Housing Price Volatility:
Exploring Metropolitan Property Markets in South Africa

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By

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DECLARATION

I, Reuben Mabutho Zwane, hereby declare that:

• The work in this dissertation is my own original work;
• All sources used or referred to have been documented and acknowledged; and
• This paper has not been previously submitted in full or partial fulfilment of the requirements for an equivalent or higher qualification at any other recognised educational institution.

REUBEN MABUTHO ZWANE  Date: 30 NOVEMBER 2016
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ABSTRACT

This study analyses the housing price volatility in metropolitan areas in South Africa, particularly Port Elizabeth and East London residential housing markets. This study uses secondary statistical data, obtained from secondary sources. The study uses quarterly time series data for the period 1981:1 to 2015:3 giving 139 observations. The data will be collected from different sources.

The main sources of data are real estate agencies (Trafalgar, Harcourts and Property24), the South African Department of Trade and Industry (dti) and supplemented by the South African Reserve Bank (SARB) and Statistics South Africa (Stats SA). The study shall use the ordinary least squares (OLS) method to estimate its results. Ordinarily, this is a generalised linear modelling technique that may be used to model a single response variable which has been recorded on at least an interval scale. This method requires that the underlying stochastic processes of the variables are stationary. That is, explanatory variables should exhibit constant means and variances over time. If the stochastic processes are not stationary, OLS produces unreliable significant coefficients.

Results showed that household savings, household income and total growth in household buildings (TGH) are statistically significant in explaining changes in house prices. Jointly, all the explanatory variables can account for almost 52% of the changes in the dependent variable. The Durbin Watson statistic showed that there is no autocorrelation in the model. This shows that the model is good. Results from the regression show that there is a negative relationship between house prices and household savings. A one-unit increase in household savings leads to a 0.407 decrease in house prices. This relationship makes economic sense because when households save, there is less income available to buy houses. When there is less income available to buy houses, it would mean there is less demand for houses.
KEYWORDS

Volatility, House prices, Metropolitan residential areas

ACRONYMS

ACF       Autocorrelation Function
CAHF      Centre for Affordable Housing Finance in Africa
CCI       Construction Cost Index
CEE       Central European Eastern
CPI       Consumer Price Index
CPIX      Consumer Price Index (excluding mortgage costs)
dti       Department of Trade and Industry
GARCH     Generalised Autoregressive Conditional Heteroskedastic
NHFC      National Housing Finance Corporation
NHSS      National Housing Subsidy Scheme
RHLF      Rural Housing Loan Fund
SARB      South African Reserve Bank
SARS      South African Revenue Services
StatsSA   Statistics South Africa
OLS       Ordinary Least Squares
VAR       Vector Autoregressive
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CHAPTER 1: INTRODUCTION

1.1 BACKGROUND TO THE STUDY

Property markets in emerging countries have been an attention-grabbing field of research for many scholars over the past two decades (Bardhan, 2007:1). These markets not only play an important role in the economy, but are regarded as a significant component of the economy. This has led to the revitalisation of debates in recent years on housing price dynamics and volatility in many countries around the world, including in South Africa (Theuns, 2013:14).

The South African residential property market is considered the largest component of the South African property market, which comprises the majority of property assets within the country, and an important component of household wealth. This market is generally regarded as the single largest investment made by individual households, with house price risk considered to be the major risk confronting these households. Thus, this research attempts to shed light on the determinants of house price volatility in the Port Elizabeth and East London metropolitan areas.

The South African metropolitan residential property market has seen considerable volatility over the years, to such an extent that economic players and policy makers in the property arena have found it difficult to forecast and accurately predict house price movements. This unpredictability has resulted in some investors in the South African property market showing extreme scepticism in making property investment decisions, specifically because of the volatility of house prices (Theuns, 2013:14).

The South African property market recorded strong growth in house prices from the late 1990s onwards, following a long period of mediocre growth in the mid-1980s and early 1990s. However, after remarkable price increases recorded between 2000 and 2007, South Africa’s house price growth in real terms ground to a halt in the first quarter of 2008.
Although the house price index had risen by 6.8%, year on year, by April 2008, it actually fell by 3.84% when adjusted for inflation, according to figures from ABSA, South Africa’s leading mortgage provider (Frankel, Schmukler and Serven, 2005: 134).

The metropolitan housing market in South Africa trends in different ways and across several property market indicators, including household savings, household disposable income, household debt, interest rates and total growth in residential construction. Comparing trending indicators, it would appear that housing markets in South Africa operate in two different economies. There are three categories of house prices, purely government funded, government and private funding (almost a middle-income market) and purely private.

This is supported by Hutchison and Pyle, 1994: 97, (2006: 26), who states that, on average, house prices tend to be more volatile in markets with lower supply elasticity and a more flexible business environment – a situation that is currently witnessed in the South African residential property markets, specifically in the metropolitan areas.

While the income return in both residential and commercial property in South Africa is impressive, the larger part of the rental growth driving this is being eroded by an ever-increasing operating costs bill. There are further worries for the South African market in the form of likely rates and taxes adjustments. Municipalities in metropolitan areas are in the process of revaluing commercial and residential property in order to adjust rates and taxes. Many properties have not been revalued for some time and could see significant adjustments, which could mean sharp increases in rates and taxes for some property owners, which would result in unpredictable and unprecedented house price volatility (Laubach, 2003: 8).

Generally, a house is regarded as a long-lived asset that delivers consumption services over many periods, and whose implicit value is the discounted value of the expected service stream. It is a special type of asset that has a dual role as a consumption good as well as an investment good. From the long-term perspective, the equilibrium price a household is willing to pay for a house should be equal to the present discounted value of
future services provided by the property, that is the present value of future rents and the discounted resale value of the house (Glindro, 2007:3). From a short-term perspective, house prices may not accurately represent the unique characteristics of the real estate market. In spite of recognition of the dual importance of housing as both consumption and investment good, two things are not well understood, namely the implications of house price volatility, and the dynamics for the life-cycle path of consumption and wealth.

1.2 STATEMENT OF THE PROBLEM

The study of housing price volatility in metropolitan areas has grown in importance as a result of risk associated with investing in residential property. The causes of this volatility vary from economy to economy, such that from the South African residential property markets perspective, house price fluctuations and volatility are influenced by a list of non-exhaustive factors. These factors include household disposable income, household debt, affordability ratio real interest rates, credit policies and demographic factors, as well as monetary and fiscal policies (Égert, 2007:13).

The volatility of house prices emanates from the volatility of the general price level in the economy. As a result, economic players and policy makers in the property market face challenges in forecasting and predicting metropolitan house price movements. Due to the risk, investors in this market tend to invest less in housing.

Furthermore, given the relationship between volatility and risk – the higher the volatility in the market, the higher the risk associated with it – a very close analysis is essential to view the impact of house prices volatility. Highly volatile house prices lead to unprecedented high risk in the property market, thereby resulting in unpredictable upswings in the overall economy. Since investors and households are notably risk averse, this will lead to an overall loss of confidence in investing and consuming a volatile and risky good, further affecting the aggregate housing consumption and investment in the whole economy.
In short, the volatility and dynamism of house prices inexorably lead to the instability of the metropolitan housing market, as this volatility spills over into other markets such as the mortgage market, mortgage insurance and mortgage backed bonds, as well as consumer durables.

House prices, like other asset prices, also have important effects on output and inflation, to the extent that it affects the economy in three primary ways. When they begin to escalate, the expectation of further appreciation of metro houses tends to build into the market. This expectation boosts the demand for homes, which in turn stimulates new construction and aggregate demand. The sustained rise in prices can simultaneously lead to market distortion by making houses progressively less affordable. In these cases, house prices increase disproportionately in relation to incomes of households, ultimately inhibiting the demand for them and restraining additional construction. Higher home prices increase household wealth, thus stimulating consumer spending, which is another component of aggregate demand (Mishkin, 2007:17). This, therefore, raises the importance and significance of analysing the impact of house price volatilities in metropolitan areas of South Africa.

Given the above-mentioned problems which accrued as a result of the volatility of house prices, there is a clear need to critically analyse the fundamental long- and short-run impact of house prices volatilities in the South African property market. The above-mentioned problems faced by the economy as a result of these fluctuations and house price dynamics creates the space for this study to be carried out, investigating the housing price fundamental determinants, consequences and implications.

1.3 OBJECTIVES OF THE STUDY

The main objective of this study is to investigate the fundamental determinants of house price volatility in the Port Elizabeth and East London metropolitan areas. This broad objective is explored through the following sub-objectives:

- To analyse the effect of mortgage interest rates on metropolitan house prices;
• To examine the effect of households’ disposable income on metropolitan house prices;
• To investigate the impact of total growth in residential construction on metropolitan housing prices;
• To analyse the impact of household debt on metropolitan house prices; and
• To examine the impact of household savings on metropolitan house prices

1.4 HYPOTHESIS

The hypothesis of this study is that real mortgage interest rates, household disposable income, household debt, total growth in household buildings and household savings are the major determinants of house price volatility in metropolitan areas, and that these factors directly and strongly influence property prices in South Africa.

This study is further underpinned by the following hypotheses:

• There is an inverse and causal relationship between household debt and house prices;
• There is a positive correlation between real disposable income and house prices;
• An increase in the population will concurrently cause a positive impact on housing demand and the economy, thus resulting in an increase in house prices; and
• An increase in interest rates leads to an increase in the cost of borrowing money for building purposes, therefore leading to an increase in the price of houses.

1.5 SIGNIFICANCE OF THE STUDY

The economic literature yields highly conflicting and often unresolved theoretical and empirical findings on the key determinants of house prices volatility (Hutchison and Pyle, 1994: 27). This is as a result of ever-changing global markets which have led to instability and the financial turmoil in property markets, therefore leaving as unanswered some fundamental questions regarding the volatility of housing market prices.
This study seeks thus to contribute to empirical literature on house price volatility in metropolitans in South Africa, with specific reference to the South African residential market’s unique constituent space, capital segment, development segment and land market.

Furthermore, the study seeks to be a resource for economic players in the property markets to inform decision making and policy formulation by providing information on the dynamics of house price volatility, property valuation and mortgage interest rates illusion. By contributing to the empirical literature on factors that has led to house price volatile in South Africa, this study could also aid researchers by contributing to the wider debate on this subject.

Residential housing is an important component of the aggregate household wealth. This is one of the factors that contribute to explaining household spending, which accounts for approximately 50% of GDP in South Africa (household consumption and residential investment) (Égert, 2007:13). This clearly shows that house prices are a salient indicator in any analysis of a country’s macroeconomic or financial stability, and prominent and significant in unearthing the impact of prices volatilities in the metropolitan areas of South Africa.

Theoretically, decreasing house prices will in turn reduce household wealth and the value of collateral assets, aggregate household consumption and aggregate spending at large. Since house prices play a vital role in both micro and macro economy activities, it is necessary to evaluate its impact and creditworthiness on the economy as a whole. Therefore, the volatility of house prices influences not only business cycle dynamics through their effect on aggregate expenditure, but also the performance of the financial system through their effect on the profitability and soundness of financial institutions (Gale and Orszag, 2003:565).

