An Analysis of the Performance of Residential Property Investments in South Africa

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A research project submitted in partial fulfilment of the requirements for the award of degree of Master of Accountancy in the School of Accounting, Economics and Finance, University of KwaZulu-Natal

September 2021

DECLARATION

I, Edwin Mashaba, declare that

i) The research report in this dissertation, except where otherwise indicated, is my own original research.

ii) This dissertation has not been submitted for any degree or examination at any other university.

iii) This dissertation does not contain other persons' data, pictures, graphs, or other information, unless specifically acknowledged as being sourced from other persons.

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   a. their words have been rewritten but the general information attributed to them has been referenced;

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v) This dissertation does not contain text, graphics or tables copied and pasted from the internet, unless specifically acknowledged, and the source being detailed in the dissertation and in the References sections.

Signature_____ **Date**_____

Edwin Mashaba (Student)

Signature_____ **Date**_____

Yergenthren Naicker (Supervisor)

DEDICATION

This dissertation is dedicated to my mother, Mrs Helen Mashaba. Your determination to succeed against all odds is exemplary. I could not give up on this because I always remembered that you never gave up. You are the epitome of hard work, resilience, life-long learning, empathy, and generosity. Words will be inadequate to express my deep admiration and gratitude towards you.

ACKNOWLEDGEMENTS

Thanks be unto the Lord, through whom I can do all things!

To my parents, Mr Eric Mashaba and Mrs Helen Mashaba, thank you for always believing in me and doing your utmost to give me a better future.

To my dear wife, Mrs Precilla Mashaba, thank you for your endless support and motivation. I am truly blessed to have you in my life.

To my siblings, friends, colleagues, and ex-colleagues, thank you for your continuous support, motivation and always being there.

To Lightstone property, thank you for availing the data used in this study.

To my Supervisor, Mr Yergenthren Naicker, thank you very much for being my mentor on this journey. I am very grateful for your guidance and patience.

ABSTRACT

Residential property is amongst key asset classes available to investors. While many studies have been conducted on residential property investments, the evaluation of residential property according to its value segments (low-value, medium-value, high-value and luxury) is seldom given attention. This study sought to analyse residential property investments in South Africa according to the value segments from 2010 to 2019. The study compared the performance of the various residential property segments. Then the performance of residential property segments was compared with the performance of other key asset classes. The study also evaluated the short-run and long-run relationships between residential property segments and key economic factors using the ARDL model. The results indicated that low-value property was the best-performing segment, followed by the luxury segment while the mid-value and high-value segments were the least-performing segments. The results were consistent with and without consideration of risk, supporting the principle of risk-return trade-off. In contrast to other asset classes, equities were the best-performing asset class, followed by low-value property. However, on a risk-adjusted basis low-value property outperformed all asset classes followed by cash and equities. This study also found evidence of short-run and long-run relationships between residential property segments and the economic factors of inflation and interest rates with mixed results between segments. Interest rates were found to have a negative long-run relationship with mid-value, high-value and luxury property segments but not the low-value segment which was found to be positively related. In contrast, inflation was found to have a positive long-run relationship and a negative short-run relationship with all residential property segments. Economic growth was found to be unrelated to any of the residential property segments. In conclusion, the study found that the performance of residential property investments varied across segments and the economic factors had mixed relationships with residential property segments. It is recommended that investors should consider including low-value properties in their investment portfolios, while also maintaining a balance between asset classes. It is also recommended that investors should consider relevant economic factors when making residential property investment decisions.

Keywords: Investments, Asset Classes, Residential Property, Economic Factors, ARDL

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LIST OF ACRONYMS

ALBI	All Bond Index
ALSI	All Share Index
ARDL	Autoregressive Distributed Lag
BBQ	Bry and Boschan Quarterly
BIS	Bank for International Settlements
BRT	Bus Rapid Transit
CAHF	Centre for Affordable Housing Finance in Africa
CAPM	Capital Asset Pricing Model
CPI	Consumer Price Index
Cusum	Cumulative Sum
EGARCH	Exponential Generalised Autoregressive Conditional Heteroskedastic
ETF	Exchange Trade Funds
FBI	Federal Bureau of Investigation
FIFA	Federation of International Football Association
GDP	Gross Domestic Product
GIS	Geographics Information System
H_0	Null hypothesis
H_1	Alternative hypothesis
HLM	Hierarchical Linear Modelling
IMF	International Monetary Fund
JSE	Johannesburg Stock Exchange
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
PPP	Purchasing Power Parity
REIT	Real Estate Investment Trust
Repo rate	Repurchase Rate
RQ	Research Questions
SARB	South African Reserve Bank
SLR	Simple Linear Regression

StatsSA	Statistics South Africa
STEFI	Short-Term Fixed Interest
VAR	Vector Autoregression
VIF	Variable Inflation Factor

CHAPTER ONE: INTRODUCTION

1.1. Introduction

There are many investment options available for South Africans. This chapter provides an overview of the various types of investments with a specific focus on residential property investments in the South African context. The research problem is then identified and clearly defined in the context of existing studies. This chapter then establishes the objectives and questions which the study seeks to answer. Finally, this chapter highlights the potential benefits of the study and provides an outline of the dissertation.

1.2. Background to the Study

South African investors have a diversity of asset classes they can invest in. These include cash, equities, bonds, property, commodities, derivatives and exchange traded funds (ETFs) amongst others. Although there are many other types of investments, Stefan (2017) identified cash, equities, bonds and property as the most common types of investments in the South African context. It is no wonder then that most South African retirement funds also allocate their investments to these four asset classes to provide their members with diversified and balanced investment portfolios. Luus (2005) also identified property, cash, bonds and equities as the pillars of a diversified investment portfolio.

The importance of maintaining a well-diversified investment portfolio has long been a key strategy for successful investing. Asmal (2003) found that diversification is a key strategy to achieve meaningful returns at a reasonably low level of risk. Jaques (2007) singled out property as one of the key asset classes to ensure a diversified and balanced investment portfolio. As compared to other asset classes, property investments have also been found to be effective in hedging against the erosion in purchasing power (Stefan, 2017).

Without downplaying the importance of diversification and other asset classes, residential property investments are of particular interest in this study due to their unique characteristics. Beyond being an investment, residential property is of interest because it is also a basic human need. According to Maslow's (1943) hierarchy of needs, every human being requires a shelter. Due to its necessity as a source of shelter, Keng and Hwa (2004) noted that residential property is in many instances the most significant asset class in the investment portfolio of many

individuals. A recent survey by StatsSA (2019) found that 65 percent of South African households own residential property.

By their nature, residential properties also differ from other types of investments due to their lower level of liquidity, lower level of risk, ability to generate rental income, relatively stable valuations, and the ability to leverage such investments. Furthermore, numerous strategies can be adopted to invest in residential property investments. These include buy-to-let, buy-to-sell, property development and investing in listed property shares. By far, the strategy that yields the highest returns is the buy-to-let strategy (Jaques, 2007).

There are however divergent views on whether investing in property is more favourable than investing in other asset classes. Asmal (2003) found that returns from property investments exceeded returns from other asset classes from 1983 to 2002. However, Rode (2000) established that the returns from equity investments tend to outperform property investments in the long term. Rode (2000) also acknowledged that the returns from property investments and equities tend to be similar in the long term when the risk factors are accounted for. It is these contrasting and often contradicting views that have sparked the interest for this study.

The performance of one type of property may differ fundamentally from that of another property over the same period. According to Asmal (2003), this is due to factors that are specific to the type of property, such as location, physical attributes, rental prospects, and factors specific to the market, such as the economy, property laws, crime levels and general consumer behaviour. This sentiment has been echoed by Luus (2005) who noted that properties are hardly comparable due to their unique attributes. Therefore aggregate property values are more likely approximations rather than accurate values (Luus, 2005).

This study explores the different segments of residential property available to an investor in South Africa with a view of expressing findings on the performance of each segment over time. The study also aims to examine the relationship between the performance of each residential property segment against the other types of investments and against key economic factors to add to the existing body of knowledge about residential property investments. There is no doubt that this could assist active and potential investors to make well-informed investment decisions.

1.3. Problem Statement

Several studies have been conducted on the performance of property investments both nationally and internationally (Kgano, 2017; Qiao & Wong, 2015; Tyranes, 2010). Some work has also been done to understand the extent to which economic factors influence property investment returns (Erasmus, 2015; Irandu, 2017; Sibanda, 2013). In the studies reviewed, it is very clear that property is a very significant asset class on its own and in the context of a diversified investment portfolio. Most people consider property as a safe investment with potential for capital appreciation over time (Asmal 2003).

The problem with existing studies is that they tend to generalize the performance of property investments by depicting them as homogenous. This leads to generalizations about the performance of property investments which may not necessarily hold true for all the property segments. The discrepancies may be much more amplified in a country like South Africa where there are high levels of inequality (Kgano, 2017). Jaques (2007) established that different properties are subject to different externalities and economic factors. Accordingly, this study aims to explore the performance of residential property investments across the four segments (low-value, mid-value, high-value and luxury) to provide a more vivid depiction of residential property investments in South Africa. By analysing the individual residential property segments, as opposed to all residential property in general, the study aims to address the issue of generalisation observed in other studies.

This study also aims to contrast the performance of residential property investments with the other asset classes (equities, bonds and cash) to establish the best-performing asset class from 2010 to 2019, which according to Faure (2017) was a period of sustained low economic growth in South Africa. Key economic factors relevant to residential property investments are also investigated to understand their relationship with the different segments of the property market.

1.4. Research Objectives

As a starting point, this study explores residential property according to its four segments with a view of establishing the type of residential property segment that yields more value for the investor over the long term. This provides more context on the dynamics of residential property investments in South Africa. The study then looks at the performance of residential property investments against other asset classes to determine the best-performing asset class with and without consideration of risk. Finally, the study looks at key economic indicators and their

effect on residential property investments at a segmental level. Therefore, the objectives of the study are:

1. To evaluate and assess the performance of residential property segments in South Africa from 2010 to 2019;

2. To evaluate and assess the performance of residential property investments against other asset classes in South Africa from 2010 to 2019; and

3. To establish the relationship between residential property segments and key economic indicators in South Africa from 2010 to 2019.

1.5. Research Questions

To achieve the objectives set out above, the study seeks to answer the following research questions:

1. How did the individual residential property segments perform in relation to one another in South Africa from 2010 to 2019?

2. How did the residential property investments perform in relation to other asset classes in South Africa from 2010 to 2019?

3. What was the relationship between the individual residential property segments and key economic indicators in South Africa from 2010 to 2019?

