cash flows being a function of returns, which are in turn affected by economic activity. The study includes growth rate in INDP.
EXCHC	The Foreign exchange rate considers the conversion of one currency into another currency. Contradicting results have been found in literature of exchange rates as significant risks, the findings vary across countries. The study includes changes in the exchange rate.
INFLC	Inflation is the increase in price for a basket of goods. The inclusion of inflation is represented by changes in the GDP deflator. The GDP deflator measures the level of prices of all new, domestically produced, final goods and services in an economy. The changes in the GDP deflator will be included in the study.
PRLINR	Interest rates are considered as they are used to discount cash flow streams. Prime lending interest rate will be used in the study.

5.1 Descriptive statistics

Figure 5 represents the annual returns of the All REIT index for the US. The US, an advanced economy, is analysed from the period 2005 and reported positive returns for the year 2005 and 2006. The impact of the global financial crises is indicative in the negative returns reported in 2007 and 2008. The All REIT index recovered with positive returns of 18 per cent from 2009 and gradually declined to report negative returns of 1 percent in 2013. The All REIT index closed off with a negative return of 2 percent for the year ending 2015.

Figure 5: Annual returns of the United States REIT stocks

Source: Bloomberg



For the Emerging markets, figure 6 represents the annual returns for the BG REIT index. Bulgaria is analysed from October 2007 and reported the negative annualised return of 3 percent for the year 2007. The BG REIT index further reported a minimum negative return of 58 percent during the period of the global financial crises in 2008. The index continued to report negative returns of 10 percent by the year ending 2010. The Index recovered into positive returns from the year 2011 to 2014 with a maximum positive return of 44 percent in 2012. The BG REIT index closed off with a negative return of 2 percent.

Figure 6 Annual returns of Bulgarian REIT stocks

Source: Bloomberg

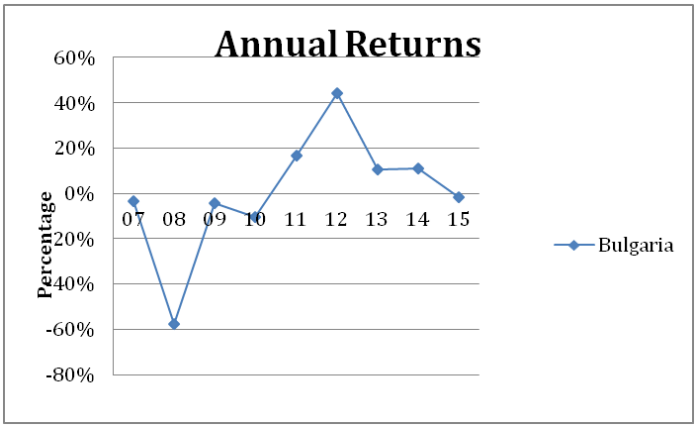
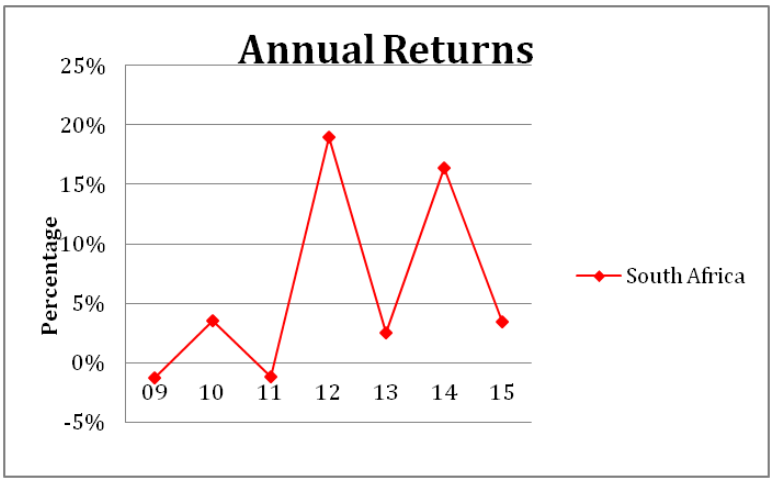


Figure 7 represents the FTSE/JSE index for South Africa. The FTSE/JSE REIT index is analysed from December 2009 and reported a negative annualised return of 1 percent

for the year 2009. The index reported a positive return of 4 percent in 2010. The index overall reported positive returns from the year 2012 to 2015 with maximum returns recorded at 19 percent and a minimum of 3 percent in the year ending 2015.