Understanding the behaviour and dynamism of residential house prices in metropolitan areas of South Africa is therefore of key interest to central banks charged with
maintaining price and financial stability in the economy at large. In addition to the role played by house price movements, it was also found necessary to investigate the factors affecting house prices volatility in South Africa’s metropolitan areas because of their significance in stabilising the financial sector. It is worth noting that the movement of house prices appears to have been an important contributor to the recent global financial crisis, which was caused by many banks holding numerous mortgages and improperly rated mortgage-backed securities.

Therefore, this paper seeks to provide supplementary information, fill in gaps and clarify blurred issues around the key determinants of house price movements, with a view to contributing to discussions around a proficient, effectual and stable financial system.

1.6 ORGANISATION OF THE STUDY
This study comprises five chapters. Chapter 1 sets the conceptual framework and provides the background to the dynamics and volatility of house prices in South Africa. Chapter 2 reviews the theoretical and empirical literature pertaining to house price dynamics and volatility, and its consequences. This chapter also presents the analytical framework for examining the determinants of house price volatility and the developments in the property markets. Chapter 3 provides the research methodology and research strategies employed, while the empirical findings, include methodology, data analysis and interpretation, are presented in Chapter 4. In conclusion, Chapter 5 contains a summary of the study, findings, conclusions and limitations, and offers policy recommendations.
2.1 Macroeconomic and Microeconomic Models on Housing Prices

Metropolitan housing has a unique characteristic insofar as it can be analysed as both an investment and consumption good. The literature related to determinants of house price volatility can be separated into two main lines of research, namely the microeconomic approach (Kim, Park and Lee, 2014; Owusu-Ansah; 2010) and the macroeconomics analysis (Agnello and Schuknecht. 2009:4).

The Hedonic approach considers the relationship between the price and the quality characteristics of houses at a microeconomic level, while the macroeconomic analysis is mostly concerned with factors influencing house prices volatility over time at an economy-wide level, for example per capita GDP, unemployment, interest rate on loans, inflation, returns in the stock exchange (Guren, 2014: 16). In this regard this study will mainly focus on a macroeconomic analysis which stems from the demand and supply of housing. Therefore, this chapter reviews the theory of housing property markets based on the demand and supply framework and the determinants of house prices volatility.

In addition, the empirical literature on the macroeconomic and financial factors that determines house price volatility is also reviewed. The empirical literature will be classified into three groups, specific to developed countries, emerging and developing countries and lastly South Africa in particular. The aim is to provide a detailed analysis based on the findings from studies previously done by other researchers in other parts of the globe.

In this study, there are several theories that attempt to explain key determinants of house prices volatility from the demand and supply side at a macroeconomic analysis. These theories include classic theory of interest rates, demand and supply theory, Q theory of housing investment and the user cost model for housing. Each of these theories makes assumptions regarding the behaviour of house price volatility and focuses on the trends and dynamics of house prices.
2.1.1 A classic theory of interest rates

Housing investment is generally acknowledged as one of the most interest rate-sensitive demand components in macroeconomic models. A variety of interest rates is used in empirical studies. Long-term rates are normally thought to influence the demand side, given the long-term perspective of the house purchase decision. These are often measured by either the mortgage rate, as the cost variable, or by the long-term bond rate, acting as an indicator of the return to alternative assets.

Models of housing supply, on the other hand, tend to include short-term interest rates, reflecting the borrowing costs for house builders (Egebo and Lienert, 1988: 17). In general, an increase in interest rates increases the cost of borrowing as loan repayments become more expensive. Thus, a high bank lending rate results in high mortgage repayments, reducing the affordability and hence the demand for property. As a result, interest rates and property prices are expected to have an inverse relationship.

Before starting an examination of global house prices and interest rates, it is important to make a few comments about the theoretical framework that links house prices to interest rates. Considering the standard Gordon Growth Model (McMillen and McDonald, 2004:473), which is expressed as:

\[
Asset\ Price = \frac{Dividend}{(interest\ rate - Dividend\ Growth\ rate)}
\]

and in the context of the housing market, the Gordon Growth Model can be interpreted as;

\[
House\ Price = \frac{Rent}{(interest\ rate - Rental\ Growth\ rate)}
\]

where the above equation shows that the fundamental house prices are determined by a sequence of rents that are a constantly paid, provided that rental is payable within a year (Hubbard and Mayer, 2009: 14).

This model shows a convex relationship between the prices of housing and the rates of interest. It implies that the lower the level of the interest rate, the greater the elasticity of
house prices to changes in interest rates. In simple theoretical terms, the lower interest rates are, the bigger the percentage increase in house prices when interest rates fall by one percentage point. Of course, when making time series comparisons, even this convex relationship between house prices and interest rates is still a simplification. The model factors in the net present value in price determination.

Despite being widely used, the Gordon Growth Model has significant weaknesses, including failing to explain the relationship between real interest rates and real housing and stock prices. Consequently, a more accurate model is used. The user cost model takes into account adjustments for factors like risk, taxes, depreciation and mortgage rates which enable us to discuss it in detail (Miles, 1994:7). According to this model, house prices are explained by variations in valuation methods applied to properties, risks eminent in the market and the tax rate charged by the government. Therefore, from the given introduction on house price determinants highlighted above, the fundamental factors determining house prices volatility in South Africa can traditionally be divided into supply and demand factors.

2.1.2 Housing demand theory
House price volatility is usually modelled in terms of changes in housing demand and supply (HM Treasury, 2003:12). Therefore, to model determinants of house prices volatility, this study makes use of the demand and supply equilibrium model, which provides us with an academic tool, from which it is possible to incorporate different housing determinants and analyse the impact of each. This type of model is developed and improved by two of the most respected economists in this area Poterba (Poterba 1984:19) and Miles (Miles, 1994: 7), who expanded the theory of house prices, combining the supply side with demand side views.

Theoretically, on the demand side, key factors are typically taken to be expected changes in house prices (PH), household income (Y), the mortgage interest rate on housing loans (R), financial wealth (WE), demographic population (D), the expected rate of return on housing (E) and a vector of other demand shifters (X). The latter may include proxies for the location, age and state of housing, or institutional factors that facilitate or hinder
households’ access to the housing market, such as financial innovation on the mortgage and housing loan markets (Égert, 2007:6). The demand side of house price can be illustrated by the equation below.

\[ DH = f (PH, Y^+, R^-, WE^+, D^+, E^+, X^-) \]  \hspace{1cm} (Equation 3)

We assume that the major variables determining the demand for the total stock of housing, as measured by housing space, are shown with the housing demand equation above. Any fluctuation of these factors seems to cause variations in demand for residential properties and contributes to the volatility of the house prices.

2.1.3  Housing supply theory

The supply side of the housing market is more rigid because of the shortage of land for housing as well as the time needed for new construction to be completed (Green, Malpezzi and Mayo, 2005: 5). The supply side of the housing market is generally driven primarily by the profitability of the construction business and is regarded as sticky in the short run (Poterba, 1984:20).

The housing market is often divided into two segments: existing housing, with inelastic supply where the price is already fixed, and new housing construction, where the price determines the amount of new construction. Supply in the existing housing market can be proxied using the saturation of housing needs (the number of apartments per 1 000 inhabitants) or the dynamics thereof (the number of newly completed apartments). Higher saturation of housing needs should lead, ceteris paribus, to lower upward pressure on apartment prices (Hlaváček, 2011: 70).

The supply of housing is usually described as a positive function of the profitability of the construction business, which in turn is taken to depend positively on house prices and negatively on the real costs of construction (C), including the price of land (PL), wages of construction workers (W) and material costs (M), as shown by the equation below:

\[ SH = f (PH^+, C (PL^-, W, M) \]  \hspace{1cm} (Equation 4)
All these cost factors can be proxied using “apartment construction prices”, which aggregate the total projected construction investment costs. Another possibility is to use the construction output price index. A rise in the costs of acquiring a new apartment should, at a given level of demand, lead to a rise in the value of existing apartments. Supply factors often pass through to property prices with a long lag, due to a long time it takes to prepare and actually implement a construction project (Hlaváček, 2011:70).

2.1.4 Housing market equilibrium

Assuming that the housing market is in equilibrium, with demand equal to supply at all times, house prices could be expressed by the following reduced-form equation. The long-run equilibrium condition requires housing demand to be equal to the housing supply, such that there will be no excess supply or excess demand in the housing market.

Combining Equation 3 and Equation 4 yields the long run equilibrium function of the housing prices, which can be represented by the following equation:

\[ DH = f(PH_-, Y^+, R_-, W^+, D^+, E^+, X^-, C(PR^-, W, M)) \]  
(Equation 5)

The above equation can further be explained by numerous theories of housing markets below.:  

- **Theory**: Income Growth ↑ ⇒ Demand for Housing ↑ ⇒ Housing Prices ↑  
- **Theory**: Interest Rates in general ↓ ⇒ Demanders borrow more easily ↑⇒ financial investors find housing more attractive. ⇒ Demand for Housing ↑ ⇒ House P↑  
- **Theory**: House prices ↓ ⇒ Household wealth ↓ ⇒ (Value of collateral ↓) ⇒ Cost of construction↓  
- **Theory**: House prices ↓ ⇒ Construction less attractive ⇒ Residential investment ↓ (akin to Tobin’s q described below)  
- **Theory**: House prices ↓ ⇒ Collateral ↓ in value ⇒ Market value of mortgage loans ↓⇒Banks, and other financial institutions
The view that both supply and demand for housing interact to determine an equilibrium level for real house prices should not be taken to imply that house prices are necessarily stable. In many countries, it is frequently observed that house prices are significantly more volatile than would be predicted by the variation in the main determinants of supply and demand alone. Moreover, the structure of housing finance, spatial effects and tax treatment of owner occupancy may significantly affect house price volatilities in the long term (Égert, 2007: 13).

2.1.5 The Q theory of housing investment

The Q theory of investment, introduced by James Tobin (1969: 15), is the popularly accepted theory of real investment hypothesised to be a positive function of Q, defined as the ratio of the market value to the replacement cost of capital (McMillen and McDonald, 2004:465). This theory assumes that:

(a) Firms make the investment decisions based on the cost price and install the purchased capital goods in their own business;
(b) There are certain adjustment costs associated with investment in capital goods (meaning that, in addition to the direct cost of buying new capital goods, there are also costs of installation, costs of reorganising the plant, costs of retraining workers to operate the new machines); and
(c) The adjustment costs are strictly convex, that is, the marginal adjustment cost is increasing along with the level of investment.

This strict convexity of adjustment costs is the crucial constituent of the Q theory of housing investment. It is that element which assigns investment decisions an active role in the model. There will be both a well-defined saving decision and a well-defined investment decision, separate from each other (McMillen and McDonald, 2004:466).

Applying Tobin’s Q theory to the housing market, construction activity is determined by the profit incentive represented by the ratio of the asset prices of existing structures, to the cost of new construction. Tobin’s Q investment theory has often been used to analyse
supply and to model long-term changes in the housing market and to assess real estate. The following relationship has been used to find Tobin’s Q:

\( Q = \frac{\text{market value of installed capital}}{\text{replacement cost of installed capital}} \).

If \( q > 1 \), then there is an incentive to invest in the residential property since the construction costs will be less than the market value of the installed capital. But if \( q < 1 \) it will not be worth investing in the residential property since the construction cost will outweigh the capital installed. Average Tobin’s Q is defined here as an index \((1991 = 1)\) of the market value of installed capital and replacement cost of installed capital.