1.6. Relevance of the Study

The South African residential property market is estimated to consist of 6.3 million houses with a combined value of about R4.5 trillion (Pam Golding Properties, 2019). Luus (2005) had estimated the value at R750 billion in 2002, which suggests a six-fold increase over an eighteen year period. This positions the residential property market as a significant asset class from a pure financial perspective. Furthermore, property is arguably the most significant asset class that many individuals hold as an investment (Keng & Hwa, 2004). According to Chatterjee, Czajka & Gethin (2020), residential property accounts for 29% of total household assets, just slightly below bonds and equities, which account for 35% of total household assets. The findings from this study can assist current and potential investors to make informed investment decisions.

Property investments are already a topic of much interest, as evidenced by the amount of existing scholarly work both locally and internationally. This study aims to add to the existing body of knowledge by exploring various aspects of property investments in South Africa. By contrasting property with other asset classes, the study aims to enlighten everyday South Africans about different types of investments. This study also provides a more comprehensive view of property investments in South Africa, which can be used as a basis for further studies.

1.7. Delimitations of the Study

The study is confined to residential property in South Africa and the findings may not be generalised to non-residential property and/or property located outside of South African borders. Furthermore, the study considers the ten-year period from 2010 to 2019 which was a period characterised by sustained low economic growth in South Africa. The findings may be different if the study is applied to a different period. While there are other factors affecting residential property investments, the analysis in this study is confined to the selected economic factors of economic growth, inflation and interest rates.

1.8. Assumptions

This study assumes the following:

a) Returns from residential property investments are only measured in terms of capital appreciation. In addition to capital appreciation, residential property investors usually earn rental income, which is not considered in this study.

b) Returns from equity investments are only measured in terms of capital appreciation. Equity investors usually also earn returns in the form of discretionary dividend income, which is not considered in this study.

c) Investment and holding costs are not considered. While difficult to quantify for research purposes, there are costs associated with acquiring and disposing investments. Furthermore, residential property investments usually require upkeep and maintenance over the holding period. These costs are not considered in this study.

d) The effects of financial leverage are not considered. Usually residential properties are financed through a mortgage loan which could affect overall returns due to the leveraging effect.

1.9. Limitations of the Study

This study has the following limitations:

a) Alternative residential property indices are available to conduct a study of this nature, which could yield different results. Therefore, the findings from this study are more likely to remain informative rather than conclusive.

b) The property index relied upon in this study specifically excludes all township properties and informal property. The impact of excluding these properties and its significance on the findings is unknown.

c) While all residential properties in this study are deemed relevant to investors, some of the residential properties are owner-occupied and thus not necessarily held as investments. The impracticability of separating owner-occupied property from investment property is one of the limitations of this study.

1.10. Outline of this Dissertation

Chapter One has introduced the topic, outlined the background of the study, and established the research problem and objectives.

Chapter Two presents the theoretical framework and reviews existing empirical studies on property investments. Gaps are identified and a rationale is drawn for the analysis of residential property investments in South Africa.

Chapter Three describes the research methodology followed to collect and analyse data for the study. It explains how the research was designed and conducted. Data sources and analytical methods are also presented in this chapter.

Chapter Four analyses the data, presents the findings and provides a discussion of the findings for each of the research objectives.

Chapter Five summarizes the key findings, implications, recommendations, and draws conclusions.

1.11. Chapter Summary

This chapter has presented the study topic, being an analysis of the performance of residential property investments in South Africa. The chapter has provided a synopsis of the topic and established the problem statement and research objectives. By analysing the performance of residential property investments in South Africa during a period of sustained low economic growth, the study will add to the existing body of knowledge on residential property investments and other asset classes. This can assist existing and potential investors in making informed decisions, while also enhancing financial literacy amongst South Africans.

The next chapter presents the theoretical framework underpinning the study and an overview of existing empirical studies relevant to this study.

CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

This chapter provides an overview of existing work relevant to this study, both locally and internationally. The insights from this review are used to identify gaps for further research. As a starting point, the theories around property investment are discussed and the appropriate theoretical framework relevant to the study is identified. This is followed by a review of the South African property market over the last two decades. The different residential property segments are explored and compared with other major asset classes. The macro-economic factors relevant to residential property are explored and a rationale for this study is drawn.

2.2. Theoretical Frameworks

This study on property investments forms part of a broader financial literacy framework. According to PennState (2020), financial literacy theory consists of five key components, namely, earnings, savings and investments, spending, borrowings, and protection.

PennState (2020) suggested that individuals should maximize their earning potential while they are young. They should spend less than they earn and save the difference, and start investing early and in a diversified manner by taking only 'good debt' and protecting their assets from adverse life effects. Lusardi and Mitchell (2014) emphasized this theory by suggesting that people need to consume less than they earn during their working life so they can have something to consume in retirement. This study brings together a number of these components in that, to invest in property, one generally needs to earn an income or have some assets in the form of savings or investments. It is also common for property investors to take out debt to finance property and property should be insured against risk.

Bodie, Treussard & Willen (2011) advocated for the theory of life cycle investing. According to this authors, this theory can be used to make decisions around savings, insurance, buying or renting a property and financing property. The theory considers three life stages of an investor (youth, prime earning years and retirement) and savings decisions should be made with due consideration of these life stages. The theory also posits that there is trade-off between consumption and investing whereby higher consumption in one life stage reduces the funds available for consumption in other life stages. An investor who consumes more during their prime years may have very little to consume during their retirement. Therefore, the theory

suggests that property investment decisions should be made with due consideration to all life stages to avoid a financial crisis in any life stage.

It has always been said that an investor should not put all the eggs into one basket (Rodrigues 2009). This principle speaks directly to the imperative of reducing risk through diversification. In the context of this study, property is not regarded as the ultimate asset into which all funds should be invested. Rather, it is one of the essential classes of assets into which funds may be invested to ensure balance and diversification in a portfolio. This notion is better encapsulated by the modern portfolio theory which was developed by Harry Markowitz in 1952. According to this theory, investors can construct a diversified investment portfolio that maximizes returns based on a specified level of risk (Fabozzi & Grant, 2001).

Despite its wide acceptance and usage, this theory has been criticized for some of its assumptions. For instance, the theory assumes that investors always make rational decisions, while investors often just follow the herd. Similarly, the theory assumes an unlimited capital can be borrowed by the investor at a risk-free rate. However, this is not realistic as investors have credit limits and the interest is often subject to the credit risk profile of the investor.

With its own challenges, the modern portfolio theory is widely used by investors in decision making. In the context of this study it could be used to assist investors to determine the optimal combination of asset classes for a diversified and balanced investment portfolio. Furthermore, the modern portfolio theory could be employed to determine the optimal combination of different types of residential property investments to reduce risk while maximizing returns. Therefore, this study adopts the modern portfolio theory as a theoretical framework for investing.

2.3. The Context of the South African Property Market

South Africa is a developing nation with its own unique demographics, history, opportunities, and challenges. With its well-documented history of colonialism and apartheid, South Africa became a democratic nation in 1994, paving the way for the structural reforms and policy changes that followed. Located on the southern tip of the African continent, it is the most industrialised of all African countries and often regarded as the gateway to the rest of Africa (Pillay, 2009). Much of its economic prosperity is derived from its rich mineral resources. The Witwatersrand gold basin is regarded as the world's largest reserve of gold deposits and, until recent years, South Africa was known to be world's leading producer of gold (Frimmel, 2019).

2.3.1. Population Dynamics

The discovery of gold in Johannesburg in 1886 set in motion the mass migration of people from predominantly rural areas to the urban Witwatersrand in search of economic opportunities (Mlambo, 2018). This mass migration and abundance of economic activity played a key role in the urbanization and industrialization of what is now Gauteng. As of the middle of 2020, South Africa had a population of approximately 59.6 million people, with the majority being black Africans. Table 2.1 illustrates the population composition in terms of race and gender.

Table 2.1: Population by race and gender

Population group	Male		Female		Total	
	Number	Percentage distribution of males	Number	Percentage distribution of females	Number	Percentage distribution of total
Black African	23 519 474	80,7	24 634 253	80,8	**48 153 727**	**80,8**
Coloured	2 555 204	8,8	2 692 536	8,8	**5 247 740**	**8,8**
Indian/Asian	787 662	2,7	753 451	2,5	**1 541 113**	**2,6**
White	2 266 535	7,8	2 413 235	7,9	**4 679 770**	**7,8**
Total	**29 128 875**	**100,0**	**30 493 475**	**100,0**	**59 622 350**	**100,0**

***Source**: StatsSA (2020)*

The population of South Africa is spread out over nine provinces. The Northern Cape is the largest province by land area, accounting for 30.5 percent of the country's land area, while Gauteng's land area accounts for a mere 1.5 percent of the total, making it the smallest province. Interestingly though, the largest province is also the province with the lowest number of people and the smallest province is also the province with the highest number of people (StatsSA, 2020). This can be seen in Figure 2.1.

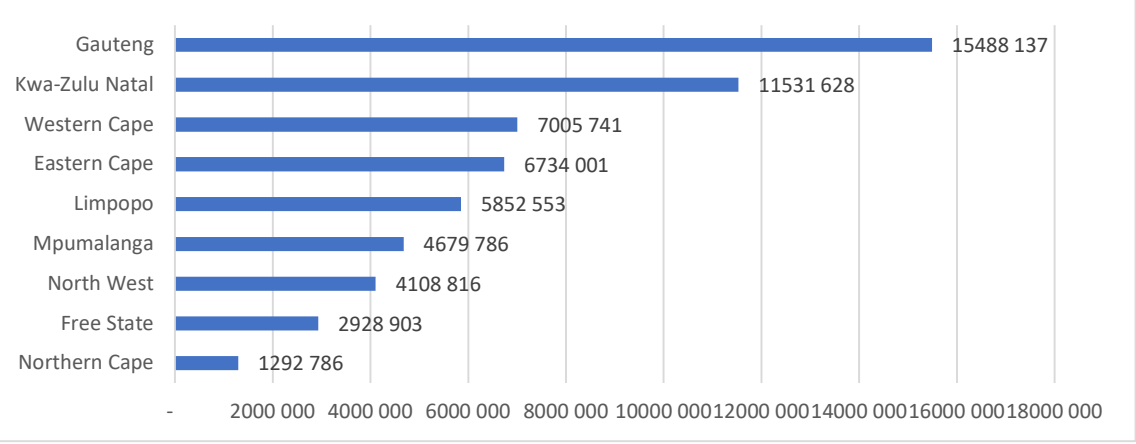


Figure 2.1: National population, by province

***Source**: StatsSA (2020)*

The general household survey conducted by StatsSA (2019) showed that Gauteng had the highest number of houses and Northern Cape had the least. Despite its position as the smallest and yet most populous province, Gauteng is still experiencing the highest level of net immigration as compared to other provinces (StatsSA, 2020). According to Landau and Gindrey (2008), this skewness in population numbers is expected to continue unabated for the foreseeable future due to Gauteng being the economic centre of the country.

