EFFECT OF MACROECONOMIC SHOCKS ON REITs RETURNS

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DECLARATION

I declare that this work has not been previously submitted and approved for the award of a degree by this or any other University. To the best of my knowledge and belief, the Research Project contains no material previously published or written by another person except where due reference is made in the Research Project itself.

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This Research Project has been submitted for examination with my approval as the Supervisor.

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OPERATIONAL DEFINITION OF TERMS

REITs- are securitised real estate investments that raise funds through public financing by issuing shares in the capital markets.

Shocks- are any unpredictable changes or disturbance in the economy that affect macroeconomic aggregates.

Macroeconomic Variables- this are factors that indicate the general performance of an economy.

LIST OF ABBREVIATIONS

REITs	Real Estate Investment Trust
APT	Arbitrage Pricing Theory
CAPM	Capital Asset Pricing Model
VAR	Vector Auto Regression
ADRL	Autoregressive Distributed Lag
VECM	Vector Error Correction Model
GDP	Gross Domestic Product
IR	Interest Rates
INF	Inflation Rate
ER	Real Exchange Rate
MS	Money Supply

ABSTACT

While REITs are useful investment vehicle that offer a variety of benefits, little is known about how they interact with the macroeconomic conditions in developing REITs markets. The objective of this study was to establish the effect of macroeconomic shocks on the returns on REITs in Malaysia, Taiwan and Turkey as well as the direction of the relationship between the macroeconomic shocks and REITs returns investments. This paper addressed this issue by looking at the interaction between REITs which are securitised real estate property and changes in the macroeconomic factors namely inflation rate, interest rate, exchange rate, money supply and gross domestic product for three developing REITs markets. This study used quarterly secondary data that covered the period between 2009(Q4)-2019(Q3) for all the three countries. This study involved the use of the theoretical framework which is the Arbitrage Pricing Theorem and pooled OLS empirical framework that was determined after carrying out various diagnostic test on the data. This study found out that GDP and Foreign exchange rates were the only significant variables in explaining REITs returns. From the study, there was 1.035784% increase in REITs returns whenever the local currency depreciated to imply that there was a heavy investment on REITs by parties outside the borders of the three countries. GDP growth and REITs returns had a negative relationship. Whenever the gross domestic product went up by a billion, then REITs returns would decrease by 25%.

CHAPTER ONE: INTRODUCTION

1.1Development of REITs and Their Importance

For a long time now, it has been believed that changes in the macroeconomic environment have had an impact on equity returns. To mitigate unforeseen changes in equity due to these factors, the security returns models have factored the impact of market-wide factors and firm-specific factors to price securities (H.Thomas, 1994). Having the Real Estate Investment Trusts market behave similarly to the stock market in terms of how they generate returns for investors, this study sought to investigate how changes in the macroeconomic environment impact the REITs market.

REITs are regulated real estate companies that own or finance income-generating real estate properties (Chan K. C., 1990). REITs work like a mutual fund in that they allow investors to pool funds together and distribute the realized income from the investment amongst themselves. The properties invested in are then entrusted to a trustee who can manage them himself or hire a management team (Allen, Madura, & Springer, 2000). Income is generated by leasing and renting out of properties and is collected in the form of rent. The leasing agreement with tenants helps to remove the uncertainty of cash flows. The income is distributed among the stakeholders inform of dividends.

REITs were first introduced in the USA in 1963 as a special purpose vehicle to increase the flow of funds from the public sector to the real estate sector thus helping to solve the deficit in the financing of real estate (Chan, 1990). The introduction of REITs bridged the gap between the average and wealthy investors by enabling the average investor to tap into investment in large scale commercial, residential and industrial properties (Richard Stooker, 2011).

In recent years, the real estate industry has been key in economic performance. The REIT market has seen progressive expansion with now having a market capitalization of US 1.7t as in 2017 (EY Global Real Estate, 2017) and with more than 34 countries having REITs markets. This growth has brought up a debate on whether REITs are fads or they are here to stay (V Chandrashekaran, 1999). According to (Danny, Nardo, & John, 2009) the growth of REITs has been contributed by investors who are interested in holding liquid assets that can be marked to market. Investors

perceive REITs to be more liquid than direct real estate as they have short trading settlement for four days.

Among investors, REITs are popular as they are perceived to be tax-efficient since income derived from REITs investment is exempted from tax deductions depending on the regulations of each country (Steers & Cohen, 2015).Therefore, investors perceive REITs to be tax efficient as they help them take home as much of their earnings as possible by avoiding double taxation.

REITs are required to distribute a majority of its taxable net income to shareholders and must adhere to certain restrictions on their operations, organization, and ownership to acquire a tax exemption status. These restrictions are usually dependent on the regulations of each country (Steers & Cohen, 2015). In Most countries, REITs companies are exempted from paying corporate tax under the condition that they redistribute 90 per cent of their income amongst shareholders (Organisation For Economic Co-operation and Development, 2007).

REITs stocks are better at diversification than common stocks. Chandrashekaran (1999) shows that the correlation between REITs stocks with the general stock market tends to be much higher than the correlation of real estate indices with stock markets. William L. Burns (1982) concluded that REITs, in particular, equity REITs, offer investors good diversification benefits than stocks did. REITs can diversify risk by acquiring a varied investment portfolio thereby demonstrating a quite stable investment return.

REITs have elements of real estate in them and can, therefore, be used to hedge against inflation. The inflation hedging properties of REITs have been discussed widely by various authors such as Grissom, Hartzell & Liu (1987), Yobaccio, H. Rubens, & Ketcham (1995), Chan (1990) show different levels of hedging abilities levels of REITs but they all conclude that investment in real estate provided a positive hedge against actual inflation. Linneman & Gyourko (1998) showed that REITs can be used to hedge against unexpected inflation.