In long equilibrium, the value of Tobin’s \( q \) converges to 1, implying that asset prices converge towards construction costs, but in the short run \( q \) may vary from 1. The Q index would, however, converge to some other constant where Tobin’s \( Q = 1 \), since \( Q = 1 \) merely signifies the base year (and also happens to be the sample mean value of our Q index) approximately. According to Tobin (1969:16), inconsistent fluctuation of the \( q \) value will affect the aggregate investment of the housing market, causing prices to be volatile.

The Q theory posits that investment in any asset is a function of the Q ratio, that is the ratio between the market value of installed capital and replacement cost of installed capital (Tobin, 1969:16). In the case of housing, arbitrage by consumers between new and existing housing markets is what drives housing investment. For example if existing houses are expensive relative to new houses, housing consumers will demand more new houses. Alternatively, if existing houses are cheap relatively to new houses, consumers will buy more existing houses and fewer new houses. Alternatively, if existing houses are cheap relatively to new houses then consumers will buy more existing houses and fewer new houses. However, in a competitive environment, where builders and developers (housing suppliers) are price takers, suppliers will respond to the demands of housing consumers by building new houses
when existing house prices are high relative to new houses (McMillen and McDonald, 2004:466).

2.1.6 The user cost model for housing

This theory seeks to compare rental costs with the costs of housing expense incurred by house owners, referred to as the shadow price. It suggests that rental price is the maximum housing expense that individual households are willing to pay (Himmelberg, Mayer and Sinai, 2005:67). The housing market is subject to a number of different policy measures designed to promote the affordability of housing, with the user cost of capital believed to influence housing demand when housing is also treated as an investment asset. Households therefore measure the shadow costs by including the sum of the after-tax costs to maintain and service a house (depreciation, mortgage interest, property taxes and maintenance) minus expected capital gains in the future (Kalra, Mihaljek and Duenwald, 2000:23).

In addition, most homebuyers require some form of leverage in the form of mortgage credit, which may leave homeowners exposed to changes in interest rates. While it can be argued that changes in these variables may have contributed to housing demand individually, what is more important is how the interaction of these factors may have influenced the homebuyers’ decision-making process.

The user cost model for housing, as purported by Himmelberg et. al. (2005:77) is a good candidate for this analysis. However, as some analysts have pointed out, the user cost model does not fully consider the question of affordability. Therefore, the research will also consider a variant on user costs – the ratio of owner-imputed rent to income as a second measure of housing affordability. The user cost is defined as:

\[ R = P (1-\tau) r + m - E \% \Delta P. \]

Where, \( R_i \) is the rent for one unit of housing services for one year in city \( i \) at time \( t \), \( P_i \) is the corresponding price for repurchasing the entire future flow of \( R_i \), \((1-\tau)rt\) is the after-tax, equivalent-risk opportunity cost of capital, \( m \) is a measure of carrying costs (such as
maintenance) per dollar of house, and \( E[\%\Delta P] \) it is the expectation of future house price appreciation in city \( i \) at time \( t \).

The key variable in the user cost model is expected appreciation and the expected rate of inflation. It is important to understand that this measure of house price appreciation does not attempt to model what home buyers might expect house price appreciation to be at any moment in time, but rather a longer-term measure of house value changes. As well, the calculated user costs are not intended to be a measure that can be used to forecast near-term changes in house prices.

Himmelberg et. al. (2005:79) make the case that the user cost model can help explain how differences in expected appreciation rates of house prices across metropolitan areas can make house prices in high-growth rate markets more sensitive to changes in mortgage rates than those in low growth rate markets.

Hofmann (2004: 99) show that the relationship between the price-rent ratio and \( 1/\text{user cost} \) is large and statistically significant. By contrast, using aggregate data from several countries, Case, Quigley and Shiller (2007b:4) argue that the simplified Gordon Growth Model cannot explain the relationship between real interest rates and real housing and stock prices.

Analysis of housing prices by Hofmann (2004:104) does not conduct any formal analysis and nor does it consider either the movement of rents or the behaviour of mortgage markets. It is beyond the scope of the paper to compute a formal user cost model for each of the countries reported in this paper.

2.2 THEORY ON DYNAMICS IN HOUSING MARKET IMBALANCES

The preceding section seeks to explain the dynamics associated with the housing market and imbalances eminent in the property market. The fluctuation of house prices led to the equilibrium of these prices to be disturbed. Housing supply and demand often are not in equilibrium in large part because there is a long lag between when land is purchased...
with the intention of building homes, and when homes are actually completed. In fact, the process of getting land entitled by local authorities and then developing it is often so long that development and construction can easily take two or more years.

By the time houses are completed, the level of demand can be far less than was expected at the time that capital was initially committed to residential development. Furthermore, homebuilding remains a highly competitive and fragmented industry at the local level. In any given market, hundreds of builders try to anticipate future demand. Thus, by the time housing is built, the supply added by competitors can be far greater than was originally anticipated by any one supplier. Housing is therefore quite susceptible to overbuilding (McCue and Kling, 2009: 8).

Conversely, when markets are flooded, builders may wait for clear signs of a recovery to recommit capital. As a result, coming out of a housing market downturn it is not uncommon to have a period of time when supply expansion lags demand growth. In markets where regulations constrain the amount of land available for development and extend the time and risk of land entitlement and development, supply can badly lag demand until house prices rise enough and the recovery is certain enough to jumpstart another lagged building cycle. Housing is therefore also disposed to periods of undersupply (Crawford and Fratantoni, 2003:23).

Furthermore, during periods of tight markets house prices and households, behaviour tends to be more volatile. During this period houses for sale are snapped up by anxious buyers and sell quickly. As buyers compete for a limited supply, they bid up house prices. Sellers find themselves with multiple offers after brief listing periods (Herring and Wachter, 1999:9). Under such circumstances, buyers may fear that prices will continue to spiral higher and that failure to act will result in having to pay higher prices later, and a missed opportunity for house price appreciation.

Since house price appreciation expectations drive user cost calculations, buyers become more willing to go to more extreme lengths to buy a house, including allocating larger fractions of their income to housing, investing in larger down payments, or tolerating
riskier loans to lower their monthly carrying costs. Prices can rise swiftly in tight markets and become serially correlated as the promise of higher prices feeds the price run-up (Garmaise and Moskowitz, 2004:6).

In contrast, sellers in slack markets find themselves with homes that remain on the market longer. As buyers awaken to the fact that homes are remaining longer on the market and bids are scarcer, they begin to bid less than asking prices. When time on market lengthens and sales slow, seller behaviour varies depending on time urgency. Those not in a rush to sell or who do not need to sell at all tend to hold out for their asking prices, at least for a time.

Sellers who have a sense of urgency may balk at low-ball offers at first before realising that they must lower their prices to sell their homes. Distressed sellers include owners who have lost their jobs, builders sitting on vacant inventory and with capital tied up in land development, speculators sitting on vacant inventory and banks that have foreclosed on properties (McCue and Kling, 2009:8).

Clearly, the larger the supply of inventory in the hands of distressed sellers, the greater the risk that prices will fall rather than just grow more slowly, and that the correction will be prolonged and potentially severe. But because sellers are reluctant to lower their prices, prices tend to fall more slowly and with greater resistance than when they go up.

In addition, the majority of home sales remain discretionary. Buyers who are not time-urgent can simply sit out a downturn. As a result, the behaviour of prices on the way up can be different than on the way down. With the exception of a few “regime-switching” models, house price models typically do not allow for this possibility (Karantonis and Ge, 2007:12).

However, after a long debate on the theoretical overview of the housing market and the fundamental determinants of house prices volatility, it is somewhat imperative to review the empirical literature. The next section will thus explain in more detail the empirical literature on housing property markets and its determinants.
2.3 **EMPIRICAL LITERATURE REVIEW**

The behaviour of housing price volatility has been extensively studied in the literature using the ARCH-GARCH framework pioneered by Engle (1982:989) and further developed by Bollerslev (1986:307) and others. Furthermore, various estimation techniques have been employed in order to investigate the fundamental factors that drive the prices of housing in various areas of the world. Nevertheless, the results from these studies are inconclusive. Thus, this section looks at the empirical studies that have been conducted in developed, emerging and developing economies.

House prices behave differently across and within countries, depending on economic cycles, capital markets and local regulations dealing with land availability and environmental requirements (Clavijo, Janna and Munoz, 2005: 25). This has led previous researches to come up with different empirical results in analysing house price fundamentals across the globe. Although empirical research on housing markets is different and substantially scarcer than financial asset markets, there are a large number of articles examining housing price volatility in various countries and regions.

Since there is a great variability in the literature regarding empirical results reported, the theoretical grounds and methods employed vary as well. This section presents previous literature on house price volatility and the fundamental determinants of house prices. The empirical literature will be presented in three groups – developed countries, emerging and developing countries, specifically Eastern European countries, and South Africa in particular.

2.3.1 **Volatility of housing prices in developed countries**

In order to understand the factors that determine volatility in housing prices in developed countries, Borowieki (2009: 18) examined the determinants of house prices in the case of the Swiss economy. By employing the VAR model, Borowieki (2009) provides evidence that variables such as wealth, banking, demography and real estate-specific variables are fundamental factors that explain variations in housing prices in the Swiss economy.
In the context of Spain, Sabal (2005:5) investigated the determinants of residential house prices and identified factors such as increase in population, migration, land and economic condition such as interest rate, aggressive competition in the mortgage market and tax as playing a significant role in explaining volatility in house prices. These variables however, do not necessarily hold true across all developed economies.

In the context of an oil producing country, Humoud and El-Sakka (2016: 10) analysed the determinants of housing prices in Kuwait. The authors argue that government expenditures, inflation and interest rates play a fundamental role in determining the prices of housing in Kuwait. On the other hand, Kim, Park and Lee (2014:97) used auction data to examine the factors that affect housing prices in Seoul, Korea. By employing the hedonic price model, the authors point to factors such as building age, size, grand floor and floor level to be important factors that determine house prices.

In addition, Kim, Park and Lee (2014:6) suggest that location, scenic view and proximity to subways and high schools also play a significant role in explaining variations in housing prices. Also in the context of Asia, Glindo, Subhanji, Szeto and Zhu (2012:36) argue that house prices tend to be more volatile in markets with lower supply elasticity and a more flexible business environment.

In the case of United States of America, Abraham and Hendershott (2010:15) analysed the determinants of housing in the metropolitan areas. The authors posit that factors such as employment and real income growth, changes in real construction costs and changes in the real after-tax financing cost are the main determinants that explain movements in housing prices in the various regions of the United States. Furthermore, the authors argue that growth variables are a major driving force for house prices in metropolitan areas.

In the same vein, Agnello and Schuknecht (2009:12) examined the determinants of boom and bust cycles of housing prices in the developed countries. Using the Random Effect Panel Probit Model over the 1980-2007 periods, they argue that policy variables such as
short-term interest rates, local and global money and credit developments significantly affect the probability of experiencing boom and bust housing price cycles. On the other hand, (Panagiotidis and Printzis 2015:16) employed a VECM approach to investigate the macroeconomic determinants of housing markets in Greece. The authors suggest mortgage loans are the most important variable for housing.