Figure 7 Annual returns of South African REIT stocks

Source: Inet BFA



Monthly returns are computed as the difference in natural logarithm of the indices. The Excess return is calculated by deducting the risk-free interest rate from the monthly returns. The 3 month Treasury bill is used as a proxy for the risk-free interest rate. Table 3 represents the descriptive statistics of the excess returns of the countries respectively. The descriptive stats include the mean, standard deviation, maximum, minimum, skewness and kurtosis of the monthly excess returns.

Over this period, the average monthly excess returns are; -0.56 percent (Bulgaria), -5.46 percent (SA) and -0.50 percent (US). The standard deviations over this period are 8.39 percent (Bulgaria), 3.49 percent (SA) and 6.93 percent (US).

The distributions of the excess returns for all countries are negatively skewed, with Bulgaria being the most negatively skewed. Kurtosis measures the peak of the distribution, whereas a normal distribution has a kurtosis of 3. The data indicates that only the excess returns of Bulgaria and United States are leptokurtic. The hypothesis of normality is thus rejected for all countries. Previous studies indicate that financial series returns have volatility clustering, volatility mean reversion, "heavy-tailed" probability distributions and asymmetry. Zivot (2008) indicates that heavy-tailed probability

distributions may be attributed to the non-constant conditional variance of the data. Our empirical analysis includes GARCH (1,1) model to extract the conditional variance of the data, hence we are able to model the conditional heteroskedasticity and heavy tailed distributions of the data.

Additionally, we test for autocorrelation in the residual series through the Ljung-Box Q test. The Ljung-Box test allows us to jointly test the series for autocorrelation in a series up to lag k. The Ljung – Box statistic tests the null hypothesis that autocorrelations up to lag k are equal to zero. We use the lags of 1 to 4 as well as lag 6, 12, 18, 24 respectively. The results indicate that the monthly excess returns reject the null hypothesis of no autocorrelation for Bulgaria and South Africa for all lags. The US data fail to reject the null hypothesis for the United States monthly excess returns for the majority of the lags at a 1 percent significance level with the exception of lag 1 and 2. This however does not affect our empirical study as the GMM parameter extraction model corrects for autocorrelation and heteroskedasticity in the data (Zivot, 2008).

Table 3: Descriptive statistics of monthly excess returns on REIT stocks

	Bulgaria	**SA**	**US**
Mean	-0.0056	-0.0547	-0.0050
Std. Deviation	0.0839	0.0344	0.0693
Maximum	0.2552	0.0270	0.2788
Minimum	-0.4166	-0.1444	-0.3066
Skewness	-0.8245	-0.0921	-0.5049
Kurtosis	9.3223	2.9181	7.386
Lejung-Box Q statistics			
Q(1)	1.3243	0.0000	0.0963
Q(2)	1.6680	1.2677	5.8768
Q(3)	3.2234	1.8903	12.1256***
Q(4)	4.7202	2.9283	27.1942***
Q(6)	5.0952	3.5155	35.5183***
Q(12)	10.3062	7.0292	58.5232***
Q(18)	12.5457	14.8669	76.5723***
Q (24)	14.3927	23.141	84.9764***

Notes: ***, ** , * Indicates two tailed significance at 1%, 5% and 10% significance levels respectively

Table 4 represents the descriptive monthly statistics for the macroeconomic variables. The macroeconomic variables include the growth rate in gross domestic production (GDPG), growth rate in industrial production (INDPG), change in the GDP deflator (INFLC) as a proxy for actual inflation, the change in the real effective exchange rate (EXCHC) and the prime lending interest rate (PRLINR). The data for GDP and GDP

deflator were interpolated from quarterly data to monthly data.[41] Supported by the literature review, these macroeconomic variables are expected to be, but not limited to, relevant proxies of economic sources of risk.