According to StatsSA (2020) there are more people migrating into South Africa than leaving the country on a nett basis. This has been partly due to the migration of other African nationals into South Africa because of political and economic challenges in their own countries (Luus, 2005). It flows logically that these immigrations should result in a higher need for property to house the immigrants. All things equal, the heightened demand for property should increase property prices. However, Luus (2005) noted that a significant number of immigrants tend to live in informal settlements around cities, which tends to reduce property prices instead. Table 2.2 shows the migration patterns between 2016 and 2021.

Table 2.2: Migration patterns, by province

Province in 2016	Province in 2021									Out-migrants	In-migrants	Net migration
	EC	FS	GP	KZN	LP	MP	NC	NW	WC			
EC	-	13 912	147 876	99 442	14 168	16 996	8 184	38 047	176 984	514 888	191 931	- 322 957
FS	8 613	-	83 824	8 030	6 693	11 012	9 265	24 275	12 471	164 185	134 256	- 29 929
GP	52 196	40 565	-	70 546	103 684	82 955	12 663	111 507	98 647	572 765	1 553 162	980 398
KZN	26 474	12 804	232 459	-	9 965	38 148	8 941	12 156	34 636	375 583	287 420	- 88 163
LP	4 576	5 924	353 346	8 406	-	48 355	2 645	32 910	11 532	467 693	278 581	- 189 112
MP	5 391	5 570	143 588	13 483	25 013	-	2 481	14 323	10 454	220 302	281 336	61 034
NC	4 600	9 264	17 449	5 901	2 768	4 685	-	13 259	19 027	76 954	88 507	11 554
NW	5 456	12 386	113 683	6 416	20 913	12 499	24 787	-	9 582	205 723	318 604	112 881
WC	53 664	8 469	65 793	13 883	6 128	7 699	13 521	8 855	-	178 013	468 568	290 555
Outside SA (net migration)	**30 961**	**26 081**	**395 145**	**61 313**	**89 249**	**58 986**	**6 019**	**63 273**	**95 234**			

***Source**: StatsSA (2020)*

As can be seen from Table 2.2, Gauteng has been the recipient of the highest number of nett in-migrants, followed by the Western Cape. While also receiving nett in-migrants, the numbers have been relatively lower in the North West, Mpumalanga and Northern Cape. On the other hand, the Eastern Cape had the highest number of out-migrants, followed by Limpopo. KwaZulu-Natal and the Free State only had a marginal number of nett out-migrants. Gauteng

also received the highest number of immigrants from outside South Africa, followed by the Western Cape. In essence, more people seem to be migrating away from the more rural provinces like Limpopo and the Eastern Cape to the more urban provinces like Gauteng and the Western Cape. Incidentally, Gauteng and the Western Cape have the highest levels of GDP per capita while the Eastern Cape and Limpopo have the lowest (StatsSA, 2019). This seems to suggest that migration patterns are influenced by the search for better economic prospects.

2.3.2. Housing Dynamics

The general household survey conducted by StatsSA (2019) analysed the living arrangements of South Africans. According to the survey, about 82 percent of households live in formal houses built from bricks and concrete, while 18 percent live in traditional huts and shacks. Over the years, the government has been providing low-cost housing to alleviate informal structures, but the project still experiences a lot of challenges, such as substandard houses being built and significant backlogs. Figure 2.2 summarizes the housing dynamics in South Africa.

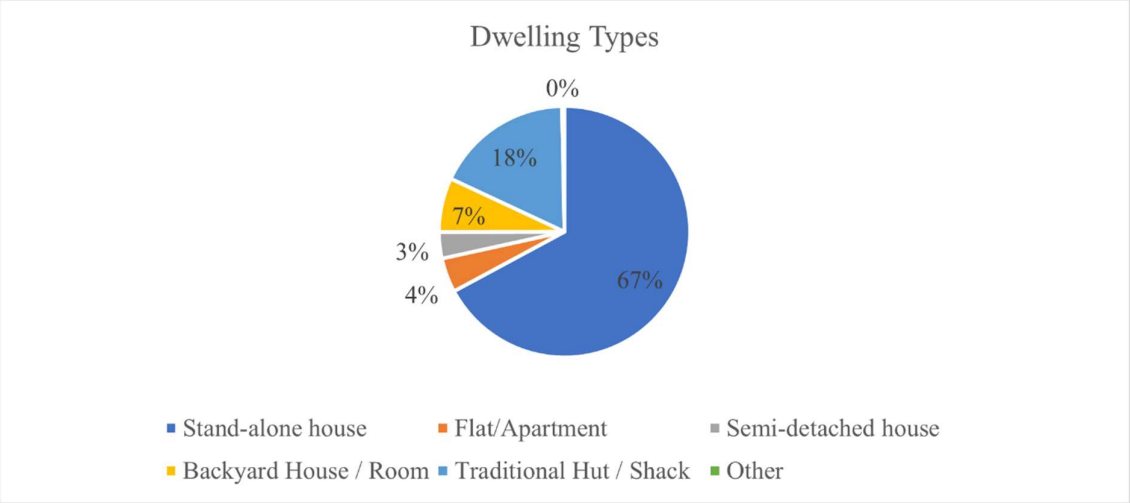


Figure 2.2: Types of housing structures in South Africa

***Source**: Compiled by author using data from StatsSA (2019)*

The StatsSA (2019) survey also looked at the ownership of dwellings and found that 65 percent of households lived in property they owned, 22 percent in rented property and 13 percent occupied a property that was not their own without paying any rent. Moreover, 57 percent of households indicated that they had fully paid off the houses they lived in. Gauteng had the lowest proportion of households who had paid off their houses, followed by the Western Cape. These findings are in line with the report of the Centre for Affordable Housing Finance in

Africa (CAHF) which found that over 56 percent of houses in South Africa are usually not financed as they fall within the affordable category (valued below R600 000) (CAHF, 2020).

2.3.3. Employment and Wealth Distribution

To invest in property, households need to have a certain level of income or wealth. As of March 2020, South Africa had an estimated 38.9 million people of working age (15-64 years). 16.4 million of these were employed in either the formal or informal sector (StatsSA, 2020), while 15.4 million were not economically active. Consequently, the official rate of unemployment in South Africa has been estimated at 30.1 percent, making it one of the highest unemployment rates in the world. The situation looks much bleaker when the broader definition of unemployment is considered, which sits at 39.7 percent. This also explains why South Africa has a gini index of 63, making it one of the least equal countries in the world (World Bank, 2021). The impact of such high levels of unemployment and inequalities on residential property dynamics in South Africa is quite evident in the growing disparities in living conditions between poor townships and rich suburbs.

Chatterjee, Czajka & Gethin (2020) published a working paper on the wealth distribution in South Africa. The paper put the extent of gross inequalities into more perspective. More specifically, the average adult person in South Africa has a net worth of R326 000 measured at purchasing power parity (PPP). However, the distribution of wealth is extremely unequal amongst citizens. An estimated 85.6 percent of the national wealth is in the hands of only ten percent of the population, while 90 percent of the population shares the remaining 14.4 percent of national wealth. Moreover, those not in the top one percent of the population share only 45.3 percent of national wealth, while the remaining 54.7 percent is shared amongst the top one percent of the population. The situation only gets worse when one looks at the granular information and it is very clear that South Africa is an extremely unequal society (Chatterjee, Czajka & Gethin, 2020).

Figure 2.3 illustrates the wealth distribution of South Africa compared to other nations.

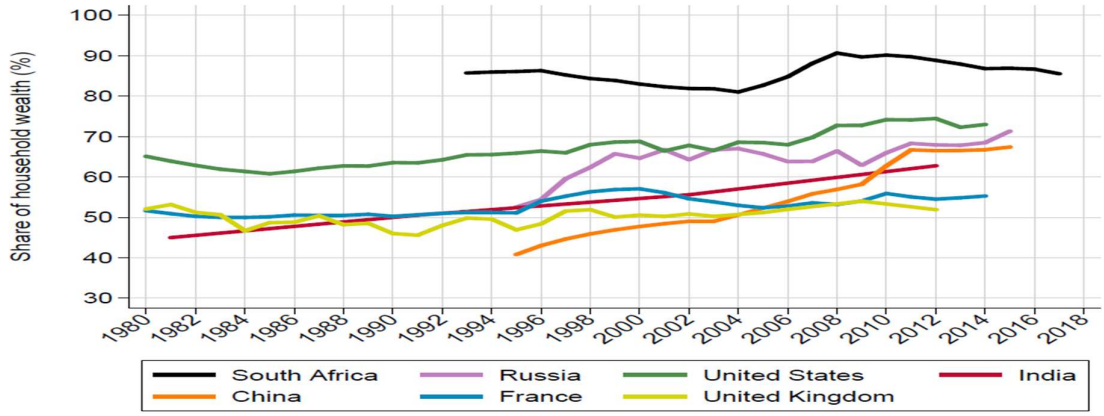


Figure 2.3: Wealth distribution within 10% of the population, by country
***Source**: Chatterjee, Czajka & Gethin (2020)*

As can be seen from the Figure 2.3, the distribution of wealth within 10 percent of the population in South Africa is remarkably higher than that of other nations. Over 80 percent of wealth is concentrated in the hands of only ten percent of wealthiest people in South Africa and this has hardly improved since 1994. This places South Africa amongst the most unequal countries globally.

The extreme levels of inequality are also reflected in the high number of people receiving social grants in South Africa. In a recent survey, StatsSA (2019) reported that 31 percent of the population receive some form of a social grant. This proportion was 13 percent in 2003 and has been growing steadily over the years. According to CAHF (2020), 53 percent of South Africans live below the poverty line. Recently there have been renewed calls for the government to implement a basic income grant to reduce poverty in South Africa. While this has been contested and debated extensively, the implementation of such a grant has had a positive impact in other countries. If implemented effectively, such a grant is expected to go some way in reducing the gross inequalities in the country (Marais, 2020).

2.3.4. Education

South Africa spends a significant portion of its budget on basic and higher education as it has always been held that education is a gateway out of poverty into a prosperous life (Allais, Cooper & Shalem 2019). StatsSA (2020) has consistently shown that the more educated people are, the less likely they are to be unemployed. Unemployed people are less likely to invest in property simply because they do not have the means. The recent StatsSA (2020) labour force

report showed that of all the unemployed people in the country, only 2.3 percent were graduates.

Figure 2.4 illustrates unemployment by education level.