Hao, Chang, Lee, & Chen (2016) contributes to the exploration to clarify macroeconomic factors' influence on the real estate investment trust index in three Asian countries which are Japan, Singapore and China. Their results show that there is a significant negative relationship between interest rates and the REIT index. In China, Singapore and Japan, a unidirectional relationship in

which shifts in inflation rates result in changes in the REITs index. The effects of wealth accumulation on REITs index are only evident in Singapore.

This study, therefore, sought to shed more light on how REITs interact with macroeconomic shocks in a developing country set up. This will guide investors as well as policy makers in emerging economies such as Kenya.

1.2 Problem Statement

As discussed above, REITs have a lot of benefits that investors can gain from including them in their portfolios. Among the reason investors invest is to create wealth and protect their assets from losing value with time. REITs have the benefits of diversifying away risk better than stocks do and therefore maximize returns by reducing the risk exposure in the portfolio. REITs come with stable income stream which is as a result of the tenant agreement and they therefore remove the uncertainty of cash flows. REITs distribute their income inform of dividends which are issued to investors and are not subject to taxation depending on the regulations of different countries and because of this they are perceived to be tax efficient and therefore allow investors to take home much of the returns. REITs act as partial hedges against inflation and they therefore prevent REITs from losing value as a result of inflation.

In developing REITs markets, REITs are new investment vehicles and most investors do not know how they interact with macroeconomic variables. Since REITs do not exist in isolation, but in an economic space, their performance should be affected by macroeconomic variables which impact on their returns. Due to in-availability of information on how REITs interact with macroeconomic variables, most investors in developing REITs markets shun away from REITs. This is because most investors are risk averse and they therefore prefer investing with what they know and are familiar with and avoid ambiguous investments. For this it is prudent to look at how REITs interact with macroeconomic variables in order help investors in developing REIT markets in making their investment decisions. This issue can expound by checking on how REITs returns react to changes in macroeconomic variables in comparator countries.

This study sought to analyse the impact of macroeconomic shocks on the REITs market looking at the case of Malaysia, Taiwan which are developing countries and Turkey which is a developed

country. This will guide investors as well as policy makers on the implication of macroeconomic changes in emerging REITs economies.

1.3 Research Objective

The general objective of the study was:

i) To establish the effect of macroeconomic shocks on REITs investment in Malaysia, Taiwan and Turkey

ii) To evaluate the direction of the relationship between macroeconomic variables shocks and REITs returns in Malaysia, Taiwan, and Turkey.

1.4 Research Questions

To achieve the objectives the study answered the following questions:

i) What was the effect of macroeconomic shocks on the returns on REITs investment in Malaysia, Taiwan, and Turkey?

ii) What was the direction of the relationship between shocks on macroeconomic variables and REITs investments returns in Malaysia, Taiwan, and Turkey?

1.5 Scope of the study

This study covered three countries which are Turkey, Malaysia and Taiwan.

1.6 Significance of the study

This study would be of value to equity real estate investors who may use the findings in establishing major macroeconomic aspects influencing REITs indices. The findings would also be useful to REITs investors who would use the study recommendations to determine the optimal time to invest given specific economic situations. The findings would also be of value to portfolio managers and investment analysts who may use the study recommendations, especially in the emerging markets to come up with strategies that would mitigate the adverse effects of price changes due to changes in the macroeconomic environment. This study also contributed to the body of literature on the impact of macroeconomic shocks on REITs returns.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter presents the existing literature on the impact of macroeconomic shocks on the returns from REITs. Section 2.2 begins by discussing the theoretical arguments on macroeconomic shocks on REITs returns while section 2.3 presents an empirical review of the previous studies on this topic followed by a literature review which summarises the entire chapter.

2.2 Theoretical Literature Review

2.2.1 Capital Asset Pricing Model

The model was developed by Jack Treynor in 1962 and later improved by William Sharpe in 1964 and Linter in 1965. The model says that there is a linear relationship between risk and return of an asset. Total risk that an asset is exposed to can be classified into two; systematic risk or market risk and unsystematic risk (Josef Lakonishok, 1986). Systematic risk is risk which affects all assets in the market and cannot be diversified away while unsystematic risk is risk which is inherent in an asset or specific to a firm and can therefore be reduced through diversification or an investor not including the given asset in their portfolio (Enzo Busseti, 2010). Since unsystematic risk can be avoided or reduced, CAPM says that the only risk that is relevant in determining the returns of an asset is the market risk (Sharpe, 1964). The CAPM is specified as shown in equation 2.1

$$E(R_a) = R_f + \beta_{am}[E(R_m) - R_f] \quad (2.1)$$

Where $E(R_a)$ is the expected return of an asset which investors use to get the value of an asset. R_f represents the risk-free rate and R_m is the market risk. $[E(R_a) - R_f]$ which is the market risk premium and represents the returns that are excess of the risk-free rate. β_{am} is the market beta for asset a and represents market risk and is always equal to one. The beta measures the sensitivity of an asset to the market portfolio or how risky an asset is when compared to the market portfolio (Eugene F. Fama, 2004).

Since CAPM only deals with pricing of the systematic risk, then all assets with the same systematic risk should have the same expected return or alternatively, prices of assets in a capital market

should adjust until all assets with equivalent risk get the same expected returns. If an asset has $\beta_i > 1$ then the asset is said to be risky than the market. CAPM is built on various simplistic assumptions which are hard to hold in the real life and are used to criticise the model (Eugene F. Fama, 2004). In CAPM model, the following assumptions are used; Investors have homogeneous expectation on the of risk and returns. It assumes that the market is frictionless so that one can invest and diversify their position without incurring transaction costs and taxes. It also assumes that investors can borrow or lend unlimited amounts of money at the risk-free rate of which it's impossible, (Fischer Black, 1972),while in reality it's only the government which borrows at that rate this is because the risk of an individual investor is more than that of the government and therefore in reality the slope of the equation is always greater than the risk-free rate. It also assumes that investors hold the diversified portfolios which represent the market portfolio which implies that investors want to hold portfolios that track the market (Roll Richard, 1977). The market portfolio must include all the assets in the market and the return on all these assets are difficult to observe (Roll Richard, 1977).