The results indicate that the data exhibits skewness. Also the series is leptokurtic, with the exception of GDPG (SA), INFLC (SA and US) and PRLINR (SA and US). These findings suggest that the data cannot be considered as a normal distribution. This has no implication on the empirical study as the GARCH model is able to take into account heteroskedasticity and heavy-tailed probability distributions.

The Ljung- Box test is also computed for the residual series of the data at lags 6, 12, 18 and 24. For Bulgaria, we reject the null hypothesis of no autocorrelation for INDPG, EXCHG and PRLINR and fail to reject the null hypothesis for the GDPG and INFLC. The South African data rejects the null hypothesis for the EXCHG and PRLINR and fails to reject the null hypothesis for the GDPG, INDPG and INFLC. The US macroeconomic variables fail to reject the null hypothesis of no autocorrelation with the exception of the EXCHG.

41 We employ cubic spline interpolation to extract unknown data points using the known quarterly data of our variables.

Table 4: Descriptive statistics of macroeconomic variables

		Panel A						Panel B: Lejung-Box Q Statistics			
		Mean	**SD**	**Maximum**	**Minimum**	**Skewness**	**Kurtosis**	**Q(6)**	**Q(12)**	**Q(18)**	**Q(24)**
Bulgaria	GDPG	0.0027	0.0132	0.0365	-0.0573	-1.8976	9.8143	110.278***	146.081***	222.04***	234.056***
	INDPG	0.0005	0.0268	0.1128	-0.1110	0.3939	8.7844	6.38331	9.36303	23.5029	30.5234
	INFLC	0.0305	0.0455	0.1202	-0.0660	0.1801	2.0381	29.7765***	43.2878***	64.0134***	67.2607***
	EXCHC	0.0013	0.0130	0.0989	-0.0194	4.2876	30.2560	3.00797	9.54266	16.2539	22.9680
	PRLINR	0.0985	0.0132	0.1152	0.0704	-0.5217	1.9477	15.7876	24.6433	25.0947	29.0473
SA	GDPG	0.0215	0.0100	0.0341	-0.0163	-1.2133	0.5908	29.3841***	34.3240***	40.0301***	42.2267***
	INDPG	0.0043	0.0854	0.1500	-0.2190	-0.7591	3.2530	22.9407***	92.8146***	107.135***	158.748***
	INFLC	0.0134	0.0149	0.0540	-0.0273	0.1127	3.0223	85.6403***	157.789***	229.006***	277.704***
	EXCHC	-0.0027	0.0254	0.0950	-0.0657	0.3938	4.9023	4.39826	10.4436	16.3844	21.1845
	PRLINR	0.0325	0.0003	0.0350	0.0325	8.3674	71.0140	0.00027	0.00211	0.00742	0.01876
US	GDPG	0.0156	0.0249	0.0534	-0.0820	-1.7825	7.1778	139.730***	142.377***	159.081***	162.742***
	INDPG	0.0006	0.0075	0.0153	-0.0427	-2.2371	12.2451	22.0994***	28.9674***	30.873**	38.4892**
	INFLC	0.0113	0.0076	0.0308	-0.0022	0.2831	2.2574	171.615***	182.111***	190.936***	125.173***
	EXCHC	0.0004	0.0123	0.0548	-0.0326	0.5581	5.1748	9.15436	15.2560	23.7819	28.8671
	PRLINR	0.0454	0.0191	0.0825	0.0325	1.0322	2.3609	55.3631***	98.5338***	102.099***	116.030***

Notes: GDPG = Growth in Gross Domestic Product; INDPG = Growth in Industrial Growth Production; INFLC = Change in Inflation; EXCHC = Change in Exchange Rate; PRLINR = Prime Lending Interest Rate; ***, ** , * Indicates two tailed significance at 1%, 5% and 10% significance levels respectively

Chapter 5: Empirical Results

5.2 Principal Component Analysis (PCA)

Table 5 represents the Principal component analysis results for the five macroeconomic variables considered in the study. The eigenvalues represent the variance on the new factors that were extracted. The percentage of the variance is also given, as well as the cumulative variance.