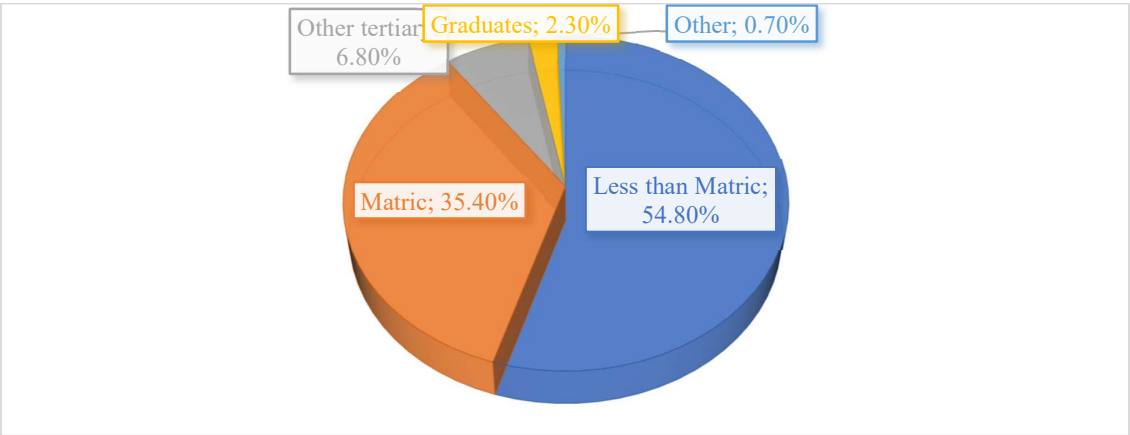


Figure 2.4: Percentage of unemployed people by education level

***Source**: StatsSA (2020)*

As illustrated in Figure 2.4, unemployment has been the highest (54.8%) amongst people who do not have a matric qualification and the lowest (2.3%) amongst graduates. A recent report by the Organisation for Economic Co-operation and Development (OECD) has affirmed the importance of education in reducing unemployment as it shows that 85 percent of all tertiary graduates between the ages of 25 and 64 are employed (OECD, 2019). Unfortunately, a huge number of South Africans do not have tertiary qualifications. A recent report by the OECD has shown that only seven percent of adults between the ages of 25 and 64 in South Africa have tertiary qualifications, which is well below the OECD average and for countries belonging to the group of 20 forum (G20). It is encouraging, though, that the number of South Africans with a secondary school attainment has been increasing over the years. However, the low level of the population with tertiary qualifications implies that many South Africans are still economically excluded as they remain unemployed (OECD, 2019).

2.3.5. Past Performance of the South African Property Market

The average price of a house in South Africa increased from R23 200 in nominal terms in 1975 to an average of R358 700 in 2002. This was an increase of about 11 percent year-on-year. Compared to the inflation rate of about 11.5 percent during this period, it can be safely concluded that property prices only kept up with inflation over this period. However, during

this period, there were significant fluctuations owing to the various events that occurred during this period. For instance, the period from 1975 to 1980 was characterised by much political unrest such as the Soweto uprisings in 1976, and this had an adverse effect on the economy and property prices, and property values declined in real terms during this period (Luus, 2005).

The boom in gold prices and gold exports from 1980 to 1984 increased the general household incomes, which bode well for South African house prices. In effect, house prices recovered from the setback of 1975 to 1980. From 1984 to 1987 there was a lot of political pressure against the apartheid system which affected the South African economy and sent interest rates soaring. Real house prices declined by at least 42 percent in real terms during this period. From 1988 to 1990 house prices stayed relatively the same. However, the uncertainties surrounding the transition to a democratic South Africa shook the economy during the 1991 to 1993 period, resulting in a decrease in average house prices (Luus, 2005).

The beginning of the democratic era in 1994 ushered in a period of stabilization in the political landscape, the emergence of a black middle class, progressive economic policies and favourable changes in legislation. According to Delmendo (2020), these factors created a positive environment for the property market as many individuals could purchase property in urban areas for the very first time. On the back of heightened demand, property prices stabilized and entered a growth trajectory. According to Luus (2005), house prices nearly doubled between 1998 and 2003.

Figure 2.5 depicts the movement in house prices between 1975 and 2002:

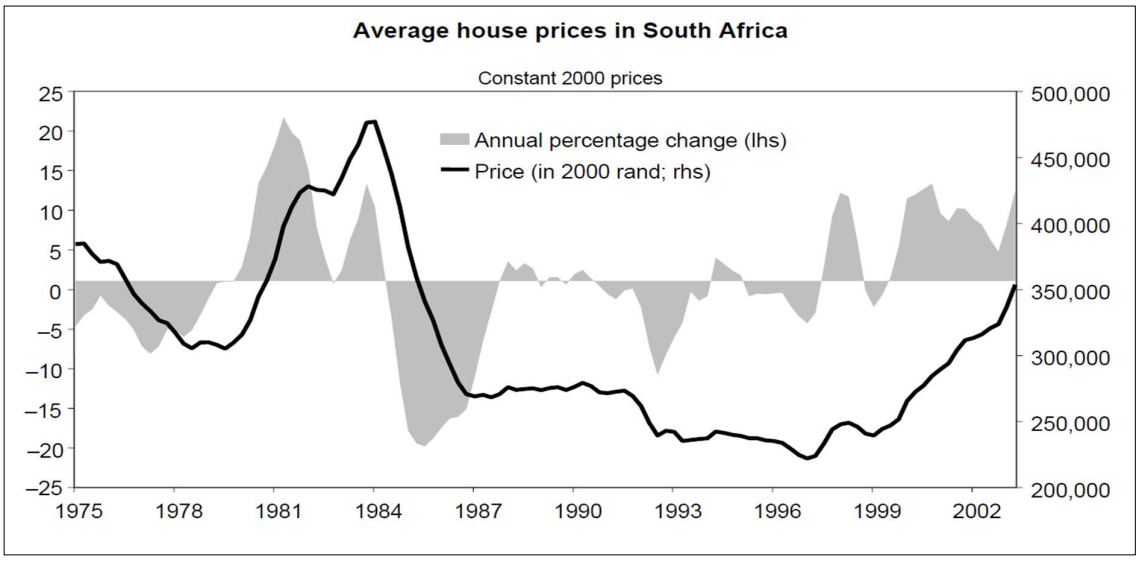


Figure 2.5: Average house price (1975 – 2002)

***Source**: Luus (2005)*

As can be seen in Figure 2.5, residential property prices were booming during the early 1980s. A sharp decline was experienced from the mid-1980s to the late 1980s. Marginal but sustained declines in property prices continued until around 1997 with a sharp upturn from 1998. Rambhai (2017) attributed the property upturn of the late 1990s to declining interest rates. To put it into context, the prime interest rate reached a historical 25.5% in August 1998 and declined to 11% by August 2003 through successive monetary policy interventions. However, this property boom of the late 1990s and early 2000s was disrupted by the global financial crisis of 2007 and 2008, with lasting adverse effects on world economies (Kwangware, 2009). Around the same time, power outages commonly known as 'load shedding' also began in South Africa. These power outages interrupted business activity which filtered into the economy. These power outages had a significant and adverse impact on the South African economy (Lenoke, 2017).

Figure 2.6 depicts the movement in house prices from 2000 to 2009.

Figure 2.6: Nominal vs Real House price movement (2000 – 2009)

***Source**: Portfolio Property Investment, (2009)*

As can be seen from Figure 2.6, residential property prices increased in both nominal and real terms from 2000 until late 2004. From 2005 to 2009 residential property prices declined in both nominal and real terms and they began to pick up again in 2010. Delmendo (2020) noted that the National Credit Act was introduced in 2005. This tended to reduce access to mortgage bond

finance as lenders became more conservative in their lending criteria. On the other hand, the hosting of the 2010 FIFA world cup in South Africa and the continuing emergence of the black middle class seemed to have mitigated against some of these negative factors (Delmendo, 2020).

While many investors were eagerly anticipating an economic recovery from the economic shake-up of the late 2000s, Delmendo (2020) observed that the early 2010s ushered in a period of pro-longed low economic growth, continuing load-shedding, sovereign credit downgrades by major credit rating agencies, rising debt-to-GDP levels, rising levels of unemployment, policy uncertainty and the lack of economic reforms. During this period, there was also a boom in property development projects across major cities which increased the supply of residential properties. While some suggested that the stagnation in property prices was merely a price-correction period in the property cycle, others questioned the very fundamentals of property as a viable investment. Figure 2.7 depicts the movement in property prices during this period.

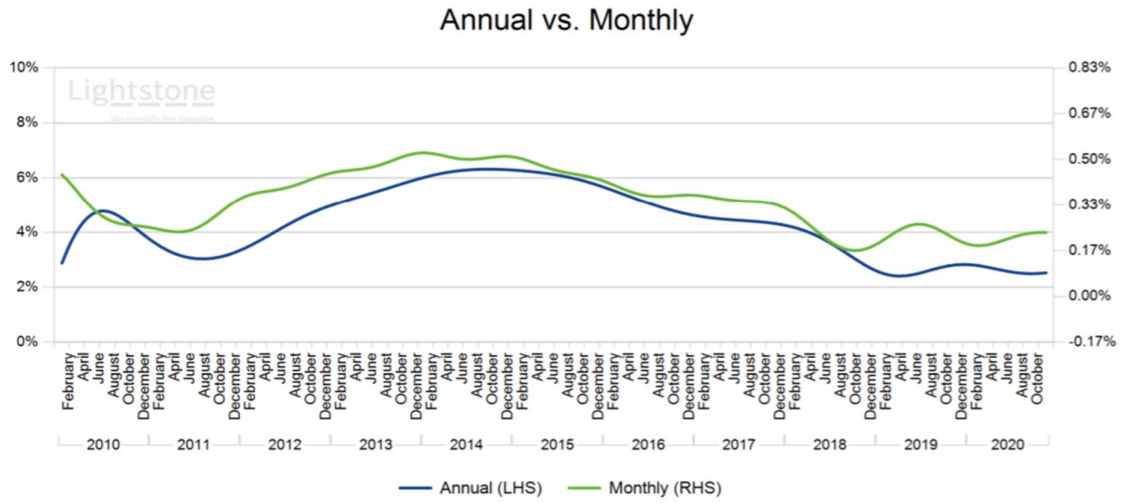


Figure 2.7: Annual vs monthly house price movement (2010 – 2020)

***Source**: Lightstone (2020)*

Figure 2.7 shows that nominal residential property prices increased by between 2% and 6.5% on an annual basis from 2010 to 2020. Unlike the preceding decades, the 2010-2020 decade showed a less volatile but moderate movement in residential property prices. This decade was characterised by low economic growth owing to a downturn in the commodities cycle, declining exports, slowdown in productivity, economic policy uncertainty, electrical outages, and labour market disruptions (Faure, 2017). This study aims, as one of its objectives, to

highlight the specific economic factors that could have contributed to this moderate movement in house prices during this period.