CAPM which is a result of simplistic assumptions, that show how an ideal world should be, is attractive and offers powerful and intuitively pleasing predictions about how to measure risk and relation between expected return and risk (Eugene F. Fama, 2004) but in its' empirical application it has failed to work. (Eugene F. Fama, 2004) state that the empirical record of the model is so poor-poor enough to invalidate the way it's used in application. (Fischer Black, 1972) showed that the Betas used for individual assets might be imprecise and this shows that the expected excess return on an asset is not always proportional to the beta. They conclude that this provides strong basis to reject the model.

The theory informs the study by saying that the REITs returns are a function of one market risk but does not say which risk it is.

$$Reits\ Returns = f(market\ risk) \tag{2.2}$$

2.2.2 Arbitrage Pricing Theory

Arbitrage Pricing Theory (APT) is an equilibrium model that was formulated by Ross in 1976 (Stephen A. Ross, 1976). The theory was developed as an alternative to the CAPM (Capital Asset Pricing Model) and it suggests that there is a linear relationship between returns of an asset and risk from various factors (Stephen A. Ross, 1976). Whenever there's a linear relationship, then the

market is said to be in equilibrium and there can only be one price of an asset at any particular time. When macroeconomic variables are used as the factors in the APT return generating process, the resulting APT model is described as being a macroeconomic variable model (Su-Jane Chen., 1997). The macroeconomic factors act as proxy of risk that the asset is exposed to (Stephen A. Ross, 1976). The APT model can be represented in an equation in the form below:

$$E(R_a) = R_f + \beta_1 f_1 + \beta_2 f_2 \ldots . + \beta_n f_n \quad (2.3)$$

Where $E(R_a)$ represents the expected return on the asset while R_f represents the risk-free rate or the expected return if the asset wasn't exposed to any risk. And f_i are the specific factors that contribute to the risk of the asset.

β_i shows how sensitive the asset price is to the given factor i.
β_i is obtained by regressing past returns of the asset on the specific factor (Chen, 1986).
Since REITs do not exist in a vacuum but in a broader market and macroeconomic environment, movements in macroeconomic variables have a potential to cause fluctuations in the expected returns. The APT being a multifactor model takes into account several risk features that can affect REITs returns such as surprises or changes that come inform of shocks which impact on prices such as inflation rate, interest rates and gross domestic product (Ross, 1991).

Any economic factors that systematically affect the expected future cashflow on the assets (REIT) and the discount factors will have an impact on assets price and thus the returns (Chen, 1986). For example, interest rates affect the cost of construction and valuation of REITs properties (JM Keynes, 1971) as well as the saving rates of individuals while inflation affects the purchasing power of individuals (Robert E.Lucas, 1980). Whenever inflation is higher, it becomes expensive for people to buy real estate or invest in REITs. Whenever there is an increase in real economic activities, real output increases from various sectors of the economy which results to an increase in demand for commercial and residential real estate. Due to the increased demand and limited supply of real estate, vacancy in the real estate decrease and this lead on rental income increasing thus increasing REITs returns as well.

Since the Real Estate is affected by a number of variables, the APT model can be important in determining the return generating function of REITs. Since returns in APT are dependent on the factors used, it is possible to get different returns depending on the factors used. The APT

framework is built on several assumptions : (i) For any given investment, investors will always prefer more returns (ii) Investors will always seek to be compensated for every risk they partake and are therefore termed to risk averse (iii) Investors have homogeneous risk expectations (iv) the Capital market is frictionless as it has transaction cost and taxes.

The advantage of using the APT model is that the variables are observable, and the associated betas and risk premiums can be easily interpreted (Chen and Jordan). The APT suffers from one major throwback that there exists no formal justification that guides on the appropriate variables to include in model.

The APT inform this study by stating that the expected REITs returns are a function of macroeconomic factors, but it does not specify what type of market risk should be used.

$$RR = f(Market\ risk\ 1, market\ risk\ 2, \dots market\ risk\ n) \quad (2.4)$$

2.3 Empirical Literature

McCue & King (1994) explored the correlation between the macroeconomy and real estate returns in the United States. In the study, monthly Equity REITs from 1972-1991 are used to represent real estate returns. The equity REIT returns are regressed against returns from the Standard and Poors 500 Stock Index, saving the residuals. These residuals are used in the analysis since this technique controls for the covariance between equity REIT returns and the overall stock market and thus the residuals represent pure industry effects. The residuals are then employed in an unrestricted vector autoregressive model with the macroeconomic variables to test for relationship with the macroeconomy. The macroeconomic variables used are Consumer Price Index to represent prices changes, three-month Treasury bill rate for the short-term nominal rate, Federal Reserve's Industrial Production Index for output, and the McGraw Hill Construction Contract Index as a proxy for investment variable. The study observed that the real estate variable is significant in both the investment and output equations implying a feedback relationship. From the study it is also observed that macroeconomic shocks account for almost 60% of the variation in the real estate returns. The study identifies one strong relationship between real estate returns and nominal interest rates. There exists a correlation between output & investment and real estate returns as well implying shocks contribute to the movement of real estate prices. McCue and King apply equation 2.4 to represent REITs returns as a function of various macroeconomic factors which can be summarised by the equation;

$$RR = f(nominal\ interest\ rates, output, investment, inflation) \quad (2.5)$$

McCue and King inform the current study on the choice of macroeconomic variables to use which are inflation and interest rates. The difference between the McCue and King and the current study is that the time periods used are not the same where McCue and King study covered the period between 1972-1991 in United States of America while the current study covers the period 2008-2018 for Malaysia, Turkey and Taiwan.