To determine the number of factors we retain, we use the Kaiser criterion. The Kaiser criterion (Kaiser, 1960) suggests that we retain factors with eigenvalues that exceed one. The first two principal components for Bulgaria and the United States as well as the first three principal components for South Africa are greater than one. The retained components are able to explain a cumulative 72.17 percent (SA), 63.57 percent (United States) and 57.74 (Bulgaria) of factor variance. The first principal components for the respective markets are able to explain 34.52 percent (United States), 33.06 percent (Bulgaria) and 27.04 percent (South Africa) of the total sample variance.

Table 2 also displays the factor loadings for the retained principal components. Coefficient loadings are indicative of the relationship or correlation between each of the original variables and the retained principal component. A high coefficient loading indicates a strong relationship between the variable and the principle component. We follow Liow H, K., Faishal Ibrahim, M. and Huang, Q. (2006) and we only display the macroeconomic variables that have high loading coefficients greater than the absolute value of 0.5 in each retained principal component vector.

All five macroeconomic variables are significant for Bulgaria and South Africa. With the exception of the GDPG and INDPG, the remaining three variables are significant for the United States. For the first principal component (P1) indicates the highest negative correlation (-0.662) with the GDPG for South Africa and it is not included for Bulgaria and the United States.The P1 component also indicates a negative correlation (-0.579) with the INFLC for the US and contrastingly a positive correlation (0.612) for Bulgaria. P1 is also negatively correlated (-0.548) with the INDPG for the US and positively correlates (0.606) with the PRLINR for Bulgaria.

The second principal component (P2) indicates the highest negative correlation (-0.612) for the EXCHC for Bulgaria and also indicates a negative correlation (-0.516) with the GDPG.

The INDPG indicates a common negative correlation (ranges between -0.545 to -0.586) for Bulgaria and South Africa but it is not retained for the US. The PRLINR indicates a common positive correlation (ranges between 0.536 to 0.587) for SA and the US. The INFLC is also included and indicates a positive correlation (0.527) for South Africa. The Third principal component (P3) only includes the EXCHC for South Africa and indicates a positive correlation (0.876).

Table 5: Eigen values and proportions of variance explained by derived principal (Panel A) and factor loadings for the retained principal components (Panel B)

		Panel A: Derived principal components					Panel B :Factor loadings for retained principal components			
Country		1	2	3	4	5	Country	1	2	3
Bulgaria	Eigenvalue	1.6532	1.234	0.8261	0.7816	0.5051	Bulgaria	INFLC(0.612)	GDPG (-0.516)	
	% of Variance	33.06	24.68	16.52	15.63	100		PRLINR (0.606)	INDPG (-0.545)	
	Cumulative %	33.06	57.74	74.26	89.99	100			EXCHC (-0.612)	
SA	Eigenvalue	1.3518	1.2421	1.0148	0.772	0.6141	SA	GDPG (-0.662)	INDPG (-0.586)	EXCHC (0.876)
	% of Variance	27.04	24.84	20.30	15.54	12.28			INFLC (0.527)	
	Cumulative %	27.04	51.88	72.17	87.72	100			PRLINR (0.536)	
US	Eigenvalue	1.726	1.4523	0.8755	0.5079	0.4382	US	INDPG (-0.548)	PRLINR (0.587)	
	% of Variance	34.52	29.05	17.51	10.16	8.76		INFLC (-0.579)		
	Cumulative %	34.52	63.57	81.08	91.24	100				

Notes: GDPG = Growth in Gross Domestic Product; INDPG = Growth in Industrial Growth Production; INFLC = Change in Inflation; EXCHC = Change in Exchange Rate; PRLINR = Prime Lending Interest Rate; figures in parentheses are correlations (factor loadings) of macroeconomic variables