To understand the behaviour of the South African property market better, Ocran and Anyikwa (2013) studied the pattern of movements and variations in residential property prices in South Africa from 1980 to 2011. Using the EGARCH statistical model, house price movements were analysed in response to significant economic events. It was found that house price movements in South Africa were random as they did not follow a fixed pattern. It was also observed that any economic disruptions to house prices tended to have a lasting effect on house prices. This makes it difficult to predict future house price movements based on past house price movements. Contrary to this view, Bracke (2013) argued that property values did not follow a random movement. Instead they tended to follow a certain momentum in the short run and a mean reversion in the long run.

Notwithstanding these findings, it is also submitted that there are underlying factors that lead up to sudden disruptions in the economy. A lot of economic crises do not occur haphazardly; they often build up over time, as observed with the 2008-2009 global financial crisis. Therefore, if potential economic shocks can be pre-empted based on current economic activity, one may then be able to anticipate their effect on house prices. This notion has been supported by Boshoff and Cloete (2012), who established that the behaviour of the property market can be predicted based on expectations of future economic behaviour.

Bracke (2013) investigated the upswings and downswings of property prices in 19 OECD countries to establish the duration of property cycles. The study used the Bry and Boschan Quarterly (BBQ) algorithm developed by Harding and Pagan (2002) to dissect house price series into cycles. Official property data from 1970 to 2010 for the 19 OECD countries under observation were used. It was found that property values are characterized by a series of booms and busts, with booms generally lasting longer than busts. Essentially, property prices have a tendency of trending upwards. However, such upward movements are imperfect, which leads to overshoots in some instances. Those overshoots tend to self-correct through periods of busts. Moreover, the duration of a property bust is highly dependent on the duration of a previous boom.

Xie and Liu (2004) studied the relationship between house prices and rentals in the Chinese residential property market. It was established that the realistic price-rent ratio in China should

be around 150-200. This means that for every 150 units of currency invested in property, monthly rental income of one unit of currency should be earned. This suggested that house prices in Shanghai and Hangzhou were overvalued while properties in Beijing and Guangzhou were deemed reasonably priced. The existence of price bubbles in the South African property market could be tested using similar methodology, however, it is limited by the lack of reliable rental data in South Africa at a reasonable price as observed by Kgano (2017).

2.4. Residential Property Segments

Bourassa, Hoesli and Peng (2003) conducted a study to establish the relevance of property segments in Auckland, New Zealand. In their study, they noted that properties were often segmentalized based on their size, room numbers, whether property was detached or semidetached, and geographical location. They used official data for residential property transactions in New Zealand. Principal component analysis and hedonic regression methods were used to assess whether segmentalizing property was useful when conducting automated valuations and predicting house prices. Their study found that residential property segments were very relevant when analysing property investments, particularly with respect to the geographical locations of properties.

The implication of Bourassa, Hoesli and Peng's (2003) finding is very significant and warrants investigation in the South African context. As location was found to be important in property valuations, it implies that the performance of residential properties in various locations around South Africa may potentially reveal distinct or contrasting results. For instance, the performance of residential property in predominantly rural Limpopo could be fundamentally different from that of mostly urbanized Gauteng. Similarly, the performance of residential property in the coastal areas of KwaZulu-Natal could be very different from the performance of inland properties in the same province or other provinces.

James (2013) found that identical properties located in different towns in the country can draw vastly different levels of demand, and within a single town there could be sub-markets of property. For instance, a major city may typically have a central business district (CBD), surrounding suburbs, upmarket suburbs, outskirts, and townships. According to James (2013), these dynamics make the supply and demand attributes of property much more complex than may be apparent on the surface.

Kgano (2017) noted that individual residential property segments tend to reveal distinct performances over time as opposed to the often generalized outcomes. This supports the view that residential properties are not homogenous. Jaques (2007) also observed that different types of property are subject to different external factors. Accordingly, price movements and the impact of economic factors could vary based on the type of property being observed. While many scholars tend to generalize the performance of all residential properties as though they are homogenous, such generalizations often fall short in providing sufficient decision-useful information to an individual property investor.

According to Kgano (2017), the residential property market can be segmentalized into low-value, middle-value and high-value properties. This is also in line with other property indices such as the FNB residential property index and the Absa house price index. In his study, Kgano (2017) also found that that the high-value residential property market was not as resilient as the low-value market, while the resilience of the middle-value segment was found to be moderate. Kgano (2017) focused only on residential properties in the City of Johannesburg inner city, which has provided an opportunity for the extension of the study to other areas across the country.

Jaques (2007) on the other hand sought to establish the type of property investment strategy with the highest likelihood of creating value for the investor. He found that the buy-to-let property investment strategy offered a much higher return overall as compared to other property investment strategies such as flipping property, developing property, or investing in property shares. It must be noted that Jaques' (2007) findings did not point to a specific type of buy-to-let property investment that can maximise value for an investor, but rather to all buy-to-let properties in general. Jaques (2007) recommended that much research still needs to be done in South Africa on property investments and wealth creation through investments. This study aims to contribute to this recommendation.

Qiao and Wong (2015) investigated the yields from residential properties of various sizes in Hong Kong. They evaluated the yields from residential properties of various sizes using stochastic dominance techniques and found that smaller properties had higher yields than bigger properties. This implies that a residential property investor in Hong Kong could generate more wealth by investing in smaller properties as opposed to bigger ones. However, some of the literature cited by Qiao and Wong indicated that the results of similar investigations produced mixed results in other parts of the world, particularly the United States.

Gupta, Jurgilas and Kabundi (2010) investigated the reaction of the different property segments to monetary policy in South Africa. All property segments according to the house price index compiled by Absa from 1980 to 2006 were considered in the study. A factor-augmented vector autoregression (VAR) model was used to assess the movement in house prices in relation to shocks in monetary policy. It was found that shocks in monetary policy adversely affected house prices. The effect was much more pronounced on the luxury segment, large-middle segment and medium-middle segments and less observable on the small-middle segment and affordable segments. The inconsistency in the level of impact across the different segments also support the need to look at property from a segmental basis as it is a heterogenous asset.

Ekemode (2021) studied the relationship between inflation and residential property segments in Nigeria by looking at three segments (flats, bungalows and detached houses) from 1999 to 2018. Using official data from the National Bureau of Statistics, the short-run hedging capabilities of property were tested on the ordered least squares regression model. The long-run effect was also tested using the Johansen (1988) and Juselius (2018) cointegration models. The outcomes of the study were mixed across the different segments over the short-run and long-run as some property types provided more significant inflation hedges than others. According to Ekemode (2021), this highlighted the importance and relevance of analysing property across its segments.

2.5. Asset Classes

Out of the many asset classes available to investors in South Africa, equities, property, bonds and cash are the most common. As one of the objectives of this study is to compare the performance of different asset classes, a broad overview of these asset classes is provided.

2.5.1. Equities

Equity investments involve purchasing shares in a company, typically through the stock exchange. The shareholder then becomes the proportionate owner of the company in accordance with the number of shares held. The financial performance of the company, investor sentiment and the economic laws of demand and supply (amongst others) cause the share price to either increase or decrease as they are being traded. Investors benefit from the positive movement in share prices and dividends which may be paid by the company from time to time. Generally, equity investments are very liquid as the shares are usually traded daily on the stock market and the transactions are executed in real time. However, equity investments also carry

a higher investment risk because share prices can be volatile and upon liquidation, equity investors do not have any preferential rights to receive payment (Asmal, 2003).

2.5.2. Bonds

Bonds are debt instruments which are used by both corporates and governments to raise capital. An organisation issuing bonds receives cash from bondholders and in return undertakes to make periodic interest payments to the bondholders. The company then settles the capital portion of the bond at the end of the agreed period. Accordingly, the bondholders have an investment in the form of the right to receive bond interest and capital invested. Bondholders have a preferential right to receive payment over ordinary shareholders, which makes bonds less risky than equity investments (JSE, 2021).

2.5.3. Cash

Cash is considered one of the essentials of a balanced investment portfolio. This is because investors seeking to earn returns at the minimal level of risk have the option of investing cash in an account that bears interest, such as a savings account or money market account. The cash will earn interest while also providing liquidity when it is needed. Cash investments usually provide lower rates of return than other asset classes, but they also carry a lower level of risk than other asset classes. The interest earned from cash investments is usually not sufficient to overcome the effects of inflation over the long term, but it certainly helps to maintain the purchasing power of the money invested (Morningstar, 2016).

2.5.4. Property

Investing in property can be done in numerous ways. One way is to follow the direct path, where an investor purchases a physical property. The investor would benefit by earning rental income from letting the property and by capital appreciation on the value of the property (Asmal, 2003). Jaques (2007) found that the strategy of investing in buy-to-let properties has the best prospects of success. Investors can also invest directly in property by purchasing existing property, developing and improving it, and then selling it at a profit (Jaques, 2007). While property has its own specific investment risks, many investors still perceive property as a lower-risk investment due to its tangible nature (Asmal, 2003).

An investor can also invest indirectly in property by purchasing shares in a company that invests in physical property. The returns would then come in the form of periodic dividends and appreciation in the value of the shares. The rise of real estate investment trusts (REIT) has provided an opportunity for investors to invest indirectly in property. This is preferable for investors who do not have the ability, time or willingness to invest directly in property. Furthermore, investing in REITs often offers better diversification as most REITs invest in different types of properties and in different locations.

2.6. Performance of Residential Property against Other Asset Classes

As residential property is only one of a number of asset classes available to investors, it is often important to compare the performance of residential properties with the performance of other classes to understand their relative performance. This provides information that can be useful to investors when deciding on the allocation of capital to the various asset classes. Over the years, there has been considerable debate about whether investing in property is a 'good' decision as compared to investing in other asset classes such as equity and bonds. The results of existing studies on this topic are often inconclusive and sometimes contradictory.

Goodman (2003) contrasted the returns and volatilities of residential property against those of equities, bonds, cash and REITs for two periods, 1976 to 2001 and 1992 to 2001, in the United States. The analysis was performed using official quarterly data of the house price index and returns from other asset classes. Returns from residential properties were found to be less than returns from other asset classes, often by significant margins. However, returns from residential property had lower volatility than other asset classes, except cash, which suggests that residential properties carry a lower level of risk. In his analysis, Goodman (2003) noted the key differences between residential property and financial assets like equities, bonds and cash, one being that residential property is a physical investment while financial assets are non-physical. Another difference is that residential property is usually leveraged while financial assets are not. According to Goodman (2003), these differences often make a direct comparison difficult.

Asmal (2003) compared property investments and share investments on the basis of their returns and risks. The research involved gathering different views from property specialists, stock-brokers, and active investors, and analysing consumer behaviour and how it affected investment choices. Data about the risks and returns of property and stock markets were also analysed and it was found that both investment types are susceptible to certain risk factors.