Karolyi & Sanders (1998) examined the predictable components of stocks, bonds, and Real Estate Investment Trusts. The study used monthly data, from January 1983-September 1995, for stocks returns, bonds returns, REITs returns, interest rates and inflation rates. The study employed APT which is a multi-beta asset pricing model to measure the predictability. The results showed that the degree of predictability varies between stocks, bonds, and REITs. The stock market risk

premium is highly important in capturing the predictable variation in stock portfolios, and the bond market risk premiums which capture the term and risk structure of interest rates are important in capturing the predictability of the variation in bond portfolios. For REITs, however, both have comparable return predictability to stock portfolios. The study concludes that there is an important economic risk premium for REITs that are not captured by the traditional single-beta asset pricing models. Karolyi and Sanders use equation 2.4 to represent REITs returns as a function of interest rates and inflation,

$$RR = f(interest\ rate, inflation\ rate) \tag{2.6}$$

and inform the current study on the choice of variables to use of which are inflation rates and interest rates as well as the use of APT (Arbitrage Pricing Theory) to show how changes in the macroeconomic variables impact on REITs returns. The current study uses exchange rates as an additional macroeconomic variable. Karolyi and Sanders cover the period between 1983 to 1995 in United States of America while the current study covers the period 2008-2018 for Malaysia, Turkey and Taiwan.

Brooks & Tsolacos (1999) explored the impact of Economic and Financial Factors on UK Property Performance. The study employed a Vector Autoregressive Model and uses monthly data from December 1985 - January 1998. The study used changes in unemployment rate, nominal interest rate, spread between long- and short-term interest rates, unanticipated inflation as well as dividend yield to show how returns in real estate change. From the study, they concluded that identifying the factors that determine UK property returns over the twelve year were difficult to determine. The results also showed that the historical prices of a property highly influence the current pricing of the properties. Brooks and Tsolacos use equation 2.4 to show that the return generating function of REITs returns is;

$$RR = f(unemployment, nominal\ interest\ rate, yield\ curve, unticipated\ inflation) \tag{2.7}$$

and inform the current study on the uses of interest rates and inflation rates as macroeconomic variables. Brooks and Tsolacos differ with the current study on the time period and country of study. Brooks and Tsolacos studied the UK property market for the period between 1985-1998

while current study covers the period 2008-2018 for Malaysia, Turkey and Taiwan. This study included an additional variable which was exchange rates.

Yunus (2012) explored the dynamic interactions among securitized property markets, stock markets and key macroeconomic variables in ten developed countries. The study used quarterly data for the period between 1990- 2007. The macroeconomic variables that were used in the study are GDP, Money Supply, Inflation and 10-year government bond yield quarterly. The study employed the Vector Error Correction Model, and the results indicated that each property market was co-integrated with its respective stock market and macroeconomic shocks in the long run. The property market was also influenced by the overall economy in the short run. Further analysis showed that shocks to GDP, money supply, stock markets, and inflation induce a positive response in the real estate returns as shocks to long-term interest rates to induce a negative response but at different levels given specific countries. Yunus uses equation 2.4 to show that the return generating function of REITs is;

$$RR = f(GDP, inflation, money\ supply, bond\ yield) \quad (2.8)$$

and informs the current study on the choice of macroeconomic variables to use which include GDP and inflation. Yunus tries to show the interaction between the macroeconomic variables and securitised property market while the current study tries to show the impact of changes in macroeconomic variables on REITs returns. Also, the two studies differ on the time period of the respective studies where. Yunus study covers the period between 1990 to 2007 in United Kingdom while the current study covers the period 2008-2018 for Malaysia, Turkey and Taiwan.

Hao, Chang, Lee & Chen (2016) contributed to the exploration to clarify macroeconomic factors' influence on the real estate investment trust index in three Asian countries which are Japan, Singapore and China. They used monthly data from 2008 -2012 for the three countries and the macro variables used were inflation and interest rates. The study employed an Autoregressive distributed lag (ARDL) model to test the existence of a long-run equilibrium between real estate investment trust index and the interest rate, inflation, and stock index. They also used Granger non-causality. The results showed that there was a significant negative relationship between interest rates and the REIT index. In China, Singapore and Japan, a unidirectional relationship in which shifts in inflation rates result in changes in the REITs index was observed. The effects of

wealth accumulation on REITs index were only evident in Singapore. Fang, Chang, Lee and Chen apply equation 2.4 to show that the return generating function;

$$RR = f(inflation\ rate, interest\ rate), \tag{2.9}$$

inform the current study on the macroeconomic variable which are inflation rates and interest rates. Fang, Chang, Lee and Chen cover the period between 2008 to 2012 in Japan, Singapore and China while the current study covers the period 2008-2018 for Malaysia, Turkey and Taiwan.

2.4 Literature Overview

The reviewed theoretical literature shows that the relationship between REITs and the macroeconomy can be modelled using CAPM and APT model. This study applies the APT model. The APT model is preferred to the CAPM as it does not make unrealistic assumptions and also acknowledges that REITs are not affected by only one type of risk. The current study adopts the APT due to these advantages.

In the reviewed empirical literature, different empirical methods have been used to study how macroeconomic variables affect REITs returns. These methods include VAR, ADRL and VECM. This study will use the VECM model to try and establish the impact of macroeconomic variables on REITs returns. From the previous studies it has been established that different macroeconomic variables affect the performance of REITs and hence their returns.

The various studies touched on various time periods. McCue and King, Karolyi and Sanders, Brooks and Tsolacos, Fang, Chang, Lee and Chen used monthly data from 1972-1991, 1983-1995, 1985-1998 and 2008-2012 respectively. Yunus used quarterly data for the period 1990-2007. From the reviewed empirical literature, various variables were used, interest rates, output, inflation, investment, unemployment, GDP, money supply and the yield

Due to the integration of the world economy, it is important to check at how changes in exchange rates may affect REITs investments. This has not been done before and therefore this study sought to do so. One of the major factors that brought about the Asian Financial crisis was that exchange rates had not been incorporated in pricing of property REIT (Yilmaz Akyüz, 2000).

In most studies, the researchers have looked at the impact of macroeconomic factors on REITs return where interest rates and inflation rates have been the major According to (Chan K. C., 1990)

the macroeconomic factors that have an impact on REITs returns are inflation rate, interest rate and GDP.