Hutchison and Pyle (1994:26) examined the major determinants of housing price volatility and argue that factors such as nominal interest, household income and the supply of new dwellings to be major causes of housing prices. In the same context, using quarterly data and employing VAR model for the period of March 1994 to June 2014, Ge and Williams (2015:573) examined the factors that drive the housing prices in Sydney. The authors investigated whether variables such as population, growth, family income, mortgage rate and supply factors contribute to changes in house prices. The authors argue that house prices are largely affected by price movements from the previous periods.

In addition, variables such as mortgage rates, net overseas migration and lack of house supply are the major driving force for housing price in Sydney.

Furthermore, Droes and Minne (2015:7) identified factors such as population growth; construction costs and new housing supply are the most determinants of house prices. The results of the study could be inferred to the metropolitan areas of South Africa considered in the current study. The South African population has steadily grown over the years and based on the findings of the study by Droes and Minne (2015), the escalation of housing in could partly be a result of such.

The impact of house price volatility in metropolitan areas was also examined by McMillen and McDonald (2004:466) in a number of industrialised economies. They found that inflation, economic growth, interest rates, bank lending and equity prices have substantial explanatory power on house price dynamics. Hofmann (2004:17) proposed that house prices generally depend on inflation, the yield curve and bank credit, but national differences in the mortgage markets also matter. He further acknowledges that house prices are more sensitive to short-term interest rates where floating mortgage
rates are more widely used and more aggressive lending practices are associated with stronger feedback from prices to bank credit. However, the above-mentioned literature may differ from the South African results as these studies generally found that the estimated elasticities of real house prices with respect to economic fundamentals differ widely, depending on the sample of countries, the period examined, and the methodology used. Furthermore, differences in policies, housing programmes and the level of development will cause studies and results to vary.

Hossain and Latif (2009:128) examined the fundamental determinants of housing price volatility in Canada. The study focused on the dynamic interactions between house price volatility and some key macroeconomic variables. Their research identified macroeconomic factors such as GDP, interest rates, inflation, tax rates and population to have a significant impact on buying and selling decisions. They also found that any changes in these factors influence the variances and co-variances of asset prices.

According to a study by Poterba (1984:14), supply on the housing market is generally driven primarily by the profitability of the construction business and is regarded as sticky in the short run. The supply of housing is usually described as a positive function of the profitability of the construction business, which is in turn taken to depend positively on house prices and negatively on the real costs of construction, including the price of land, wages of construction workers and material costs (Green et al. 2005:35). Therefore, assuming that the housing market is in equilibrium, with demand equal to supply at all times, house prices could be expressed by the equality of supply and demand side.

This view of both the supply and demand for housing interacting to determine an equilibrium level for real house prices should not be taken to imply that house prices are necessarily stable. This is because in many countries it is frequently observed that house prices are significantly more volatile than would be predicted by the variation in the main determinants of supply and demand alone.

However, according to Wood (2005:217) there is a remarkable linkage between property and bank lending, with house price dynamics and volatility differing across metropolitan
areas with different degrees of supply elasticities. Prices of other types of assets, including equity prices and exchange rates were also found to be another key factor to be considered in examining house price movements.

It is well documented that house prices tend to move with other asset prices. Sutton (2002:17) and Borio and McGuire (2004:40) find strong linkages between equity price and house price movements. The direction of such linkage, from a theoretical perspective, is not clear, as the substitution effect and wealth effect point in opposite directions. Even if housing as an investment differs from stocks and bonds in terms of return, risk and liquidity, it was found that prices of other assets determine house prices, with a real effective exchange rate appreciation expected to exert positive influence on the property market, thus influencing house prices (Sutton, 2002:15).

2.3.2 Volatility of housing prices in developing countries

In the context of emerging markets, (Stohldreier, 2012:2) examined the causes of housing prices in 35 large and medium-sized Chinese cities between 2000 and 2012. The author found that factors such as incomes and savings disparity, foreign direct investment and migration rate could cause housing price differentials among various cities. Furthermore, the author posits that government revenue has a significant positive correlation with housing prices and the population in negatively related with property prices in different cities.

In the case of Namibia, Mishkin (2007:16) empirically examined the determinants of house price volatility and argue that only land supply has a significant impact on property or house price fluctuations. In the context of Ghana, Owusu-Ansah and O’Connor (2010:7) identified factors such as land registrations, number of rooms, floor space and property age, location of the property and the availability of garages are important factors in explaining changes in housing price volatility. In addition, the authors also
argue that fence walls and the availability of swimming pools are important determinants of housing prices in Kumasi, Ghana.

Research in central Eastern European countries has highlighted quality and supply constraints in the early stages of the development of the property market. It is a well-known fact that the quality of housing in developing countries is low. As recently as 2002, the developing Central European Eastern Countries (CEECs) scored much lower than most industrialised countries with regard to measures of housing quality such as access to piped water, a fixed bath or a flush toilet (Égert, 2007:17).

Other indicators of housing quality, including the average size of dwellings and floor space per occupant, were also markedly lower in CEE countries. One would therefore expect that, once better-quality housing became available on the market, house prices in CEE countries would grow faster on average than in countries with a higher quality of the initial housing stock. The rapid increase in house prices in CEE countries may thus simply indicate that there is an improvement in housing quality in this area. This is as a result of the quality adjustments that are likely to persist for as long as the transition economies keep on catching up with the standard of living in the EU-15 countries, house prices in CEE countries can be expected to grow faster than in Western Europe in the foreseeable future, as shown by a study by Égert (2007:17).

Another transition-specific factor that has affected the dynamics of house prices in CEE countries is the limited supply of new homes (Friedman, 1978: 594). For many decades, the public sector had been the dominant supplier of new housing in CEE countries, especially in cities. During the 1990s, however, the public sector largely withdrew from housing construction owing to public expenditure retrenchments. Private construction companies and property developers only gradually began to fill the resulting void. Even where the capacity to build new private homes existed, spatial planning was often inadequate, which means that long construction delays were common. This situation resulted in a shortage of new, better-quality housing, which may explain why house prices went up so fast in some countries (Égert and Mihaljek, 2007:7).
In 1995 less than two new dwellings per 1,000 inhabitants, on average, were completed in CEE countries, compared with three to eight dwellings in developed Western Europe countries. By 2000, the supply of new homes had increased only marginally (except in Croatia and Slovenia). Even in 2005, the supply of new housing in countries such as Bulgaria, Estonia and Lithuania which, as noted above, recorded the fastest growth of house prices, was far below the supply in Western European countries with strong housing markets, such as Denmark, Finland and France, not to mention Ireland and Spain. Against this background of constrained supply, the rapid increase in house prices in some CEE countries should not come as a surprise (Égert and Mihaljek, 2007:37).

2.3.3 Empirical literature on South African housing prices

Investigating the determinants of housing price volatility has also been done in South Africa. Theuns (2013:15) identified factors such as GDP, demographic location and demand for the proposed developments having an impact on the rand value of houses. In addition, Theuns (2013:15) suggests that any positive increase in economic growth will increase the price of houses in South Africa with GDP contributing to 69% of changes that occur in the house index. Moreover, factors such as the inflation rate, household disposable income, final household consumption and household debt ratio contribute about 25% of changes in housing prices in South Africa.

An analysis of literature from developed and emerging and developing countries was conducted. It was observed that there is no general consensus of the exact factors that determine the volatility of housing prices. While some studies, including Theuns (2013:16), and Tsatsaronis (2004:25) found that variables such as inflation, gross domestic product and land are the most important determinants of housing price volatility, others such as Mishkin (2007:21), Sutton (2002:12) and Borio (2004:12) identify factors such as availability of garages, migration, demographic factors, construction cost and government expenditure as the major determinants of housing prices. Nevertheless, due to the differences in estimation techniques and also the fact that the studies were conducted in different countries, different results could be obtained.
2.4 SOUTH AFRICAN HOUSING MARKET STRUCTURE AND INSTITUTIONS

An understanding of the prominent features of the South African housing market would provide the contextual emphasis to the analyses of the determinants of house prices in South Africa. South Africa’s property markets are normally dominated by a few major developers. This has led to the banking system, alongside the government housing finance system, playing important roles in meeting the demand for housing in most sample housing sectors in South Africa. Therefore, it is deemed essential to discuss South Africa’s housing market structures, developments and programmes in detail.

2.4.1 Trends in the South African housing finance system

The South African residential property market has not experienced uniform growth over the past 25 years. Growth patterns have fluctuated widely in direct response to exogenous events. For example, during the early 1980s, the boom in the residential property market was supported by negative real interest rates and a strong domestic currency in response to the escalating gold price. However, this was short lived as the property market endured a spectacular crash during 1984, due to the depreciation and subsequent crash of the Rand, and, in addition, political uncertainty. The prime lending rate rose from 11% during the fourth quarter of 1980 to an average of 21.5%, during the second quarter of 1985.

The depreciation of the Rand was instrumental in this interest rate hike, which, subsequently, influenced the property market negatively as loans became less affordable due to excessive mortgage repayments (Clark, 2006:27).

The market crash was followed by a three-year period of decline. Thereafter, real house prices stabilised until the mid-1990s when high real interest rates depressed the property market (Prinsloo, 2000:33). It recorded strong growth in house prices towards the late 1990s. This took place after a long period of mediocre growth in house prices from the mid-1980s up to the late 1990s (Clark, 2006:28).
Besides the concern that more people with modest income were not able to afford their own housing, South Africans were worried that this change was a result of arbitrage and would widen the already worrisome wealth inequality, which could lead to social instability. They were also concerned that this increase would cause bubbles in the housing market which, if burst, could endanger the financial stability of the economy (Absa, 2005:2).

The rate of home ownership in South Africa was estimated at 89% in 1992 (Absa, 2005:7). This had fallen to 76% by the 1996 Census and to 56% by the 2001 census survey. Of this 56%, 41% owned their properties without a mortgage (Absa, 2005:3). Falling home ownership is inconsistent with government policy and suggests there may be problems with the data. An explanation may lie in changes in the census questionnaire, or perhaps increased investment in rental property as house prices have increased, but there is no concrete evidence for this.

The number of completions of houses and flats has picked up since 1998, but there remains a shortage in South Africa in spite of government targets to increase housing output. Since the start of the millennium, house prices have experienced substantial growth. The current boom in the property market is aided by low interest rates, a strong domestic currency, a growing middle income sector and high investor confidence. In addition, low transfer duties on property and strong growth in the real disposable income of households support the property market (Sutton, 2002:14).

The proportion of South African households living in formal dwellings increased to 74% by 2003, with the highest proportions in traditionally white and Asian communities (Baker, 2005:32). The average number of houses and flat completions had increased by 19% in 2004 after a few years of falling output. The number of housing transactions increased dramatically from 2000, reflecting an increase in demand as interest rates fell, but is now showing signs of levelling off (STATSA, 2011:6).

The housing finance system has had little impact on the low-income segment of the population and attempts to expand credit into this segment through micro-loans have so
far not been very successful. There have been a number of government-backed schemes to promote lending in the low-income sector through subsidy, guarantee or management of bad debts. However, the formal banking sector still finds it risky to act in the market but is attempting to increase lending volumes in this sector.

A voluntary initiative by the private sector to improve access to finance for lower income sections of the market, with a target of lending R42 billion (US$7.5 billion) over five years, was agreed at the end of 2003. The systems necessary to implement this are taking time to develop and the banks are hoping for some form of government underwriting to assist lending in this sector (Moss, 2000:22).