Asmal's conclusion recommended that an investor should maintain a diversified and balanced portfolio of investments in cash, equities, bonds, property, and a portion should be invested in off-shore markets to achieve an optimal level of risk and return.

Erasmus (2015) analysed the ability of property and other asset classes such as equities to protect investors against the effects of inflation. Erasmus utilized technical analysis, fundamental analysis, correlation analysis and Sharpe ratios with the JSE listed property as a proxy. The findings indicated that property was a preferred mitigation against inflation over the long-term, while equities were preferred over the short-term.

Stefan (2017) conducted a related study on the capabilities of various asset classes to protect investors against the impact of inflation. This study used more advanced data analysis methods such as the Pearson correlation, Granger causality, VAR theory and co-integration with secondary data from the JSE as proxy. The results of the study were different from those of Erasmus (2015) in that property, along with bonds and cash, was found to be preferrable as an inflation hedge over the short-term instead of the long-term.

Sun, Liu and Zheng (2004) compared the value of investing in new residential property investments versus shares or equity in Shanghai. The capital asset pricing model (CAPM) was used to segregate the systematic and unsystematic risk of both residential property investments and equity investments in Shanghai during the 1993 to 2003 period. When taking risk into consideration, residential property yielded a higher return than equity investments and property shares. It was also found that returns from residential property investments had a negative correlation with returns from equity investments, making a good case for using residential property to diversify an investment portfolio.

Keng and Hwa (2004) highlighted the benefits of using property to diversify an investment portfolio in their study of the Malaysian residential property market. They tracked an investment portfolio consisting of bonds and equities over the 1988 to 2001 period. The house price index was incorporated into these investments and risk-adjusted returns were computed. It was found that including property in an investment portfolio resulted in a higher risk-adjusted return overall.

Candelon, Fuerst and Hasse (2020) studied the benefits of diversifying property investments across the types of properties in the same country compared to diversifying by investing in property across different countries. According to Candelon et al., this is often an overlooked

area of research with limited prior studies. Candelon et al. used property data from 16 OECD countries for the 1999 to 2018 period and employed a modified relative Sharpe ratio loss method. It was found that diversifying across countries was more effective than diversifying across types of properties within the same country. These findings also supported the importance of diversification and the need to look at diversification from various perspectives.

2.7. Factors that affect residential property investments

Residential properties and properties in general are affected by many factors. However, property investors place varying levels of importance on those factors, making the overall effect much more complex than may be apparent on the surface. While the focus of the present study is on economic factors, other studies are reviewed to understand the other broad factors affecting residential property.

2.7.1. Physical and environmental factors

James (2015) identified environmental factors as some of the key factors affecting property investments. All things equal, a property located in an air-polluted area is expected to command a lesser price than the same property located in an area with the best air quality. Similarly, a property located near good schools and other conveniences is expected to command a higher price than a similar property located in an area with poor or no facilities.

Źróbek et al. (2015) studied the preferences of property buyers in Poland with the main aim of identifying the factors that were most significant in the decision to buy property. Primary data were collected using computer-aided interviewing methods. Apart from price being the unsurprising factor influencing the buying decision the most, security factors and noise levels were found to be dominating factors. Proximity to the workplace and the scenery associated with property were found to be of moderate importance in the buying decision. On the other hand, factors such as the proximity of the property to water bodies, the quality of the air, and the prevalence of undeveloped space were found to be of lowest importance to most buyers.

A similar study was conducted by Marchant (2009), investigating the aspects considered by property investors when purchasing a property in the city of Queensland, Australia. Surveys were conducted on property buyers where they had to rank the level of importance they placed on over 60 identified variables. The factors included physical factors, distance factors, financial factors, environmental factors, legal factors, psychological factors, locational factors, and any

other factors deemed relevant by the purchasers. Affordability factors topped the results, followed by the state of repair and maintenance, design features and neighbourhood. The key finding was that while location was an important factor in the purchasing decision, it was rather the liveability factors that came with location that were deemed more important.

Hui and Liang (2016) investigated the effects of landscape views and proximity to key facilities on property prices in the city centre of Guangzhou, China. The study utilized spatial econometric analysis to analyse both the direct and indirect effects. It was found that high-rise buildings with facilities such as an elevator attracted higher prices than those without an elevator. It was also found that the floor on which the property was located was of no essence to the investors. However, properties which had a view of the park attracted a premium price compared to those with just a view of the road. Properties with a view of the road alone attracted significant discounts, which was attributed to the perception of noise and air pollution near the roads. Interestingly, properties with a view of the river did not seem to command any premium. It was also found that people were more willing to pay a premium for a property located closer to the bank and the post office, while properties located near a hospital tended to trade at a discount.

South Africa is known to have one of the highest crime levels globally. While these high crime levels are thought to be related to the high levels of unemployment and inequality, past studies have shown that it was possible for crime levels to drop without any significant changes in the socio-economic factors (Pope & Pope, 2012). While the effect of crime levels on property values has not been widely studied locally, it has been studied abroad. Pope and Pope (2012) investigated the relationship between declining crime levels and property values in over 3 000 localities. The study was conducted on the back of declining USA crime levels between 1993 and 2000. Official crime data from FBI-administered institutions and property data compiled using the well-known Case-Shiller method were analysed and it was established that decreases in crime levels had a significant and almost immediate impact on property values.

2.7.2. Transport facilities

The role of transport facilities on property values has also been a subject of research in the past. Gallo (2020) concluded that the interrelation between transport facilities and property values is usually always positive. However, such an impact is not the same across geographical locations and projects. In one international study, Filippova and Sheng (2020) investigated the

effect of bus rapid transit (BRT) on residential property in the city of Auckland, New Zealand. They used the spatio-temporal autoregressive modelling method to evaluate the movement in house prices associated with proximity to the BRT system. It was found that the introduction of the BRT system had a moderate effect on property values. According to Filippova and Sheng (2020), the effect could have been higher if income levels in the area were not as high and if the adaptation to public transport was faster.

A similar study was conducted by Zhang et al. (2020) in Australia to assess the outcome of the BRT system on property values in the city of Brisbane. The BRT system was considered to have a significant role on the transport system of the city, accounting for just over 52 percent of public transport. The study relied on data from 2012 property transactions and used the geographically weighted regression model. A positive relationship between the BRT system and property prices was observed. However, the effect was also subdued due to the traditional preference of using cars. The actual operation of the BRT system was also found to be of significance more than the mere introduction of the system.

In South Africa, the Gautrain rail system was implemented ahead of hosting of the 2010 world cup to provide fast and reliable public transport between Pretoria and Johannesburg. Mushongahande, Cloete and Venter (2014) studied the association between the implementation of the Gautrain rail system and property development activity around three areas where Gautrain stations were located, namely, Rosebank, Pretoria and Midrand. The study relied on official property development data before, during and after the development process. Interviews with property developers and officials were also held to gauge the property development activity resulting from the introduction of the Gautrain. The Gautrain rail system was found to be a catalyst of property development activity in all three areas, especially Rosebank.

Arnold, Le Roux and Hattingh (2017) analysed the influence of Gautrain stations in Johannesburg on movements in property. The Midrand, Rosebank and Sandton stations were analysed against movements in property located within a three-kilometre radius of the stations for the period 2006 to 2015. This period covered the construction phase, commencement phase and full operation phase of the Gautrain rail system. Using the GIS system, the sales activity and movement in property prices as per the deeds office were spatially analysed. It was found that the impact of the Gautrain on property prices varied across the three stations analysed. The impact was more pronounced in Sandton, where properties within a one-kilometre radius

showed a higher increase in prices than those within two- and three-kilometre radius. In contrast, Rosebank properties located within one kilometre of the station experienced a decline in prices while those within two and three kilometres of the station showed an increase. In Midrand, property prices within one kilometre of the station showed an increase, while the prices of those located two to three kilometres away from the station declined. Thus, the proximity to the Gautrain station did not necessarily result in higher property prices.

Tian, Wei and Li (2017) studied the interplay between property prices and the combined impact of transport accessibility and negative environmental factors associated with proximity to such transportation. The study was undertaken in Salt Lake City in the United States of America which has air pollution challenges. Three regression models, ordinary least squares (OLS), simple linear regression (SLR), and hierarchical linear modelling (HLM), were employed for this purpose. Contrary to similar studies in other cities, it was found that the adverse environmental effects of living close to transport facilities outweighed the potential benefits of thereof, such that consumers were more willing to pay a premium for a property that was free from pollution, but they were less willing to pay a premium for a property with better access to transport facilities.

Liang et al. (2018) investigated the relationship between location and residential property prices in the city of Ningbo, China. Property prices of houses built in the past ten years were analysed against thirteen factors which were initially thought to have some influence on property prices. Regression analysis was utilized and it was found that house prices were positively affected by their proximity to amenities such as lakes, parks, department stores, secondary schools, banks and rail transport. However, the extent to which these factors affected property prices was not consistent. Proximity to kindergartens, primary schools, roads, medical facilities, universities, financial institutions, and supermarkets was found to be of no significance to property prices.

2.7.3. Economic factors

Kwangware (2009) observed that property investments are affected by the performance of the overall economy. Accordingly, the property market tends to perform well when the economy is performing well and vice versa. This finding is consistent with the economic principles of supply and demand. According to Erasmus (2015), prices of properties tend to increase when demand exceeds supply and they tend to decrease when supply outstrips demand. Therefore,

during periods of high economic growth, one would expect property prices to rise in response to higher demand for property, fuelled by increasing household incomes. This has been supported by James (2015), who noted that excess demand of property tends to lead to higher property prices, while excess supply tends to lead to lower property prices.

Similarly, during periods of economic recession, household incomes tend to decrease, which results in lower demand for properties. This lower demand will tend to reduce the nominal values of properties. However, Luus (2005) noted that sellers of property often react to this downward trend by deferring the sale of their properties and thereby limiting a general collapse in house prices. In contrast, a growing economy could also fuel more property development activity (Luus, 2005), which could raise the supply of property and thus reduce property prices. Therefore, the overall effect of the economy on properties is itself subject to other factors, making it much more nuanced than it appears on the surface.

According to Asmal (2003), the value of residential property is affected by property-specific factors such as location, physical attributes, rental prospects and also market-specific factors such as the economy, property laws, crime levels and the general behaviour of consumers. The present study proposes that the effect of the property-specific factors can be better captured and understood by segmenting property into different types. Market-related factors can be better understood by analysing the relationship between key economic factors and the value of residential property. The understanding of this relationship can be useful in decision-making on residential property investments.

Akinsomi, Mkhabela and Taderera (2018) investigated the extent to which returns from commercial property have been explained by macro-economic variables in South Africa. The study was conducted using secondary data from the Investment Property Databank and Statistics SA during the 1995 to 2014 period. GDP, interest rates, inflation and unemployment were tested against total returns, vacancy, operating expenses, capital value, and gross rentable area. GDP, interest rates and level of unemployment were found to be the most significant factors for commercial property returns. Moreover, returns from commercial property were found to be heterogeneous and much more complex.