CHAPTER THREE: METHODOLOGY

3.1. Introduction

This chapter discussed the research design employed in an attempt to gather the necessary information to carry out the study. It described the type of data used and their sources. It described the research methodology employed; the economic model used as well as the econometric techniques used in the analysis of the data in this study. This chapter outlined how the study sought to answer the research questions.

3.2. Research design

Research design is defined as the framework of an investigation that intends to seek answers to research questions. It is, therefore, a blueprint for collection, measurement and analysis of data (Golafshani, 2003). This study used a descriptive research design. A descriptive research design is used when a study seeks to show the effect caused by the independent variable on the dependent variable (Centre For Innovation in Research and Teaching). This study particularly sought to determine the impact of changes in macroeconomic variables; inflation rates, interest rate, GDP, exchange rates on REITs returns in developing REIT markets of Turkey, Taiwan, Malaysia. This makes it suitable for this study. This study also takes on a quantitative research methodology since it applies mathematical models to analyse the data.

3.3 Theoretical Framework

This study was anchored on the APT model. The APT model is an equilibrium model and states that there is a linear relationship between the returns on an asset and various macroeconomic risk factors. The APT model is represented by the formula below;

$$E(R_a) = R_f + \beta_1 f_1 + \beta_2 f_2 \ldots . + \beta_n f_n \qquad (3.1)$$

Where $E(R_a)$ represents the expected return on the asset while R_f represents the risk-free rate or the expected return if the asset wasn't exposed to any risk. And f_i are the specific factors that contribute to the risk of the asset.

β_i shows how sensitive the asset price is to the given factor i.

β_i is obtained by regressing past returns of the asset on the specific factor.

The APT framework is built on several assumptions : (i) For any given investment, investors will always prefer more returns (ii) Investors will always seek to be compensated for every risk they partake and are therefore termed to risk averse (iii) Investors have homogeneous risk expectations (iv) the Capital market is frictionless as it has transaction cost and taxes.

The APT model is preferred to the CAPM since it is not based on simple and unrealistic assumptions that are hard to hold in the real world. Also, APT takes into account other forms of risk that may affect the returns of an asset.

3.4 Model Specification.

This study adopts the APT model and domesticates it to fit the current study that tries to establish the effect of macroeconomic shocks variables of interest rate, exchange rate, inflation rate and GDP on REITs returns of Turkey, Malaysia and Taiwan.

The APT model formula is modified into;

$$RR = \beta_0 + \beta_1 GDP + \beta_2 IR + \beta_3 INF + \beta_4 ER + \beta_5 MS + \varepsilon_i \quad (3.2)$$

Equation (3.1) is domesticated to fit the study and gives rise to;

$$(RR_{it}) = \beta_0 + \beta_{i1} GDP_{it} + \beta_{i2} IR_{it} + \beta_{i3} INF_{it} + \beta_{i4} ER_{it} + B_{i5} MS_{it} + \varepsilon_{it} \quad (3.3)$$

Where:

RR_{it} is the Real Estate Investment Trusts Index return for country i at time t

GDP_{it} is the Gross Domestic Product for country i at time t

IR_{it} is the interest rates for country i at time t

INF_{it} is inflation rates for country i at time t

ER_{it} is the exchange rates for country i at time t

MS_{it} is the exchange rate for country i at time t

β_0 is the intercept

β_{it}= parameters to be estimated. They show the level of sensitivity of REITs Returns with respect to the independent variables for each country i at time t.

ε_{it}= error term for country i at time t.

As the model depicts, REITs Returns are the endogenous variable, while GDP, IR, INF,MS and ER are exogenous variables.

The data used in this study is panel data which is a combination of both time series data and cross-sectional data.

To understand the effect of the macroeconomic shocks to the REITs Returns, the long run relationship is expressed in the following functional form:

$$(RR_{it}) = \alpha_i + \beta_{i1}GDP_{it} + \beta_{i2}IR_{it} + \beta_{i3}INF_{it} + \beta_{i4}ER_{it} + B_{i5}MS_{it} + \mu_{it} \quad (3.4)$$

Where:

α_i = the intercept of country i

RR_{it} is the Real Estate Investment Trusts Index return for country *i* at time t

GDP_{it} is the Gross Domestic Product for country *i* at time t

IR_{it} is the interest rates for country *i* at time t

INF_{it} is inflation rates for country *i* at time t

ER_{it} is the exchange rates for country *i* at time t

MS_{it} is the exchange rate for country *i* at time t

μ_{it}= Error term of country i at time t

In panel data regression, a test known as the Hausman test is done in order to determine the type of model to be used which can either be the fixed effects model or the random effects model. The Hausman test seeks to know if there are other omitted variables that might be in the error term that are related to the explanatory variables. The null hypothesis of the Hausman test states that there's no correlation between the two while the alternative hypothesis states that there exists a correlation between the two. Whenever the null hypothesis is true the random effect is preferred while when the alternative hypothesis is true then the fixed effects model is used (Torres-Reyna).

If from the Hausman test it is established that the fixed effects is the most suitable model, then the regression model above is reconstructed to be:

$$(RR_{it}) = \alpha_i + \beta_{i1}GDP_{it} + \beta_{i2}IR_{it} + \beta_{i3}INF_{it} + \beta_{i4}ER_{it} + B_{i5}MS_{it} + \eta_i + \varepsilon_{it} \quad (3.5)$$

RR_{it} is the Real Estate Investment Trusts Index return for country *i* at time t

GDP_{it} is the Gross Domestic Product for country i at time t

IR_{it} is the interest rates for country i at time t

INF_{it} is inflation rates for country i at time t

ER_{it} is the exchange rates for country i at time t

MS_{it} is the exchange rate for country i at time t

ε_{it} = the error term of country i at time t

η_{it} = Firm specific effects for country i

3.5 Definition and measurement of variables

This study used interest rates, inflation rates, exchange rates, money supply and GDP as the independent variables. The choice of these variables was informed by the various papers that have covered the same topic. The use of interest rates was informed by Brooks & Tsolacos S (1999), Hao Fang, Tsang-Yao Chang, Yen-Hsien Lee & Chen (2016), Karolyi Andrew & Sanders B. Anthony (1998) and McCue & King (1994). The use of inflation rate was informed by Yunus N (2012), Brooks & Tsolacos S (1999), Hao Fang, Tsang-Yao Chang, Yen-Hsien Lee & Chen (2016) Karolyi Andrew & Sanders B. Anthony (1998) while the use of GDP was informed by Yunus N (2012).