A sophisticated and effective housing finance system does exist for the middle and upper income segments of the housing market. The total value of residential mortgage loans was R328 billion (US$58 billion) at the end of 2004. Residential data is only available since 2000, but over this period showed an increase from less than R200 billion (US$26.4 billion). Residential debt accounts for about three quarters of all mortgages, but it is difficult to derive estimates going back to before 2000, given the change in housing policy since then (Thomas, 2002:16). The residential debt to GDP ratio in 2004 was 24.8% and the per capita debt outstanding is estimated at R25 000 (US$4,450).

The housing finance sector is dominated by the large banks but there are over 1 000 micro lenders in addition to social housing institutions, NGOs and local and central government organisations. Mortgages are typically based on variable rates. Fixed mortgages are also offered, but mostly for periods of up to two years, with mortgage lending being funded primarily by deposits. This has paved the way for an analysis of housing development programmes in South Africa and their impact on house prices as well.

2.4.2 Housing development programmes and policies in South Africa

The South African government endeavoured to reduce the backlog of housing demand which escalated during the apartheid era by introducing policy schemes and housing
development programmes aimed at stabilising the housing environment and mobilising housing financing to provide housing to all citizens. A number of programmes and policies were introduced, but this paper will focus mainly on the National Housing Subsidy Scheme (NHSS) and the National Housing Finance Corporation (NHFC) to meet housing demand. Furthermore, it also introduced the Rural Housing Loan Fund (RHLF), which aimed to encourage increased lending for housing purposes to low income earners through the provision of wholesale finance and market development support to specialist housing lenders, micro financiers, social housing institutions and primary market lenders (or mortgage loan originators) (IMF Country Report, 2008:3).

2.4.3 National Housing Subsidy Scheme (NHSS)

Given the skewed income profile of the South African population and the severe affordability problems at the lower end of the market, the targeted provision of end-user subsidies constitutes one of the cornerstones of the Government’s approach to the housing challenge. This has led to the introduction of the National Housing Subsidy Scheme (NHSS) which was meant to enable the provision of adequate housing for low income groups based on the household’s monthly income. It was designed to take account of popular demands, enormous existing and projected backlogs, fiscal constraints, and to minimise housing and financial sector market distortions. It offers lump sum or one-off 'capital' subsidies, which are preferred over interest subsidies primarily because of South African’s high unemployment (Urban Sector Network, 2003:2).

This subsidy was divided into four main categories: The individual subsidy available to single households; the consolidation subsidy available to households that have previously received state assistance in the form of a serviced site (R7 500 then being made available for the house); the institutional subsidy directed at the establishment of social housing in South Africa; and the project-linked subsidy for housing projects identified and initiated by community-based organizations or developers (Moss, 2000:17).

The above mentioned subsidy schemes helped the housing economy significantly by providing progressive access to adequate housing, creating socially and economically
viable communities, ensuring balanced and sustainable spatial development, provision of choice, sustainability, transparency and equity, co-ordination of state investment, efficiency and effectiveness, and applying creativity and innovation.

In general, the NHSS enable the construction of many affordable houses, which will in turn improve the level of home ownership in low income groups. This subsidy will affect house prices in the sense that many people who are being subsidised will now be able to afford a house, leading to the building of houses as well as a greater demand for houses.

2.4.4 *National Housing Finance Corporation (NHFC)*

This corporation is a finance institute with the primary goal of mobilising wholesale finance for the housing sector. It also facilitates the non-traditional lending sector (stokvels and agencies making small non-bond loans) and helps kick-start the establishment of new financial 'institutions', which government considers the best way to get end-user financing to the poor at scale in the housing economy. Examples of these corporations include the Khosela Housing Finance Company (Durban) and the Peulwana Housing Finance Company (Gauteng).

The NHFC provides these institutions with start-up capital (so-called 'quasi-equity' or zero real interest loans) and wholesale funds, until they can access private sector capital. The association of the NHFC also established the Social Housing Foundation in 1998, as a membership-based advocacy and support organization for the incipient 'social housing movement', whereby individuals rent or rent-to-buy revamped or new properties. The NHFC established 'Project Gateway' (officially launched March 1999), as a faster way to get credit to end-users. It creates a secondary mortgage market, providing a package of housing subsidy and credit from R20 000 to R50 000 to low-income, regularly employed beneficiaries (Mitlin, 1999:17).

Medium-term loans provided at fixed interest rates over a five- to 10-year period. These loans were also partially secured against pension funds, and payroll deductibility was also required during the early stages of the inauguration of this housing corporation.
Accredited NHFC underwriters assess credit worthiness and conclude loan contracts knowing that approved loans will be purchased by the NHFC at the time of disbursement. This institute improved the housing sector in general through its provision of start-up capital and mortgage interest and this enabled momentum in stimulating housing demand.

2.4.5 Rural Housing Loan Fund (RHLF)

The Rural Housing Loan Fund (RHLF) is a non-profit entity that is owned by the Department of Housing and capitalised by a grant from the Federal Republic of Germany. The primary objective of this loan fund is to improve the housing conditions of the low-income South Africans in rural areas through wholesale funding to qualified intermediary non-bank lenders. Since its inception in 1997 it has enabled over 100 000 end-user loans and is currently maintaining a combined end-user loan book of R200 million across eight retail lenders throughout the country. The loans of the RHLF are generally small, unsecured term loans that support an incremental approach to home building and improvements that are well adapted to financial circumstances of low income target group.

With regard to competition from major banks, the RHLF enjoys anti-competitive behaviour since many of their loans are unsecured and their rates are relatively low since it is a non-profit organization (Mitlin, 1999:23).

There are many different conceptions about the housing development programmes and policies in South Africa, to such an extent that it is not possible to designate a single programme that would universally apply. Notwithstanding, an attempt will be made to articulate the processes and issues that are typically addressed by the housing development programs. With housing prices and housing development programmes in South Africa becoming highly contentious areas of interest to the government and many property market players, it is vital to analyse its significant on the overall housing economy.
2.4.6 Tax implications of owning property in South Africa

In terms of taxation policies, the acquisition and transfer of real estate are normally subject to the usual capital gains tax, notary fee and stamp duties, although there are huge variations, including transaction turnaround times. However, the tax consequences of buying, owning and disposing of fixed property in South Africa are determined not by a person’s nationality but his or her tax status. There are various ways of determining one’s tax status in South Africa in order to establish whether you are a resident or non-resident for tax purposes. Both private individuals and legal entities are classified in South Africa as either residents or non-residents.

South Africa uses a source-based system of taxation to tax non-residents. This means that any income earned by a non-resident person, who is South African in origin, is taxed in South Africa, unless that person hails from a country with which South Africa has concluded a double taxation agreement. Therefore, even if you are not a resident of South Africa for tax purposes, you may be required to register for tax and annually submit an income tax return (Lin, 1998: 520).

The South African Revenue Services (SARS) also uses the purchase of property as a checkpoint to ensure that all parties to property transactions are registered for tax purposes and, if already registered, that their tax affairs are up to date. Therefore, having not had previously been registered as a taxpayer in South Africa SARS will insist that you register when you purchase immovable property before it will allow the transaction to proceed.

2.5 CONCLUSION

Virtually the entire body of empirical literature on house-price volatility determinants agrees that the housing market is not efficient, thus systematic mispricing and volatility can persist. Many empirical models say that important macroeconomics effects on current house prices varies depending on the methodology used availability of data and the country being studied.
Furthermore, given the above discussion on the empirical and theoretical literature of house prices volatility determinants it was found that the major house price drivers are interest rates, construction costs, income and population. Even though these factors vary with economies, literature of housing prices in developing countries was found to be scarcer.

Also, with unclear and inconsistent results from the literature this had left a gap to estimate the empirical housing model of the East London and Port Elizabeth metropolitan areas in South Africa.
CHAPTER 3: RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter is underpinned by the literature on the determinants of house price volatility and the background of the South African residential property markets reviewed in the previous chapters. This chapter therefore builds on this background to set the methodology that is used in this study.

Specifically, Chapter 3 aims to describe the research design and methodology used in the study. This includes research strategy, target population, data collection, analysis, validity and reliability and delineation of the study. This chapter also outlines the design and methodology used to collect the data. The information presented in this chapter is organised as follows: The first section combines the literature on the determinants of house prices volatility and the econometric model that relates house prices volatility. This is followed by a section on research design. A review of research strategy and estimation techniques for the study of determinants of house prices volatility is presented thereafter, followed by a concluding section.

3.2 RATIONALE FOR THE METHODOLOGY

A research methodology aims to ensure that there are methods and tools of problem identification and problem solving by means of creating research design, scope, sample, instrument, as well as validity and reliability testing and analysis (Cant, 2011:65). Gupta and Gupta (2011:1) state that the purpose of conducting research is to gain knowledge about a problem through a documented prose work designed.

Research can be accomplished by means of employing two basic approaches for data collection on the topic being studied, which are the qualitative approach and the
quantitative approach. Creswell, 2003:154 observed that the qualitative approach is more focused on attitudes, responses and perceptions, while the quantitative approach focuses on numbers and variables.

According to (Sale, 2002:44) the quantitative approach is interested in examining gathered information using analysis based on the statistics. A quantitative approach aims at generalising the results obtained from the sample to a wider population. In agreement with (Sale, 2002:45), (Creswell, 2003:153) states that the quantitative approach is informed by collecting data and using statistical methods to analyse such data. On the other hand, qualitative research data collection instruments ask mostly open-ended questions that allow participants to freely respond in their own words.

This study will use a quantitative research methodology to investigate determinants of house price volatility in the Port Elizabeth and East London residential markets. The reason for choosing the method is because it allows for the establishment of causa and effector relationships between variables. A regression model shall be run to investigate the fundamental determinants of house price volatility in these two cities. A regression model will be used because:

(i) It can indicate if the independent variables have a significant relationship with the dependent variable; and

(ii) It can indicate the strength of different independent variables effects on a dependent variable (Stevens, 2009: 5)

### 3.3 RESEARCH DESIGN AND DEFINITION OF VARIABLES

According to Gupta and Gupta (2011:32), research design is the formulation of the structure and strategy of investigation conceived in order to get answers to research questions and control variance. Research is therefore an overall method of organised planning so as to carry out a research study. Gupta (2011:36) further states that the research designs are normally categorised as follows;
• Descriptive research design: This research design calls for the researcher to be able to describe clearly the research purpose, where the aim is to measure and find adequate tools and methods for measuring it, along with a clear-cut definition of population to be investigated.

• Hypothesis testing or casual research design: This allows the researcher to “test the hypothesis of casual relationships between the variables” (Gupta, 2011:36).

This study selected the hypothesis testing approach to investigate the determinants of house price volatility in the residential markets of the Eastern Cape’s two metros, Port Elizabeth and East London. It was selected as the most appropriate approach as this study seeks to test the relationship between certain variables, and this could indeed be done through this approach.

3.4 RESEARCH STRATEGIES

The main objective of this study is to investigate the fundamental determinants of residential house price volatility in Port Elizabeth and East London. This study shall use secondary data to achieve its objectives. The data shall be run using regression and statistics software (E Views) and the software will be used to present and discuss the findings. As a result, there will not be any primary data collection as part of the study. The data to be used is statistical data that has been gathered from recognised institutions.