5.3 GARCH (1,1) estimates

Table 6 represents the number of lags included in the mean equation of the GARCH (1,1) model. The optimal number of lags range from 1 to 12. The number for each principal component for each respective country ranges from 1 to 12, whereas the excess returns range from 1 (Bulgaria and the US) to 5 (SA)

Table 6: Number of optimal lags for principal components and REIT excess returns

	Principal component 1	Principal component 2	Principal component 3	Excess Return
Bulgaria	1	1	-	1
SA	1	12	3	5
US	1	5		1

Table 7 indicates the estimated results from the GARCH (1,1) model's variance equation. Where the GARCH (1,1) parameters are statistically significantly different from zero, this implies that the conditional volatilities of the excess return and retained principal components are time-varying. For Bulgaria and the US, most of the coefficients are statistically significant with the exception of a few, thus indicating that the data is time-varying. We however find that for SA, the majority of the coefficients are insignificant.

The Large coefficient for α_1 indicate that the variables are more responsive to market movements. Large coefficient values for α_2 indicate that conditional variance takes a long time to phase out and hence volatility is persistent.

For Bulgaria, the values of α_1 are larger than α_2 across all variables, which indicates that these variables are more responsive to market movements than their own lagged values. Similar results are obtained for the US variables, the values for α_1 are larger than α_2 with the exception of the excess return. The excess return appears to be more responsive to its own lagged values than market movements across all markets.

Table 7 also displays the results of the Ljung-Box Test which investigates the lack of fit of a time model through examining the autocorrelation of the residuals. The Q statistics for the residuals and squared residuals are obtained for all variables for each country

respectively for the 24th lag. Additionally, the GARCH (1,1) is able to serially capture the autocorrelation inherent in the residuals. To test if the linear dependence is removed, we test for ARCH effects in the data at the 12th and 24th lag. The ARCH test investigates whether there is any serial dependence remaining after we have fitted the GARCH (1,1).

For Bulgaria, the residuals and squared residuals of P1 exhibit autocorrelation, thus suggesting the model is not a good fit. Also the ARCH tests indicate serial dependence on the 12th and 24th lag. The residuals of P2 do not indicate any autocorrelation but serial dependency is found at the 24th lag.

Table 7: Estimated GARCH (1,1) results

		α_0	α_1	α_2	$\alpha_1 + \alpha_2$	$Q^1(24)$	$Q^2(24)$	ARCH LM (12)	ARCH LM (24)
Bulgaria	R	0.0003(0.744*)	0.6063(0.001***)	0.3936(0.001***)	0.9999	18.9881(0.753)	18.3911(0.784)	73.4600(0.000***)	4.3409(0.999)
	P1	0.0000(0.003***)	0.9732(0.000***)	0.0267(0.652)	1.0000	153.364(0.000***)	123.628(0.000***)	36.8537(0.000***)	38.0423(0.034**)
	P2	0.0000(0.200)	0.5824(0.073*)	0.4176(0.025**)	1.0000	31.5268(0.139)	21.4911(0.610)	0.3100(1.000)	70.6242(0.000***)
SA	R	0.0002(0.634)	0.0305(0.823)	0.7176(0.232)	0.7527	30.3817(0.172)	16.7405(0.860)	9.7673(0.636)	18.0150(0.802)
	P1	0.0000(0.138)	0.6775(0.002***)	0.2557(0.035**)	0.9335	26.4052(0.333)	22.3728(0.557)	22.5703(0.031)	29.0115(0.219)
	P2	0.0002(0.473)	0.0639(0.643)	0.6721(0.097*)	0.7361	132.238(0.000***)	26.7557(0.316)	8.2170(0.767)	-
	P3	0.0002(0.078*)	0.3140(0.271)	0.0000(1.000)	0.3141	24.1400(0.454)	20.7567(0.653)	3.2366(0.9936)	4.7212(0.999)
US	R	0.0000(0.729)	0.2045(0.012**)	0.7711(0.000**)	1.000	85.9573(0.000***)	37.8390(0.036**)	37.839(0.036**)	28.9161(0.223)
	P1	0.000(0.076*)	0.3815(0.029**)	0.0000(1)	0.3816	26.1286(0.347)	16.5298(0.868)	30.6797(0.002***)	31.275(0.146)
	P2	0.000(0.000)***	0.7080(0.000***)	0.2919(0.000***)	1.0007	69.2495(0.000***)	44.4552(0.006***)	37.1504(0.000***)	37.9018(0.035**)