This paper contributes to the existing literature by looking at how exchange rates affect REITs returns.

Table 3.1 definition and measurement of variables

VARIABLE	DEFINITION	MEASUREMENT
RR	REITs Returns	Changes in prices of REITs in respective to the previous price
INF	Inflation Rate	The rate of change in prices of commodities in the economy
IR	Interest Rate	The rate charged on borrowed or loaned funds
ER	Real Effective Exchange Rate	The value of the domestic currency against the value of the US dollar
GDP	Gross Domestic Product	The value of all goods and services produced within the boundaries of a country

3.6. Data Analysis

This study conducted appropriate panel time series diagnostic tests which will be informed by the data.

To achieve objective one, a linear regression on equation (3.4) was estimated. This showed us the magnitude by which REITs returns changed due to the changes in the macroeconomic variables.

To achieve objective two, a linear regression on equation (3.4) was performed. This helped us to observe the direction of the relationship between the macroeconomic variables and REITs returns.

The study estimated equation (3.3) and (3.5) if it is established that there are fixed effects in the equation (3.3).

3.7. Data Collection, population and sampling

This study relied on secondary sources of time series data on REITs returns, real effective exchange rate, interest rate, inflation rate, money supply and GDP. Data on real effective exchange rate, interest rates, inflation, money supply and GDP of Turkey and Malaysia were obtained from World Bank Open Data. For Taiwan data was obtained from the National Statistics Republic of China (Taiwan). REITs index returns were obtained from Thompson Reuters DataStream for the three countries. For all the three variables used, the data was quarterly covering the period 2009(Q4) to 2019 (Q3).

The target population in this study was REITs securities in Turkey, Taiwan and Malaysia. Quarterly data was used from 2009(Q4) to 2019(Q3) from the Malaysian market. In Turkey the quarterly data was used form 2009Q4) to 2019(Q3) as well as in Taiwan. The variables of interest in this research were real exchange rates, interest rates, GDP, inflation rate, money supply and REIT returns in the three countries.

CHAPTER FOUR: RESULTS

4.1 Introduction

Included in this chapter are the findings of the estimation done during this research including the relevant diagnostic tests.

4.2 Summary statistics

This section includes measures of adjacency and the spread of the variables used. The panel data used was N* T and was from three countries covering quarterly time periods from 2009 (Q4) to 2019 (Q3) the. Table 4.1 shows the findings.

Table 4.1 Summary statistics

Variable	Mean	Std. Deviation	Minimum	Maximum	No. of Observations
REITS returns	-.7193103	9.861134	-.404	.2412	116
Gross Domestic Product	1644.95	1752.548	183.36	4795.58	120
Interest rates %	5.394833	5.381524	.89	25.88	120
Exchange rates (USD)	12.37983	13.03447	1.49	32.85	120

Inflation rates (%)	.2201667	.8287461	-1.44	6.3	120
Money Supply (USD)	13322.09	17301.4	490.79	45184.97	120

Source of data : Thompson Reuters data stream

In table 4.1, the data was a weakly balanced panel where all variables had almost the same number of observations during the time period of the study. This allowed for the use of dynamic panel data methods. The average REITs Returns was -0.7193103 with a standard deviation of 9.861134 which showed there's moderately a high dispersion of the observations from the mean to imply that most data points are far from the mean. The maximum and minimum REITs Returns were 0.2412267 and -0.4039735 respectively.

The average GDP value was USD 1644.95 billion while the standard deviation was 1752.548. The standard deviation was interpreted to mean that the data had a dispersion of USD 1644.95 billion from the mean value. Judging from the coefficient of variation of GDP which was 1.065, most GDP data points were centred around the mean. The maximum and minimum GDP value in the data was USD 4795.58 billion and USD 183.36 billion, respectively.

The average interest rate was 5.394833% while the standard deviation was 5.381524. The standard deviation implied that the dispersion from the average interest rate was 5.281524. The coefficient of variation was 0.9975 to imply that most data points were close to the mean. The maximum and minimum interest rates were 25.88% and 0.89% respectively.

The average exchange rates of all local currencies in USD were USD 12.37983 while the standard deviation was 13.03447. The standard deviation implied that the data had a dispersion of 13.03447 from the average conversion value in all countries. The coefficient of variation was 1.05289 and this was interpreted to mean that most data points were around the mean. The maximum and minimum exchange rates is USD 32.85 and USD 1.49 respectively.

The average inflation rate was 0.2201667% while the standard deviation was 0.8287461. The standard deviation was low implying that there's a small dispersion of 0.8287461 units from the mean inflation rate. This was interpreted to mean that most data points are centred around the mean. The maximum and minimum inflation rate was 6.3% and -1.44% respectively.

The average money supply was USD 13322.09 billion while the standard deviation was 17301.4. The standard deviation implies that the money supply values tend to disperse from the mean by 17301.4 units. The coefficient of variation of 1.2987 is small and this implies that most data points are around the mean. The maximum and minimum money supply value is USD 45184.97 billion and USD 490.79 billion, respectively.

4.3 Diagnostic Tests

4.3.1 Test for stationarity

Stationarity test is used to show if the mean and standard deviation of the variables are constant over time. Panel unit root test are performed on all variables to ensure that the results from running the model are not spurious.

The unit root test used is Im Peseran and Shin (IPS) which is an average of individual Augmented Dickey fuller test. The null hypothesis of the test is that the series is non stationarity while the alternative hypothesis suggests that part of the series is stationary.

Ho: All series are stationary

Ha: Some but not all of the series are stationary

REITs returns and interest rates were stationary at their first level while exchange rates, money supply and inflation were stationary at their first difference.