Haworth (2005) studied the interrelationship between variations in macroeconomic variables and property values from 1997 to 2006 in Windhoek, Namibia. The study first analysed the performance of property over the ten-year period, and then evaluated the macroeconomic

factors that influence such performance. The Windhoek house index was used as a proxy for property performance. The statistical significance of the macroeconomic factors of GDP, inflation rates, housing supply, interest rates and population levels on property performance was evaluated using the Pearson correlations. It was found that housing supply was the most significant variable explaining the movement in house prices. Contrary to other studies, the other factors were found to be statistically insignificant.

Inglesi-Lotz and Gupta (2013) investigated the long-run association between inflation and property prices in South Africa with the objective of assessing whether property could be used by investors to protect their investments against inflation. Quarterly data for all the property segments contained in the ABSA property index were used. The consumer price index (CPI), excluding housing costs, was used as proxy for inflation. A 41-year period from 1970 to 2011 was observed as the objective was to assess the long-run effect. An autoregressive distributed lag (ADRL) model was used to analyse the relationship, which was found to be positive. In line with other studies, property was found to be an effective inflation hedge in the long run. The findings from this study provide more decision-useful information as the individual segments were investigated.

Irandu (2017) investigated the macro-economic variables affecting property development in Kenya using secondary data from the Central Bank and other official sources from 2007 to 2016. The macro-economic variables of interest rate, inflation rate, money supply, capital growth rate, GDP growth rate and capital growth rate were used. A multiple regression model was used to test the interrelation between property development activity and macro-economic variables. The capital growth rate and GDP were found to be strongly correlated with property development while correlations with other factors were statistically insignificant. It was recommended that policy makers should consider of the implications for property development when they formulate policies around the macro-economy.

Sibanda (2013) studied the relationship between the macro-economy and property in South Africa. This study was informed by the contrasting outcomes of similar studies conducted in the United Kingdom and America. The direct measure of mid-value property was tested against impulse responses of inflation rate, household debt and disposable income, and long-term and short-term interest rates. Vector autoregression (VAR) models were used to test the relationship. It was found that household debt and disposable income together with short-term

and long-term interest differentials influenced property investments more than the other variables.

Sibanda's (2013) study has provided insight into the factors influencing property prices in South Africa. Apart from the main finding, it was also observed that household debt and disposable income have a positive influence on property values in the short term while having an adverse effect in the long term. This is potentially because a significant portion of properties are debt-funded. On the other hand, inflation was found to have the opposite effect on property values, decreasing returns in the short-term while increasing the returns over the long-term. Accordingly, property was found to have inflation-hedging attributes in line with those reported in other studies.

Tyranes (2006) identified disposable income as a significant driver of the value of residential property in South Africa as compared to GDP, interest rates, inflation rates, exchange rates and bond affordability levels. Tyranes suggested that the effect was much more pronounced on the lower-priced segment. Vogel (2012) however concluded that GDP was the most significant driver of residential properties in South Africa, accounting for 69 percent of the movement in residential prices while another 25 percent was attributable to factors such as inflation rates, household disposable income, household consumption, and debt ratio.

Boshoff and Cloete (2012) investigated the relationship between property values and key economic indicators in South Africa. They found a strong correlation between property values and GDP, employment levels and property investment activity.

These often-mixed findings suggest that the economic factors affecting residential property in South Africa are potentially more complex and require further investigation, as acknowledged in each study. Such further investigations should also consider the developmental context of South Africa. While much can be learned from international studies on the economic factors affecting residential property, the unique contexts of developing countries should be considered when reviewing such studies. This notion has been supported by Renigier-Biłozor and Wiśniewski (2013) who found that investment in residential property in Poland, a developing country, and Italy, a developed country, was driven by different economic factors during the same period of observation. This suggests that inferences from international studies about factors affecting residential property should take the developmental status of the countries under observation into consideration.

Inasmuch as property investments are affected by the economy, the economy is itself affected by many other factors. Delmendo (2020) observed that the introduction of rolling electricity blackouts in South Africa affected the economy adversely. Goldberg (2016) studied the economic effect of those power blackouts on the retail industry using a mixed-methods research approach. Interviews were held with industry experts and the financial cost of load shedding was quantified using a subjective evaluation method. The financial effect of load shedding on the retail industry was found to be significant as revenue was lost and backup infrastructure had to be put in place. The same study could be adapted to assess the impact on residential properties in South Africa.

The rise of the sharing economy in recent years has also brought about innovations in the property industry. More specifically, Airbnb has allowed average home-owners to rent out their own properties partially or fully on a short-term basis. The general effect of the sharing economy on the asset being shared has been studied by Filippas, Horton and Zeckhauser (2020) and the findings have not been conclusive. On the one hand, this is possibly because the demand for the item that is being shared could decline as some people who would have bought the property would rather rent it instead. On the other hand, some people who would not have considered buying the item may feel incentivized to buy it due to its rental value. The supply side also presents contrasting possibilities. The effects on the property market are much more nuanced due to its immovability, scarcity of land, and other externalities.

Horn and Merante (2017) studied the effects of Airbnb on the property market in Boston, Massachusetts. Weekly data from 2015 to 2016 were used employing big data analytics to capture the effects of Airbnb listings. The study further isolated this effect by eliminating other possible causalities. Overall, it was found that Airbnb listings tended to increase average rents. It was also observed that in the long run the supply of rental property would increase due to Airbnb, but this would be limited by the restrictions on the land available for development.

A similar South African study was conducted by Niselow (2019), investigating the relationship between Airbnb and property prices in Johannesburg. This study was informed by non-academic reports attributing some of the rise in Cape Town house prices to Airbnb. The study was conducted using interviews with property experts, economists, and governmental officials, and it used available house price information. Contrary to Horn and Merante's (2017) findings and other studies around the world, this study found no evidence of a link between house prices and Airbnb listings. It was further observed that Airbnb was still in its infant stage in South

Africa compared to other cities around the world. This could be one of the reasons for the observed lack of impact on house prices. Niselow (2019) noted that the state of the South African economy could be one reasons for the subdued performance of the property market at large.

To study the relationship between residential property and key economic factors, a number of models can be used. The model to be used should be informed by the type of data to be analysed. An analysis of key economic factors and residential property involves a multivariate time series as there are several time-dependent variables. According to Zivot & Wang (2006), one of the commonly used methods in multivariate time series is the Vector Autoregressive model (VAR). The VAR model is useful where a variable depends on past values of itself as well as other variables (Sibanda, 2013). This model was successfully used by scholars such as Sibanda (2013) and Gupta (2010) to model short run and long run relationships between variables.

However, the VAR model requires all variables in the series to be stationary at level. Where some of the variables are stationary at first difference, they must be differenced first before being applied in the VAR model. Such differencing tends to diminish the long-run relationships as observed in Larsson & Haq (2016). Unlike the VAR model, the ARDL model does not require non-stationary variables to be differenced, which makes it a much more robust and efficient model than the VAR model. Similarly, the Johansen cointegration model cannot be used where the variables are of mixed orders of integration but the ARDL model can accommodate variables of different orders of integration (Shrestha & Bhatta, 2018).

With its robustness and advantages over other models, the ARDL model is in no way a perfect model. One of the criticism of the model is its relative complexity, as there are a number of steps involved in the application of the model. Furthermore, where the data has a stochastic trend, the model may fail to capture the real dynamics of the data and estimate the trend instead (Oxera Consulting, 2010). However, despite its imperfections, the ARDL model was found to be an efficient remedy for spurious regression that often occurs with other models (Ghouse, Khan & Ur Rehman, 2018).

2.7.4. Financing

According to a 2020 report by the Centre for Affordable Housing Finance in Africa (CAHF), 54 percent of all residential property transactions in 2019 were funded through a mortgage

bond. (CAHF, 2020). This implies that the availability of mortgage finance plays a role in the property market. Anundsen and Jansen (2013) studied the interplay between property prices and mortgage credit in Norway. A cointegration analysis that was system-based was used to analyse the relationship between mortgage credit and property prices. It was found that there was a two-way interplay between the two variables in the long run, where a rise in property prices increased consumer indebtedness. Such indebtedness led to lower affordability which tended to decrease house prices. It was also observed that property prices were also affected by the consumers' expectations about the economy and their own financial situation.

Basten and Koch (2015) studied the relationship between mortgage demand and property prices in Switzerland. Property data from Comparis, a Swiss mortgage platform, were analysed using the instrumental-variable methodology. It was found that an increase in house prices correlated to an increase in the size of mortgage required. However, the increase in the mortgage size was lower than the increase in house prices, suggesting that some of the price differential was financed using cash. They also found strong evidence to suggest that higher house prices increased demand for mortgage finance. This could be explained by the panic buying that often occurs when house prices rise. However, it was also observed that increasing house prices decreased the actual number of mortgages approved by banks and increased the related interest rates. This is understandably due to affordability and credit risk issues that arise as prices rise.

Che et al. (2011) investigated the association between property prices and mortgage lending in twenty financial hubs of China. Dynamic panel data and time series techniques were used in the study. The study found a positive link between mortgage lending and property prices in all the financial hubs included in the study. Moreover, the availability of mortgage lending tended to have a positive effect on house prices. According to Che et al. (2011), this was due to the fact that prices of properties in financial centres tend to be higher and people living in financial centres have more access to mortgage funding than people living elsewhere.

The South African government enacted the National Credit Act (NCA) in 2007 with the main objective of protecting customers against irresponsible lending practices. Pillay (2009) studied the impact of this new legislation on the property market. Secondary data were analysed using bivariate techniques to assess the interrelationship between residential property development, growth in housing rental market and mortgage lending. The findings were somewhat paradoxical in that the introduction of the NCA decreased mortgage lending, which led to heightened rental activity and higher rental amounts. Moreover, the property development

industry also experienced a slump in activity after the introduction of the Act, owing to low confidence in the industry. Consequently, many jobs were lost in the construction industry.

2.8. Conclusion

As a developing country with its own set of challenges and opportunities, the South African residential property is quite a significant and dynamic asset class. While there may be different views on its investment returns, residential property is undoubtedly a key asset class for diversifying an investment portfolio. This is due to its necessity as a source of shelter which is a basic human need. The study conducted by StatsSA (2019) on the rate of inequalities in South Africa also concluded that there needs to be a higher level of focus on land and housing as these are fundamental indicators of wealth.