Note: Q^1 is the Q statistic for residuals from the GARCH (1,1): Q^2 is the squared residuals from the GARCH (1,1); ARCH LM test statistic for the 12th and 24th lag; figures in parenthesis are p values; and ***, ** , * Indicates two tailed significance at 1%, 5% and 10% significance levels respectively

For SA, the residuals of P2 appear to be highly autocorrelated, whereas the squared residuals indicate no autocorrelation. The ARCH effects further indicate no serial dependence at lag 12; however the 24th lag could not be obtained due to insufficient degrees of freedom for the regression. However, the presence of autocorrelation in the estimated conditional variances is not a problem because the variables emanating from here are estimated through the GMM approach, which treats autocorrelation.

For the US, both the residuals of the excess return and P2 exhibit autocorrelation, whereas the squared residuals indicate autocorrelation for the excess returns only. The ARCH test at the 12th lag indicates serial dependency across all variables, whereas serial dependency is only found at the 24th lag for P3.

5.4 The Generalised Method of Moments

We employ the GMM to extract the parameters of our model. The residuals estimated under the GARCH (1,1) model are used as proxy for macroeconomic risk factors. The conditional variances and conditional covariances, together with a constant are used to construct a set of instruments. Table 8 displays the GMM results as well as the J-test. The J-Test is performed under the null hypothesis that the instruments are uncorrelated with the error term as well as the satisfaction of the moment conditions and instruments satisfying the underlying GMM.

Our results indicate that, in general that across the developing economy, the macroeconomic risk factors do not have an explanatory power on excess returns and conditional variance of excess returns thereof. For the US economy, as a representative economy, the first retained principal component appears to weakly explain the conditional variance in excess returns. The J-test indicates that we fail to reject the null hypothesis of no correlation between the instruments and the error term.

In table 8 we present the breakdown of these results and the interpretation thereof; The table shows that the real economy and business cycles (proxied by GDP growth rate and industrial production index), price stability (proxied by the GDP deflator), exchange rates and interest rates do not explain developing country REIT returns represented by Bulgaria and South Africa, as well as in developed markets, represented by the US.

However unlike the developing markets, changes in industrial production and inflation are important variables that affect the conditional variance of REIT returns in the US.

Furthermore, the results indicate that the change in GDP and currency exchange rate did not significantly load into any of the retained principal components for the US, which may imply that investors do not regard them as important macroeconomic variables informing their decisions.

Table 8 : GMM estimates

Excess Return Equation	**Panel (A)**		
Parameter	**Bulgaria**	**SA**	**US**
α^{*}_{mi}	-0.022 (0.517)	-0.049 (0.000***)	-0.004 (0.0612)
b_{i1}	-4.217 (0.503)	0.568 (0.781)	-21.225 (0.344)
b_{i2}	1.889 (0.507)	-0.496 (0.224)	-6.886 (0.541)
b_{i3}		-0.224 (0.823)	
J-Test	1.326 (0.250)	0.757 (0.860)	0.078 (0.78)
Variance Equation	**Panel(B)**		
Parameter	**Bulgaria**	**SA**	**US**
$\boldsymbol{\alpha_{ii}}$	0.006 (0.033***)	0.001(0.000***)	0.005 (0.001***)
b_{i1}	0.315 (0.550)	0.001 (0.978)	3.960 (0.064*)
b_{i2}	-0.081 (0.742)	0.001 (0.661)	0.843 (0.260)
b_{i3}		0.008 (0.260)	
J-Test	0.164 (0.685)	1.491 (0.684)	0.091 (0.763)