The null hypothesis is rejected when the p-value is less than or equal to 0.05. All the variables used are stationary after transformation.

Table 4.2 stationarity test

Variable	**P-value**	t bar	t tilde bar	z-t title bar
REITS returns	.00000	-6.6844	-4.5073	-6.6143
GDP	.00000	-6.9732	-4.6088	-6.8300
Interest rates	.00000	-3.1891	-2.7199	-2.7235
Exchange rates	.00000	-6.0369	-4.3069	-6.1751
Inflation rates	.00000	-5.9662	-4.3127	-6.1746
Money Supply	.00000	-5.4901	-4.0092	-5.5292

4.3.2 Hausman Test

Hausman test is performed to look for the best model between the fixed effects model and the random effects model. It does so by looking for endogenous regressors in the regression model which are variables explained by other independent variables in the model. The null hypothesis in the Hausman test is that the random effects model is the most preferred while the alternative is that the model is fixed effects.

Ho: random effects most preferred

Ha: fixed effects most preferred

Table 4.3 Hausman Test

	Coefficients		
	Fixed Effects	Random Effects	Difference
Gross Domestic Product	-0.2455657	-0.257428	0.0118623
Inflation Rate	0.4460139	-0.1346031	0.5806171
Interest Rate	-0.9448365	-0.2169374	-0.7278992
Exchange Rate	0.9447703	-1.035784	0.0910141
Money Supply	-0.163333	0.3447929	-0.5081258
Chi^2 (5)	9.63		
Prob>chi^2	0.0864		

According to the results in table 4.3, we fail to reject the null hypothesis since the p-value is greater than 0.05 significance level. This implies that the best model to use is the random effects model.

4.3.3 Breusch and Pagan Lagrangian multiplier test for random effects

The test is performed to see whether the random effects or pooled OLS should be used. In the test, the null hypothesis is that the variance of the random effect is zero. If the variance for random effects is zero and the p-value is one then the null hypothesis cannot be rejected hence the pooled OLS is used in the regression.

Table 4.4 Breusch Pagan Test

	Var	Sd= sqrt(Var)
REITs Returns	97.24196	9.861134
E	52.50376	7.239044
U	0	0
Chibar^2(01)	0.00	
Prob>chibar^2	1.0000	

According to the results in table 4.4, the pooled OLS was a better model than the random effects model. We inferred this by looking at the p-value results which was one. Due to this, we failed to reject the null hypothesis.

4.4 Empirical Results

It includes a detail explanation of the findings from the conducted regression.

4.4.1 Results from the Pooled OLS regression

From the Breusch Pagan test, the results indicate that the pooled OLS model is the best model to use. Table 4.5 has the results that were obtained from the pooled OLS.

Table 4.5 Pooled OLS Estimates

Source	SS	Df	MS	Number of observations	
				F(5,100)	17.4
Model	4939.19927	5	987.839853	Prob>F	0.0000
Residual	6243.62587	110	56.7602352	R-squared	0.4417
Total	11182.8251	115	97.2419577	Adj R-squared	0.4163
				Root MSE	7.5339
REITs Returns	Coef	Std Err	T	p>|t|	95% Conf. Interval
Gross Domestic Product	-0.257428	0.1153971	-2.23	0.028	-0.486118 -0.028713
Inflation rate	-0.134603	1.127656	-0.12	0.905	-2.369353 2.100147
Interest Rate	-0.216937	0.1621257	-1.34	0.184	-0.538232 0.104147
Exchange Rate	-1.035784	0.188596	-5.49	0.000	-1.409537 -0.662031
Money Supply	0.3447929	0.4693826	0.73	0.464	0.5854133 1.2749999
cons	1.82946	1.143528	1.6	0.113	-0.436743 4.095663

4.4.2 Test for Multicollinearity

Multicollinearity refers to a situation whereby two or more independent variables in a regression are linearly related. Multicollinearity increases the variance of the coefficient estimates hence making the model unstable. Variance inflation factor test was conducted to test for multicollinearity.

Table 4.6 VIF multicollinearity results

Variable	VIF	1/VIF
Exchange Rate	2.26	0.443264
Money Supply	2.24	0.445572
Inflation rate	1.82	0.550446
Interest rate	1.57	0.635272
Gross Domestic Product	1.17	0.858279
Mean VIF	1.81	

According to the results from table 4.6, it was concluded that there was no severe multicollinearity amongst the variables used. All the VIF were less than 5 which is the level of moderate multicollinearity.

4.4.3 Heteroscedasticity Test

Heteroscedasticity is the systematic change in the values of the error term in a regression over the range of the predicted variable. The White's test was used to test for heteroscedasticity.

The null hypothesis states that the data is homoscedastic to mean that the error terms are constant while the alternative hypothesis is that the data is heteroscedastic.

Ho: Data is homoscedastic

Ha: Data is heteroscedastic

Table 4.7 White Test

Source	Chi^2	Degree of freedom	p-value
Heteroskedasticity	32.45	20	0.0388
Skewness	7.04	5	0.2173
Kurtosis	8.81	1	0.0030
Total	48.30	26	0.005

According to table 4.7, the null hypothesis is rejected. This was because the p-values was less than the 0.05 threshold. To correct for heteroscedastic errors, robust standard errors are employed in the regression.

4.4.4 Discussion of pooled OLS results

According to the results in table 4.5, the adjusted r square was 0.4163. Adjusted r square shows the proportion of variation in REITs returns is explained by independent variables in the regression that are significant. The adjusted r squared will only change if additional variables to the model will be significant.

According to table 4.5, the probability of the F statistic was zero. The F statistic is a measure of the overall significance level of the variables used together in the regression. It shows how well the model fits the data. The null hypothesis is that all regression coefficients are equal to zero. According to the results in table 4.5, we rejected the null to imply that overall, the regression is meaningful.