3.4.1 Research philosophy

Paradigm refers to a world view in which phenomena can be understood (Bollerslev, 1986: 310). A research philosophy is a belief about the way data is collected and analysed (Saunders et al., 2007:133). The way research can be analysed, seen, interpreted and understood varies. According to Churchill & Brown (2006:3), the paradigm is “a broad view or perspective of something”.

Additionally, Brooks’ (2008:17) definition of paradigm reveals how research could be affected and guided by a certain paradigm by stating, “paradigms are patterns of beliefs and practices that regulate inquiry within a discipline by providing lenses, frames and processes through which investigation is accomplished”.

The positivistic perspective assumes that, given similar structures and incentives, people behave similarly; that there is a clear separation between the researcher and the research participants because the researcher does not influence the participants’ behaviour (Torrance, 2005:428); that the researcher can observe the participants’ behaviour; by having a control group or controlling for individual characteristics the researcher can correctly test the hypothesis concerning the benefits of a programme; and that the application of the research findings to the society at large will solve the problem the programme is addressing.

On the other hand, interpretivist is often linked to Max Weber (1864-1920), who theorises that in the human sciences we are concerned with understanding. It has been suggested that Weber is contrasting the interpretative approach needed in the human and social sciences with the explicative or explaining approach focused on causality, which is found in the natural sciences (Churchill & Brown, 2006:13).

This researcher will adopt a positivist paradigm. This paradigm is appropriate as the study attempts to investigate the fundamental determinants of house price volatility in the South African metropolitan residential market. In a positivist study the researcher is limited to the use of statistics and facts and the findings are quantifiable.

### 3.5 ESTIMATION TECHNIQUES

This study uses secondary statistical data, obtained from secondary sources. The study uses quarterly time series data for the period 1981:1 to 2015:3 giving 139 observations. The data will be collected from different sources. The main sources of data are real estate agencies (Trafalgar, Harcourts and Property24), the South African Department of Trade
and Industry (DTI and supplemented by the South African Reserve Bank (SARB) and Statistics South Africa (StatsSA).

These data sources were considered the most systematic and reliable source available for the South African residential real estate markets. The selection of this dataset aims to provide representatives for the Eastern Cape’s two metropolitan areas, namely East London and Port Elizabeth, with residential housing price volatility determinants. The selection of the dataset will aim at providing representatives of the selected two metropolitan areas.

To avoid replication of the previous studies described in Chapter 2, this research will utilise the consumer price index of housing and the average growth rate of house prices to determine the movements of prices, thus using the optimal method with which to yield precise results. The data was sourced from QuanTec and the South African Reserve Bank. The following definitions will be used on the explanatory variables of house prices:

**House prices:** The study will use the absolute values and growth rates of housing Consumer Price Index of metropolitan houses as a proxy of house prices. CPIX shows the consumer price index of houses as used with a base nominal value of (2000=100/monthly). This CPIX of houses will be used to measure the average change in house prices encountered by South Africans. The house price series will be reflected by the annual inflation adjusted consumer price index, with the cost of borrowing reflected by Consumer Price Index (CPI) adjusted interest rates. It will be obtained by calculating, on a monthly basis, the cost of a fixed house purchased by a typical South African consumer during a given month. The growth rate of the CPI will be computed as follows:

\[
\text{Growth rate of the CPI} = (\text{CPI}_t - \text{CPI}_{t-1})/\text{CPI}_{t-1}
\]

*Where: \( \text{CPI}_t = \text{Housing Consumer price index of the current period.} \)

\( \text{CPI}_{t-1} = \text{Housing Consumer price index of the previous period.} \)

**Interest rates:** The study will use the real adjusted mortgage interest rate as a surrogate for interest rate since it is a precise variable with an authentic measure of cost of borrowing to invest in a house. The study will use inflation adjusted mortgage interest
rates so that it will be flexible and sensitive to changes in the underlying market forces. This variable will be anchored and benchmarked by the repo rate, such that any changes in the repo rate will also affect mortgage rates and other rates.

The mortgage interest rate in this study will measure the price of loaned funds borrowed to buy a house in the metropolitan area. Nominal values and calculated growth rates of mortgage rates will be used in the study. The growth rates will be calculated as follows:

\[
\text{Growth rate of Mortgage interest rate} = \frac{(\text{MR}_t - \text{MR}_{t-1})}{\text{MR}_{t-1}}
\]

Where: \(\text{MR}_t\) = Nominal Mortgage Rate of the current period  
\(\text{MR}_{t-1}\) = Nominal Mortgage

**Consumer Price Index (CPI):** The CPI will be used as a proxy for the rate of inflation that will be the general increase in price level. The CPI will be a measure of the prices of consumer goods and services bought at retail prices. This will include food, fuel, clothing and pharmaceuticals. The percentage change in CPI measures inflation. To compile the CPI, a predetermined set of goods, forming a typical basket of goods bought by an average urban consumer, will be selected. All the items will be weighted according to the percentage of income that households spend per category. An average of the change in the prices of these items will be calculated on a quarterly basis.

**Household Debt:** Generally debt (including household debt) refers to an obligation or liability arising from borrowing money or taking goods or services “on credit”, in other words against an obligation to pay later. Usually a debt contract is an essential part of the debt agreement between one person or organisation, and another. A debt contract states the terms of borrowing the interest and redemption payments that the borrower must make and what security the borrower has to provide.

In addition, secured debt refers to debt where the borrower provides security, which the lender is entitled to take over if the borrower does not make the promised payments (Prinsloo, 2000:16). One kind of secured debt is mortgage debt secured on houses, other buildings or land. By contrast, if debt is unsecured the lender has no special claim on any particular part of a defaulting borrower’s assets. The two major components of
household sector debt are customarily classified into household credit and mortgage advances. Household or consumer credit is, in turn, subdivided into open accounts, personal loans at banks, other personal loans, credit card facilities, instalment sale transactions and lease agreements.

**Construction cost:** This is the cost of the basic construction of the building, including the bricks and mortar, doors, windows, plaster and paint, etc. that is quoted by the main contractor. This includes all items required to complete the basic shell of the building. The Construction Cost Index (CCI) is compiled from information collected quarterly by means of a standard questionnaire from the same group of quantity surveyors. These quantity surveyors supply information on the scope of the project, some amounts and the tariffs (rates) of a number of items from the bills of quantities of accepted tenders. Data for items from most of the categories of the Standard System of Measuring building work will be collected. A weight is accorded to each item based on considerations such as basic design criteria. In order to ensure comparability, certain adjustments in the calculation process are made.

**Household Saving:** Saving by the household sector is defined as that part of current income, after the payment of direct taxes, not consumed or transferred as part of household current expenditure. Dissaving occurs when current expenditure exceeds current income. In terms of standard economics practices, the saving of a household or of any other organisation will be equivalent to the increase in the net asset value of the household or organisation. Increases in the credit commitments of households will accordingly lead to a decline in their saving, unless this is counteracted by similar or stronger increases in the assets of households. Generally speaking, an inverse relationship can be expected between increases in the utilisation of consumer credit and the saving of private households over time. In South Africa, a clear inverse relationship can be discerned from the beginning of the 1980s between the ratios of household debt to personal disposable income, and between household saving in relation to the personal disposable income of households. The deterioration in the saving ratio of households at the beginning of the 1980s coincided with the greater use of credit by households.
Business confidence: Political and economic certainties have an influence on business confidence, which in turn influences investment decisions on whether to buy property. This will be measured by the Business Confidence Index. This, in turn, will influence consumer spending as they become more confident about the economy. Hence, business confidence indirectly influences consumer demand for residential and commercial property.

Real disposable income: This study incorporates consumption expenditure as a proxy of real disposable income. Real disposable income will be defined as the amount of retributions available for spending and saving calculated after tax. Therefore, the consumption expenditure will be used as a proxy for income in the model. Consumption expenditure is the final consumption expenditure that consists of expenditures incurred by resident institutional units on goods or services that are used for the direct satisfaction of individual needs or wants, or the collective needs of members of the community. It will be calculated as follows:

\[
Y_d = y - T
\]

Where \( Y_d \) = Disposable income
\( y \) = Income before tax
\( T \) = Income Tax

Money Supply: The study will make use of a comprehensive measure of money (M3) as a proxy for money supply. Hypothetically, when the money supply increases, prices in the economy are also expected to increase in turn. However, the prices of houses normally increase with a time lag. They do not increase automatically like commodity prices, but eventually go up if the general price level continues to increase. Thus, money supply is expected to affect the house prices positively when it increases.

3.5.1 Research instruments

The study shall use the ordinary least squares (OLS) method to estimate its results. Ordinarily, OLS regression is a generalised linear modelling technique that may be used to model a single response variable which has been recorded on at least an interval scale.
This method requires that the underlying stochastic processes of the variables are stationary. That is, explanatory variables should exhibit constant means and variances over time. If the stochastic processes are not stationary, OLS produces unreliably significant coefficients. Therefore, before conducting OLS regression analysis, we will have to test all included variables for a unit root using the Fisher-type test. These tests check if the data exhibit stationarity. If the explanatory variables (regressors) are I(1) in levels thus non-stationary and I(0) thus stationary.

3.5.2 Stationarity analysis

The importance of the concept of stationarity arises from the fact that almost the entire body of statistical estimation theory is based on asymptotic convergence theorems, that is the weak law of large numbers, which assumes that all data series are stationary. In real life, however, non-stationarity is extremely common in macroeconomic time series such as income, consumption, money, prices and gross domestic product data.

Treating non-stationary series as if they were stationary will bias the Ordinary Least Squares (OLS) and thus result in misleading economic analysis. For example, the model will systematically fail to predict outcomes and can also lead to the problem of spurious (misleading) regressions where R-squared is approximating unity; t and F-statistics look significant and valid.

In essence, the problem lies with the presence of spurious regression that arises where the regression of non-stationary series, which are known to be unrelated, indicates that the series are correlated. Hence, there is often a problem of falsely concluding that a relationship exists between two unrelated non-stationary series. This problem generally increases with the sample size, and is not normally solved by including a deterministic time trend as one of the explanatory variables in order to induce stationarity.

After the stationarity test the study will construct a single or multiple explanatory variables equation. This linear regression method will attempt to solve the regression problem by making the assumption that the dependent variable is (at least to some
approximation) a linear function of the independent variables. The regression model shall take the following form:

$$\text{HP} = f\{\text{HDI, R, HDEBT, TGH, HS}\}$$

Therefore house price volatility determinants in this study will be modelled in terms of changes in housing prices with the explanatory variables being Household Disposable Income (HDI), Real Mortgage Interest Rate on Housing Loans (R), Household Debt (HDEBT), Total Growth in Household Buildings (TGH) and Household Savings (HS). The equation used above has factored in all the variables as according to section 3.5, with some included as latent variables.

The model can be expressed in its linear form as:

$$P_{it} = \beta_0 + \beta_1 HDt + \beta_2 R_t + \beta_3 HDEBT_t + \beta_4 TGH_t + \beta_5 HS_t + \varepsilon_t,$$

Where $P_{it}$ is the real value of house prices in area i at time t, R is the real mortgage interest rate (quarterly yield), HDI is the real household disposable income, HDEBT will proxy household debt, TGH is total growth in household buildings, HS is household savings and $\varepsilon_t$ is a stationary error term.

Where $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4$, and $\beta_5$ are intercepts and $\varepsilon$ is the error term.