Notes: The estimated GMM equations are $E_{t-1}(R_{it}) = \delta_{Mi} + \sum_{j=1}^{k}\sum_{w=1}^{k}\beta_{ij}\beta^{*}_{Mw}h_{jwt-1}$ (results in panel A) and $VAR_{t-1}(R_{it}) = \alpha_{ii} + \sum_{j=1}^{k}\sum_{w=1}^{k}\beta_{ij}\beta_{iw}h_{jwt-1}$ (results in Panel B) where R_{it} is the excess return, and $VAR_{t-1}(R_{it})$ is the conditional variance, $h_{j,t-1}$ is the first lag of the conditional variance of the principal components and β_{ij} is the coefficient we estimate. We report results of only the variance terms of the two equations. Figures in parenthesis are p-values, and ***, **, * indicate statistical significance at 1%, 5% and 10% levels respectively.

Table 9: Macroeconomic factor relations with REIT excess returns

Country	Macroeconomic risk factors	Retained Principle Component	Sign	Relationship of macroeconomic risk with excess returns on REITs stock Significance
Bulgaria	Conditional variance of INFLC, PRLINR	P1	-	×
	Conditional variance of GDPG, INDPG, EXCHC	P2	+	×
SA	Conditional variance of GDPG	P1	+	×
	Conditional variance of INDPG, INFLC, PRLINR	P2	+	×
	Conditional variance of EXCHC	P3	+	×
US	Conditional variance of GDPG, EXCHC	N/A	N/A	N/A
	Conditional variance of INDPG, INFLC	P1	+	✓
	Conditional variance of PRLINR	P2	+	×

GDPG = Growth in Gross Domestic Product; INDPG = Growth in Industrial Growth Production; INFLC = Change in Inflation; EXCHC = Change in Exchange Rate; PRLINR = Prime Lending Interest Rate; figures in parenthesis are ***p*** values; and ***, ** , * Indicates two tailed significance at 1%, 5% and 10% significance levels respectively; +/ - indicates the direction of the macroeconomic variable with excess returns; ✓/× indicates whether the relationship of the macroeconomic variable with the excess return is significant or insignificant accordingly

Chapter 6: Conclusion

The main aim of this paper was to investigate the relationship between the expected risk premia, the conditional volatilities of the risk premia and macroeconomic risk factors of REITs. The study also reported the comparison of these results between developing economies (Bulgaria and South Africa) and developed economies (the US).

The study would contribute towards the understanding of risk and pricing of macroeconomic factors in REIT stocks across developing economies and developed economies.

The macroeconomic risks on REIT excess returns were proxied by conditional variances of macroeconomic variables obtained from the GARCH (1,1) model. In Bulgaria, the GARCH coefficients were significant for the excess return and retained principal components. We found that conditional volatility is time- varying in this market.

For SA, the results indicate that the majority of the GARCH (1,1) coefficients are not significant for the excess returns and retained principle components except for the first retained principle component (P1).

In the US, it is found that most of the GARCH (1,1) coefficients are significant, therefore indicating time-varying conditional volatility.

Furthermore, we established the linkage between the conditional volatilities of macroeconomic variables and REIT returns. The GMM was employed with the conditional variances serving as a proxy for macroeconomic risk and excess returns to estimate our factor model. In all three markets, none of the macroeconomic risk factors was able to explain excess returns on REITS. However the study finds the study finds a positive relationship between the industrial growth production and inflation and the variability of returns (conditional variance) for the US market.

In the Bulgarian market, the macroeconomic risks GDPG, INDPG and EXCHC were found to be significant and have a positive relation with excess returns. In South Africa, INDPG, INFLC and PRLINR were found to be significant and have a positive relationship with excess returns. In the US, only the PRLINR was found to be significant and positively related to the excess returns.

REIT portfolio managers and investors should take into consideration the fluctuations of these variables as they may accentuate volatility in REIT returns.

Further work on a global scale can be undertaken when the availability of more REIT indices in emerging markets are established. Alternatively this relationship between macroeconomic risks and REITs can be employed on a national level relating them to internal factors of different companies.

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