In table 4.5, the root mean squared is 7.5339. The root mean squared is a measure of the unexplained variation in the regression. It shows how accurately the model predicts the dependent variable which is REITs Returns. The root mean square error of 7.5339 is small to how that the data is concentrated around the line of best fit.

According to the results in table 4.5, the only significant variables at the 95% confidence interval are Gross Domestic Product and exchange rates. We conclude this since their p-values are less than 0.05 level of significance. The rest of the variables are not statistically significant.

As per table 4.5, the Gross Domestic Product is a significant variable at the 95% confidence interval and has a coefficient of -0.257428. This is interpreted to mean if GDP growth increased by one billion, then returns from investing in REITs would decrease by 0.25 percent. This is an usual finding and a possible reason for this might be that REITs securities have a low penetration rate in developing REITs markets and little is known of them by the larger population and thus most local investors would prefer investing in securities that they are familiar with. This study's findings on the relationship between REITS returns and a country's GDP is not consistent with previous literature such as Yunus(2012) who found that there existed a positive relationship between GDP and REITs returns. Yunus used quarterly data from 1990 to 2007. The difference in the results might be in the time period of the studies. Yunus study was before the financial housing crisis of 2008 while this study was post the financial crisis.

According to table 4.5, lending interest rates had a coefficient of -0.216937 and a p-value of 0.184 and were found not to be statistically significant in modelling REITs returns in the three countries at the 95% confidence interval. The coefficient would imply that if interest rates increase by one percent, then REITs returns would decrease by 21.69%. This finding is consistent with Yunus (2012) who established that there existed a significant negative relationship between long-term interest rates and real estate returns. The fact that lending rates do not significantly influence the returns in REITs could mean two things, one is that funds used to set up properties are not often borrowed locally from financial institutions or the funds invested in the countries real estate are from foreign investors. This is an interesting finding that requires further study.

According to table 4.5, foreign exchange rates had a coefficient of -1.035784 and a p-value of zero and were found to be statistically significant at the 95% confidence interval. The negative

coefficient would mean that if the local currencies depreciated by a unit, then the returns on REITs would increase by 1.035784%. This implies that there is heavy real estate investment made by parties outside the borders of the three countries. This is consistent with previous research mainly because in many countries especially those that are not yet marked as developed, foreign investors heavily invest in real estate.

According to table 4.5, inflation rate had a coefficient of -0.134603 and a p-value of 0.905 and was found not to be statistically significant at the 95% confidence interval. This means that if inflation rate went up by one percentage, then the returns on REITs would decrease by 13.4603%. A reason for this observation would be that due to increased price of commodities, the cost of construction goes up hence acting as a disincentive to investors who would have wanted to invest in the real estate securities. This implies that it is important for the government and other bodies mandated as inflation watchdogs to ensure that inflation rates are steady. This finding is not consistent with the finding by Brooks & Tsolacos (1999) who found that there existed a strong relationship between the inflation and real estate returns.

According to table 4.5, money supply had a coefficient of 0.3447929 and a p-value of 0.113 and was found not to be statistically significant in explaining returns in REITs. The coefficient of 0.3447929 would imply that an increase in money supply by one unit would result in an increase of 34.47929% in REITs returns. Yunus(2012) established that there was a significant positive short-run relationship between money supply and REITs returns. His study involved analysing ten developed REITs countries between 1990 and 2007. Yunus study was pre the financial housing crisis of 2008.

CHAPTER FIVE

SUMMARY, CONCLUSION & IMPLICATIONS

5.1 Summary

This study looked at the effect of macroeconomic shocks on Real estate investment trust returns in developing REITs markets in Malaysia, Taiwan and Turkey. The objectives of the study were to establish the effect of macroeconomic shocks on the returns on REITs in Malaysia, Taiwan and Turkey as well as the direction of the relationship between the macroeconomic shocks and REITs investments. The dependent variable in the study was REITs returns while the independent variables were gross domestic product, inflation rate, exchange rate, money supply and lending interest rate. The study employed various panel data diagnostic test that influenced the selection of pooled OLS model. The study found that exchange rates and gross domestic product were statistically significant in explaining real estate investment trust returns. Exchange rate had a coefficient of -1.035784. The negative coefficient would mean that if the local currencies depreciated by a unit, then the returns on REITs would increase by 1.035784%. Gross domestic product had a negative coefficient of -0.257428. This is interpreted to mean if GDP increased by one billion, then returns from investing in REITs would decrease by 0.25 percent.

5.2 Conclusions

The study established that there is a 1.035784% increase in REITs returns whenever the local currency depreciated. Depreciation of local currency leads to an increase in returns. This implies that there was a heavy investment on REITs in the three developing REITs markets by parties outside the borders of the three countries. The coefficient for foreign exchange had a negative sign and this implied that there existed a negative relationship between foreign exchange rate and REITs returns.

The coefficient for gross domestic product was -0.257428. This implied that whenever the gross domestic product went up by a billion, then REITs returns would decrease by 25%. This implies that despite having more money with GDP growth, most local investors in the three countries would prefer putting their money in alternative investments other than REITs securities. The negative sign on the GDP coefficient showed that there was a negative relationship between gross domestic product and REITs returns. This might also be interpreted to mean that it is foreign investors who invest in these securities.

5.3 Policy Implications

There should be measures to put foreign exchange rates in manageable levels by maybe increasing foreign reserves to prevent the local currencies from depreciating. This can help increase the level of confidence for foreign investors. This is because there is strong evidence that in developing REITs markets, most funds are from foreign investors.

The government through the necessary bodies should take the initiative to familiarize their citizens on the importance of REITs securities as investment opportunities. This would help local investor tap into the benefits that REITs have to offer by channelling their funds into REITs securities.

5.4 Contribution to knowledge

This study contributes to the existing literature by adding foreign exchange rate into the study. All previous studies had not looked at how exchange rates affect REITs returns.

5.5 Areas for further research

Most research around REITs has been around macroeconomic factors. Little has been done on how REITs are affected by microeconomic factor as well as population. It would be interesting to see how population changes would affect real estate properties returns.

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