Literature reveals that higher real disposable income and Gross Domestic Product combined with higher population will encourage greater demand for new housing and housing improvements. Thus, this will lead to an increase in household consumption spending and aggregate spending, which in turn leads to economic growth. In addition, the real mortgage rate will be expected to be negatively related to housing.

The data shall use two regression models. This is done to investigate the fundamental determinants of house price volatility in the Eastern Cape’s two metros, East London and Port Elizabeth. Since there are two cities to investigate, it is important to have a regression model for each city. However, the model shall have the same variables except for the prices of houses. The prices for the houses shall be different because of the locational differences.
3.5.3 Data analysis

E-views 9 is econometrics software that shall be used to analyse the data. E-views was selected because it works well with time series data. A regression shall be used to investigate the fundamental determinants of house price volatility in the residential market of Port Elizabeth and East London.

3.5.4 Diagnostic tests

Gujarati (2004:516) argues that diagnostic tests should be performed so that the model finally chosen is a good model in the sense that all the estimated coefficients have the right signs, they are statistically significant on the basis of the t and F tests, the R-Squared value is reasonably high and the Durbin-Watson d has acceptable value (around 2). In this regard, this study employs the Histogram and Normality test, Correlogram of Squared Residual Test, the Heteroscedasticity test and the Ramsey test.

3.6 DELIMITATIONS OF THE STUDY

The study only used one data collection instrument. Using a second data collection instrument would have allowed the study to compare its findings using two data collection instruments. However, due to time and resource constraints, this could not be done.

3.7 CONCLUSION

In this chapter, based on theory, the potential determinants for house price volatility in Port Elizabeth and East London are specified. These determinants include, among others, household disposable income, construction costs, real mortgage interest rate on housing loans, household debt, household savings, population size, total growth in household buildings and the real money supply as proxy variables for house price volatility.
The research methodology adopted by the researcher for this study was explained. This was achieved by presenting the research design, research strategy, secondary data collection and analysis, validity, reliability and delimitations of the study. The chapter explained in detail the research method used in this study which is a quantitative approach. Finally, after establishing our model we now apply these techniques to South African data in order to achieve the objectives of this study as set out in Chapter 1 by doing an empirical analysis and presenting findings of the study.

In the next chapter focus will be given to the analysis and interpretation of the research results.
CHAPTER 4: DATA ANALYSIS

4.1 INTRODUCTION

The previous chapter provides the analytical framework and model estimation techniques to be used in this study. This chapter applies this framework and introduces analytical techniques. The questions which were raised in the first chapter, namely finding the key determinants of house prices volatility, are answered through the formulation and estimation of the house price volatility determinants in Port Elizabeth and East London.

The focus of this chapter is on analysis and the presentation of results. Its purpose is to empirically test the variables that influence house prices volatility in Port Elizabeth and East London. The first part will look at the correlations, followed by the model estimation, and lastly, diagnostic tests.

4.2 CORRELATIONS

Correlation research is more accurately described as method of data analysis. When fed into a correlation equation it is possible to determine how much two variables relate. This can also be shown visually by plotting two variables on the x and y axis of a scattergram or scatter chart.

Table 1: Correlations coefficients for Port Elizabeth – East London

<table>
<thead>
<tr>
<th></th>
<th>HDEBT</th>
<th>HDI</th>
<th>HP</th>
<th>HS</th>
<th>INT</th>
<th>TGH</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDEBT</td>
<td>1.00000</td>
<td>-0.041242</td>
<td>-0.100920</td>
<td>0.713519</td>
<td>-0.627975</td>
<td>-0.193336</td>
</tr>
<tr>
<td>HDI</td>
<td>-0.041242</td>
<td>1.00000</td>
<td>0.359971</td>
<td>-0.114729</td>
<td>0.711969</td>
<td>-0.397693</td>
</tr>
<tr>
<td>HP</td>
<td>-0.100920</td>
<td>0.359971</td>
<td>1.00000</td>
<td>-0.436987</td>
<td>0.340015</td>
<td>-0.562172</td>
</tr>
<tr>
<td>HS</td>
<td>0.713519</td>
<td>-0.114729</td>
<td>-0.436987</td>
<td>1.00000</td>
<td>-0.562172</td>
<td>0.133110</td>
</tr>
<tr>
<td>INT</td>
<td>-0.627975</td>
<td>0.711969</td>
<td>0.340015</td>
<td>-0.562172</td>
<td>1.00000</td>
<td>-0.157061</td>
</tr>
<tr>
<td>TGH</td>
<td>-0.193336</td>
<td>-0.397693</td>
<td>-0.629264</td>
<td>0.133110</td>
<td>-0.157061</td>
<td>1.00000</td>
</tr>
</tbody>
</table>
Correlations were done to test if there was any association between the variables. Results showed that house prices (HP) had a negative association with household debt (HDEBT). This suggests that when household debt increases, the price of houses goes down. Results further showed that household disposable income (HDI) and house prices had a positive effect. This suggests that when household income increases, there is an increase in the prices of houses in Port Elizabeth. Results further showed that household savings (HS) and house prices had a negative association. This may suggest that when households save more, the prices of houses go down. Results also show that there is a negative association between total growth in household buildings (TGH) (new buildings) and household prices. This suggests that when there are new houses, the price of houses goes down. Also, the correlation shows that there is a positive relationship between house prices and interest rates, such that high mortgage interest rates push prices of houses upwards.

The disadvantage of correlation research is that information pulled from data analysis is very limited. This type of research only shows if there is a positive correlation, negative correlation or no correlation between data sets. This prompted the study to do a regression. Correlation does not show nor illustrate causation, meaning that it does not prove that one variable causes the other.

### 4.3 REGRESSION RESULTS

The regression results are shown below.

Table 2: Port Elizabeth regression results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>HDI</td>
<td>0.074778</td>
<td>0.139903</td>
<td>0.534504</td>
<td>0.5940</td>
</tr>
<tr>
<td>HDEBT</td>
<td>0.159421</td>
<td>0.134691</td>
<td>1.183603</td>
<td>0.2389</td>
</tr>
<tr>
<td>HS</td>
<td>-0.416328</td>
<td>0.094663</td>
<td>-4.397987</td>
<td>0.0000</td>
</tr>
<tr>
<td>INT</td>
<td>0.070444</td>
<td>0.210853</td>
<td>0.334090</td>
<td>0.7389</td>
</tr>
<tr>
<td>TGH</td>
<td>-0.082305</td>
<td>0.012469</td>
<td>-6.600680</td>
<td>0.0000</td>
</tr>
<tr>
<td>C</td>
<td>14.85506</td>
<td>3.493346</td>
<td>4.252389</td>
<td>0.0000</td>
</tr>
</tbody>
</table>
Results from the regression show that there is a negative relationship between house prices and household savings. A one-unit increase in household savings leads to a 0.416 decrease in house prices in the short run. This relationship makes economic sense because when households save, there is less income available to buy houses. When there is less income available to buy houses, it would mean that there is less demand for houses. If there is less demand for houses, it would lead to the price going down. When demand is low, sellers are forced to cut house prices, which explain why there is a negative relationship between these variables.

Results further show that there is a negative relationship between total growth in household buildings (TGH) (new buildings) and household prices. A one point increase in new houses led to a 0.082 decrease in the price of houses. This is consistent with economic theory. The theory of supply states that higher prices may create an incentive for other businesses to enter the market, leading to an increase in total supply. However, if there are many suppliers, there would be an oversupply of the commodity which would lead to prices going down. In this case, demand would be less than supply, creating a surplus, which will drive prices down.

Results show that household disposable income and house prices have a positive relationship. A one-unit increase in household income leads to a 0.07 increase in house prices. This is consistent with economic theory. An increase in income will lead to an increase in demand. When the demand increases it will lead an increase in house price. If, for example, there are 15 people selling houses, and 10 people buying, the buyers have more influence on the sellers, and the prices will be low.
If five more people decide to buy houses, the price will go up, and if another five decide to buy one of these houses, the price will climb even further. Thus, when demand is high the price goes up and, consequently, the supply contracts, while supply expands and prices go up when demand is low. This is also consistent with empirical literature. It has been suggested that the demand for housing depends on income, price and the demographic characteristics of the household. This has been the fundamental approach in estimating demand (Kormendi and Protopapadaki, 2004:23).

Results also show that there is a positive relationship between interest rates and housing prices. However, this relationship is insignificant and it cannot explain the variations in house price. Finally, the results show that there is a positive relationship between house prices and household debt. However, this relationship is not statistically significant.

The results of the East London model are displayed below.

Table 3: East London regression results

<table>
<thead>
<tr>
<th>Included observations: 139 after adjustments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variable</td>
</tr>
<tr>
<td>HS</td>
</tr>
<tr>
<td>INT</td>
</tr>
<tr>
<td>TGH</td>
</tr>
<tr>
<td>HDI</td>
</tr>
<tr>
<td>HDEBT</td>
</tr>
<tr>
<td>C</td>
</tr>
</tbody>
</table>

| R-squared     | 0.729990    | Mean dependent var | 11.41054 |
| Adjusted R-squared | 0.721930 | S.D. dependent var | 0.981765 |
| S.E. of regression | 0.517708 | Akaike info criterion | 1.556498 |
| Sum squared resid | 35.91490 | Schwarz criterion | 1.662054 |
| Log likelihood | -103.1766 | Hannan-Quinn criter. | 1.599393 |
| F-statistic    | 90.56932   | Durbin-Watson stat | 0.371376 |
| Prob(F-statistic) | 0.000000 |

These results differ slightly from those of the Port Elizabeth model. In the Port Elizabeth model, most results have a strong relationship. In the East London model the coefficients
are weaker, and the interest rates have a negative relationship. This shows that interest rates play a role in determining house prices in East London, and suggests that when interest rates rise, the cost of buying a house would be high, pushing house prices up. Furthermore, household savings have a positive relationship with house prices in East London.

In the Port Elizabeth model, household savings have a negative relationship with house prices. Also, the Port Elizabeth model showed a positive relationship between HDI and house prices. However, the East London model shows a negative relationship between HDI and house prices. In East London, household disposable income has a negative relationship with house prices. This suggests that when income decreases, house prices go up.

4.4 DIAGNOSTIC TESTS

Gujarati (2004:516) argues that diagnostic tests should be performed so that the model finally chosen is a good model in the sense that all the estimated coefficients have the right signs, they are statistically significant on the basis of the $t$ and $F$ tests, the R-Squared value is reasonably high and the Durbin-Watson $d$ has acceptable value (around 2). In this regard, this study employs the Histogram and Normality test, Correlogram of Squared Residual Test.

4.4.1 Correlogram tests

Correlation of a time series with its own past and future values is called autocorrelation. It is also referred to as “lagged or series correlation”. Positive autocorrelation is an indication of a specific form of “persistence” – the tendency of a system to remain in the same state from one observation to the next. The results from the correlogram tests show that the residuals are now stationary. This is shown by the ACF results. They go straight to zero after the 10th lag. This shows that the residuals are now stationary. This also suggests that the model is a better model.
Results from the correlogram tests are shown in the section that follows

| Date: 10/10/16 | Time: 21:45 |
| Sample: 1981Q1 2016Q4 |
| Included observations: 139 |

<table>
<thead>
<tr>
<th>Autocorrelation</th>
<th>Partial Correlation</th>
<th>AC</th>
<th>PAC</th>
<th>Q-Stat</th>
<th>Prob</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>0.594</td>
<td>0.594</td>
<td>50.127</td>
<td>0.000</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>0.499</td>
<td>0.225</td>
<td>85.698</td>
<td>0.000</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>0.408</td>
<td>0.073</td>
<td>109.69</td>
<td>0.000</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>0.345</td>
<td>0.040</td>
<td>126.92</td>
<td>0.000</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>0.365</td>
<td>0.143</td>
<td>146.44</td>
<td>0.000</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>0.262</td>
<td>-0.071</td>
<td>156.57</td>
<td>0.000</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>0.170</td>
<td>-0.103</td>
<td>160.87</td>
<td>0.000</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>0.131</td>
<td>-0.011</td>
<td>163.45</td>
<td>0.000</td>
</tr>
<tr>
<td>9</td>
<td></td>
<td>0.162</td>
<td>0.111</td>
<td>167.43</td>
<td>0.000</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>0.092</td>
<td>-0.092</td>
<td>168.71</td>
<td>0.000</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>0.081</td>
<td>0.002</td>
<td>169.71</td>
<td>0.000</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>-0.048</td>
<td>-0.157</td>
<td>170.07</td>
<td>0.000</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td>0.058</td>
<td>0.204</td>
<td>170.59</td>
<td>0.000</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td>0.070</td>
<td>0.019</td>
<td>171.35</td>
<td>0.000</td>
</tr>
<tr>
<td>15</td>
<td></td>
<td>0.049</td>
<td>-0.020</td>
<td>171.73</td>
<td>0.000</td>
</tr>
<tr>
<td>16</td>
<td></td>
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<td>-0.181</td>
<td>172.06</td>
<td>0.000</td>
</tr>
<tr>
<td>17</td>
<td></td>
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<td>0.013</td>
<td>173.31</td>
<td>0.000</td>
</tr>
<tr>
<td>18</td>
<td></td>
<td>-0.054</td>
<td>0.012</td>
<td>173.77</td>
<td>0.000</td>
</tr>
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Table 4

4.4.2 Cusum test

Cusum tests assess the stability of coefficients (β) in a multiple linear regression model of the form y=XB+ε. Inference is based on a sequence of sums, or sums of squares, of recursive residuals (standardised one-step-ahead forecast errors) computed iteratively from nested subsamples of the data. Under the null hypothesis of coefficient constancy, values of the sequence outside an expected range suggest structural change in the model over time.
Results from the Cusum test are shown in the section that follows.

![CUSUM 5% Significance](image)

**Figure 1**

Our forecasting procedure cannot be expected to produce good forecasts if the forecasting model that we constructed was stable over the sample period and will remain stable over the forecast period. If the model’s parameters are different during the forecast period than they were during the sample period, then the model we estimated will not be very useful, regardless of how well it was estimated.

Results from the Cusum tests show that the regression model was stable. This can be seen from the blue line between the red lines on Figure 1 above. This shows that the model is stable. Visual examination of the graphs of the recursive parameter estimates can be useful in evaluating the stability of the model.

### 4.4.3 Normality test

An assessment of the normality of data is a prerequisite for many statistical tests because normal data is an underlying assumption in parametric testing. There are two main methods of assessing normality: graphically and numerically. If the fit is poor the data are
not well modelled in that respect by a normal distribution, without making a judgment on any underlying variable. The normality test was done and results are shown below.

![Histogram of Residuals](image)

**Figure 2**

The results show that the residuals are normally distributed. The p-value of the residuals is 0.76 and this is above 0.05 which shows that the residuals are normally distributed. If the p-value was less than 0.05 there could be no normality. The results also show that the kurtosis is close to 3 (2.9) and the skewness is close to zero (0.1). This shows that the data is normally distributed.

### 4.5 CONCLUDING REMARKS

This chapter focused on interpreting the regression results specified and explained in Chapter 4. Several regressions were conducted for robust results in order to analyse the determinants of house price volatility in Port Elizabeth and East London. The results on the factors that influence house price volatility were presented. An assessment of the explanatory variables shows that household savings (HS), household disposable income (HDI), interest rates (R) and total growth in household buildings (TGH) are statistically significant in explaining changes in house prices.
Jointly, all the explanatory variables can account for almost 52% of the changes in the dependent variable. The Durbin Watson statistic showed that there is no autocorrelation in the model. This shows that the model is significant.
CHAPTER 5: SUMMARY, CONCLUSIONS, POLICY IMPLICATIONS AND RECOMMENDATIONS

This chapter strives to draw conclusions from results of the study and to put forward recommendations for future policy formulation. Determinants of house price volatility in Port Elizabeth and East London has been a subject of great interest that has generated much discussion in the theoretical literature. The aim of this study was to develop an econometric model for Port Elizabeth and East London house prices volatility determinants. The study used quarterly time series data for the period 1981:1 to 2015:3 giving 139 observations with four economic variables considered for possible inclusion into the econometric model house price volatility determinants.

\[ P_{it} = \beta_0 + \beta_1 H_{Di} + \beta_2 R_{t} + \beta_3 H_{DEBTt} + \beta_4 T_{GHT} + \beta_5 H_{St} + U_t \]

This chapter endeavours to draw conclusions from results of the study and make recommendations for future policy formulation, as well as articulate the implications of the findings on house price volatility in Port Elizabeth and East London. The chapter begins by providing a summary of the study, then offers conclusions and areas of further research.

5.1 SUMMARY OF FINDINGS AND GENERAL REMARKS ON HOUSE PRICE VOLATILITY

The main objective of the study was to investigate the determinants of house price volatility in the residential markets of East London and Port Elizabeth. This resulted from the fact that housing price volatility in metropolitan areas has grown in importance as a result of risk associated with investing in residential property. The causes of house price volatility vary from economy to economy, such that from the South African residential property markets perspective, house price fluctuations and volatility are influenced by a list of non-exhaustive factors.
The economic literature discussed above yields conflicting and unresolved theoretical and empirical results on the key determinants of house prices volatility. This is as a result of ever-changing global markets that have led to instability and financial turmoil in property markets. This leaves some fundamental questions regarding the volatility of housing market prices to remain unanswered.

Thus, this study should contribute significantly to empirical literature on house price volatility in Port Elizabeth and East London, with the South African residential market being unique given its constituent space, capital segment, development segment, and land market segments. This study’s specific importance with regard to economic policy and policymakers is further underscored by the fact that the literature on the overall effects of house price dynamics and volatility is scarce.

Literature showed that there are a number of theories that looked at housing price behaviour. Theories such as the classical theory of interest rate, demand and supply theory, the Q-theory of housing and the user cost model for housing investment were discussed. These theories were supported by different explanatory variables such as interest rates, replacement cost, wages, rentals, profits, material costs, among others have been identified as the major determinants of housing prices volatility.

A number of empirical studies from both developed and developing countries on the determinants of housing prices were discussed. The findings from the empirical literature have shown that there is no general consensus of the exact factors that determine the volatility of housing prices since diverse results were obtained from the studies examined. Even though these factors vary with economies, literature of housing prices in developing countries was found to be scantier.

Theoretically it was seen that a decrease in house prices will, in turn, reduce household’s wealth and value of assets, aggregate household consumption and aggregate spending at large. Since house prices play a vital role in the micro and macro economy activities, it is found necessary to evaluate its impact and creditworthiness on the economy as a whole. Therefore, the dynamics and volatility of house prices influence not only business cycle
dynamics, through their effect on aggregate expenditure, but also the performance of the financial system, through their effect on the profitability and soundness of financial institutions.

Understanding the behaviour and the dynamism of residential house prices in metropolitan areas in South Africa is thus of key interest to central banks charged with maintaining price and financial stability in the economy at large. In addition to the role played by house price movements, it was also found necessary to reveal the factors affecting house prices volatility in Port Elizabeth and East London because of its significance in stabilising the financial sector.

Results showed that household savings, household income and total growth in household buildings (TGH) are statistically significant in explaining changes in house prices. Jointly, all the explanatory variables can account for almost 52% of the changes in the dependent variable. The Durbin Watson statistic showed that there is no autocorrelation in the model. This shows that the model is good. Results from the regression show that there is a negative relationship between house prices and household savings.

A one-unit increase in household savings leads to a 0.407 decrease in house prices. This relationship makes economic sense because when households save, there is less income available to buy houses. When there is less income available to buy houses, it would mean there is less demand for houses.

Results further showed that there is a negative relationship between total growth in household buildings (TGH) (new buildings) and household prices. A one-point increase in new houses, lead to a 0.081 decrease in the price for houses. This is consistent with economic theory. The theory of supply states that higher prices may create an incentive for other businesses to enter the market leading to an increase in total supply.

Results show that household disposable income and house prices have a positive relationship. A one-unit increase in household income leads to a 0.123 increase in house prices. This is consistent with economic theory. An increase in income will lead to people demanding more. When the demand increases it will lead to an increase in house price.
5.2 POLICY IMPLICATIONS AND RECOMMENDATIONS

Flowing from the results of this study, certain policy implications and recommendations can be indicated. Household disposable income, household saving and household debt are shown to be the most influential determinants for housing prices volatility in Port Elizabeth and East London. At the same time, housing prices have been shown to respond positively to mortgage interest rates and household disposable income. Therefore, the future course of housing prices within the South Africa housing market can be assessed.

These findings should help economic players and households in the South African housing market to trace and predict future house prices as expectations about future prices have an important bearing on price setting behaviour in the short term. Furthermore, the fact that the key significant house price volatility determinants in Port Elizabeth and East London are identified should also help to predict and trace house price trends.

Based on the empirical results, the study presents the following recommendations:

(i) Results from the regression show that there is a negative relationship between house prices and household savings. The study recommends that housing contractors should offer financial savings services to those who need houses. They must be able to link them to financial institutions so that they save and buy houses at the same time.

(ii) Results further showed that there is a negative relationship between total growth in household buildings (TGH) (new buildings) and household prices. This calls on the government and players in the housing sector to build more houses. If there is an adequate supply of houses, this may drive house prices down and create a stable environment in the housing market. High demand in housing prices drives housing prices up, which is undesirable. It would therefore be preferable to have many providers for houses to ensure house prices are not high.

(iii) Results show that household disposable income and house prices have a positive relationship. The study recommends that housing contractors forecast the upswings and
downswings in the South African economy. During upswings they should adjust their prices upwards in order to get more from rising incomes. However, if there is a downswing, they should immediately adjust their house prices downwards, in order to match decreasing income.

5.3 LIMITATIONS OF THE STUDY AND AREAS FOR FURTHER RESEARCH

This study only used time series analysis and did not consider using panel data or cross sectional data. This was as a result of time and financial constraints. Further analyses should be done using a different research technique to see if different research methodologies would arrive at a similar conclusion. Another issue, which has also confronted previous researchers, concerns the unavailability of data. As in many industrial countries, housing price data availability in South Africa is somewhat limited and relies on one private sector provider, Absa, the largest mortgage provider.

A more systematic nationwide collection of data would provide more representative data. Moreover, if quality improvements are not adequately captured in housing market data, the measured volatility in house prices may be overstated. At the same time, it would be important to collect comprehensive data on commercial property price developments. Given the importance of the housing sector, improvements in the reliability of housing market data would be desirable.
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