The review of work performed by others has indicated mixed views on whether residential property investments provide better returns than other asset classes as different outcomes have been observed in different studies. For instance, Asmal (2003) and Rode (2000) have provided conflicting views on whether property provides better returns than equities. Similarly, Erasmus (2015) and Stefan (2017) have provided different views on the inflation-hedging ability of property and other asset classes. This could well be due to the different periods under observation, which represent different points in the economic cycle. However, further investigation under a different period could provide different results as none of the classes consistently outperform others under all economic decisions (Vivian & Auret, 2019). Hence the present study aims to compare the performance of residential property investments with that of other asset classes during a decade of low economic growth in South Africa.

The heterogenous nature of residential properties also underlines the importance of analysing property across its different segments of residential property. In particular, Kgano's (2017) study produced interesting findings about residential property in the city of Johannesburg. This aligns with one of the objectives of this study, to analyse residential property on a segmental basis to provide a more vivid picture of the South African residential property investments.

What is also clear from the literature reviewed is a lack of consensus on the economic factors that are the key drivers of residential property prices in South Africa. The mixed findings support the need for more studies on the relationship between residential property investment

and key economic factors. Such studies can be enriched further by taking a segmental approach as different segments of the property market tend to react differently to changes in economic factors.

2.9. Summary

This chapter has provided an overview of the theoretical framework underpinning the study and the relevant empirical studies. An overview of the South African market over the last two decades has been provided. The various residential property segments (low-value, mid-value, high-value and luxury) have been identified and explained. Residential property has also been contrasted with other asset classes to highlight its significance. The economic factors which related to residential property were also identified from existing studies. The next chapter outlines the research methodology.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1. Introduction

The previous chapters provided background to the analysis of the performance of residential property investments in South Africa. Residential property investments were located within the South African and investment context. The views of other scholars in this field were explored to obtain more insight into the relevant factors affecting residential property investments. Overall, residential property investments appear to be influenced by amongst others, the following factors:

- Physical and environmental factors (James, 2015)
- Socio-political dynamics (Delmendo, 2020; Pope & Pope, 2012)
- Population and migration patterns (Luus, 2005)
- Infrastructure dynamics such as transport and electricity (Gallo, 2020)
- Household dynamics (Luus, 2005)
- Employment and wealth distribution dynamics (Chatterjee, Czajka & Gethin, 2020)
- Economic factors (Vogel, 2012)
- Credit and financing dynamics (Anundsen & Jansen, 2013)

The purpose of this study is to analyse the performance of residential property investments in South Africa on a segmental basis during a sustained period of low economic growth and establish the impact of economic factors on residential property investments, and also to compare the performance of residential property investments with other asset classes. While the interplay between residential property investments and some of the factors outlined in Chapter Two is undeniable, this study aims to explore the contribution of the selected key economic factors suggested in earlier studies. It was also noted in Chapter Two that the performance of residential property investments does not exhibit a uniform pattern across the various property segments (Kgano, 2017). This chapter therefore aims to outline the strategy and techniques used to carry out the current research.

This research did not require ethical clearance and was exempted from ethical review. This can be seen in Appendix C.

3.2. Research Design

A research design is a framework that directs a researcher in the collection and analysis of data. A good research design assists the researcher to plan and conduct the study in a relevant, objective, efficient and cost-effective manner (Pandey & Pandey, 2015).

In Chapter Two it was observed that very few of the studies reviewed provided a clear background to the research methodology used. More specifically, the philosophical worldviews underpinning the study have often been omitted or opaquely explained. Mackenzie and Knipe (2006) observed this when they noted that the lack of consistency and clarity in the application of research paradigms tends to worsen the already daunting task for new researchers. Often this leaves new researchers uncertain about the role and relevance of research paradigms. However, Mackenzie and Knipe (2006) believed that the choice of a research methodology cannot be made without first selecting the appropriate research paradigm for the study. The chosen paradigm sets a tone for the study and provides guidance on the selection of the appropriate research design. Therefore this study first provides a context to the research methodology by locating the relevant research paradigm.

A research paradigm refers to the philosophical worldview of the researcher in relation to the topic being studied. The chosen research paradigm should be informed by the researcher's own comprehension of reality (ontology), what is perceived as acceptable knowledge (epistemology) and the researcher's own beliefs and values on research (axiology) (Saunders, Lewis and Thornhill, 2009). The chosen research paradigm sets direction for the study.

This study follows a positivism paradigm as described by Saunders, Lewis and Thornhill (2009). The study is concerned with objective observation and data analysis to generalize the performance of residential property investments in South Africa. Furthermore, the study provides a comparative analysis of residential property against other asset classes and investigates possible causal factors associated with the performance of residential property in an objective and independent manner. The positivist paradigm is mostly aligned with quantitative research design, although qualitative and mixed methods can be used in certain instances (Mackenzie & Knipe, 2006). Therefore, this study uses a quantitative research design with a combination of descriptive and correlational designs, to analyse secondary data using statistical and econometric methods.

3.3. Research Population

A research population contains all the possible items for the intended research. In the present study the population is all the South African property transactions that have taken place from 2010 to 2019. The Lightstone Property index includes all property transactions registered at the Deeds Office.

The Lightstone Property index provides nominal returns from residential properties and is segmentalized into low-value, mid-value, high-value and luxury value properties. The segments are determined based on the value of the property, as illustrated in Table 3.1.

Table 3.1: Residential property segments

Property Segment	Value-Band
Low-value properties	Less than R250 000
Mid-value properties	From R250 000 to R700 000
High-value properties	From R700 000 to R1 500 000
Luxury properties	More than R1 500 000

***Source**: Lightstone (2020)*

In compiling the segmental data, Lightstone Property used the repeat sales methodology. This methodology is preferred over the average price methodology as it only considers properties that have transacted twice during a particular time. Properties that have never exchanged hands are automatically excluded, thus eliminating the influence of the property mix. This methodology is world-renowned and is used by institutions such as the office of federal housing enterprise oversight (OFHEO) in the United States (Lightstone, 2020).

3.4. Research Sample

The residential property population used in this study was sourced from the Lightstone Property index. The study used non-probability sampling of residential property data for the ten-year period from 2010 until 2019. This included all property transactions registered in the Deeds Office during this period, and excluded non-residential properties such as agricultural property, commercial property, property held for development and newly developed properties, community services property, and township properties with their unique characteristics which could potentially skew the data, as well as transactions not at arm's length (not on normal market terms), hyperinflationary transactions, and sales made to fulfil default judgments.

Non-probability sampling was used as the research objectives specified the period covered in the study. The ten-year period used in this study was consistent with other studies of this nature (Haworth, 2005; Irandu, 2017; Kgano, 2017; Tyranes, 2010). The 2010 to 2019 period was specifically selected to confine the analysis of the performance of residential property investments to a period characterized by sustained low economic growth in South Africa.

3.5. Data Collection Methods

A study can either rely on primary data or secondary data or a combination of both. This study used secondary data sources as reliable data sources were readily available and more appropriate. The nature of this study is such that primary data in the form of questionnaires and surveys would not be appropriate and practicable as objective data for multiple properties and multiple periods needs to be analysed. Similar studies have also relied on secondary data to meet the research objectives (Irandu, 2017; Kgano, 2017; Tyranes, 2010; Haworth, 2005).

3.5.1. Property Information

Several data sources were considered before selecting the Lightstone Property index as the most appropriate for the current study objectives. The other data sources considered were the FNB house price index, the Absa house price index, and the Standard Bank house price index. The FNB house price index is compiled quarterly based on properties financed by FNB and dates back several years. However, the index accounts for only about 30 percent of all residential properties and a more comprehensive database to capture a larger part of the market was preferred. The Absa house price index has been widely used in other studies. However, the index was discontinued by Absa in 2016. Therefore, using this index would have imposed a limitation on the objectives of this study with the 2016 to 2019 period excluded. The Standard Bank house price index only commenced in 2016 and provides both national and provincial property inflation data. As this index was only available for a shorter period, its use would impose a significant scope limitation on this study.

The Lightstone Property index has been compiled by Lightstone Property and is based on residential property transactions registered in the Deeds Office. This index was selected as it has captured a larger number of residential properties than the indices compiled by the banks, which only include the banks' own transactions. Furthermore, the Lightstone Property index has classified properties into the different segments, making it easier to perform a segmental analysis.

3.5.2. Other Asset Classes

The performance of other asset classes (equities, bonds and cash) was measured using data from the Johannesburg Stock Exchange (JSE) for the study period. The all share index (ALSI) was used as proxy for equity investments as it represents about 99 percent of all investments in JSE-listed shares. The all-bond index (ALBI) was used as proxy for investments in bonds as it represents both government and corporate bonds listed on the JSE. Cash was proxied by the Alexander Forbes short-term fixed interest (STEFI) composite index. The STEFI index is the industry benchmark for cash investments as it is a more accurate representation of the various money market investments (Stefan, 2017).

The data for economic factors were obtained from Statistics South Africa (StatsSA) and the South African Reserve Bank (SARB). These are official and authoritative sources of national data in South Africa. All data used in this study were from the first quarter of 2010 to the fourth quarter of 2019, representing 40 observations. Table 3.2 summarises the type and source of data for each of the study objectives.

Table 3.2: Objectives and Research Data Source

OBJECTIVE	TYPE OF DATA	SOURCE OF DATA
Objective 1: To evaluate and assess the performance of residential property segments in South Africa from 2010 to 2019.	Residential property returns by segment	Lightstone Property
Objective 2: To evaluate and assess the performance of residential property investments against other asset classes in South Africa from 2010 to 2019.	Residential property returns by segment	Lightstone Property
	All share index (ALSI)	Johannesburg Stock Exchange (JSE)
	All bond index (ALBI)	
	Short-term fixed deposit interest (STEFI) index	
Objective 3: To establish the relationship between residential property segments and key economic indicators in South Africa from 2010 to 2019.	GDP data	South African Reserve Bank
	Prime Rate data	
	CPI data	StatsSA

Source: *Compiled by author*

Residential property returns as per Table 3.2 represent quarterly changes in residential property values expressed in percentage terms. Similarly, the ALSI, ALBI and STEFI represent percentage quarterly changes in asset values. These were converted from indices to percentages using the natural logarithm. GDP and CPI represent annualized quarterly data as obtained from StatsSA and SARB. The prime rate represents the prevailing prime rate at each quarter. Where the prime changed during a quarter, the average prime rate was computed for that quarter.

3.6. Data Analysis

Data collected were cleaned and formatted correctly before being analysed. Diagnostic tests were performed to ascertain the suitability of the data for statistical analysis. These included testing data for normality using descriptive statistics. For the application of the ARDL model, tests for unit roots were performed to ascertain the stationarity of data and the order of integration. The results are presented in tables and graphs.

Descriptive statistics for each of the variables were presented, followed by pairwise correlations to analyse the movement patterns of the various property segments. Detailed trend analyses were performed to understand the performance of each residential property segment and asset class over the study period. Sharpe ratios were then computed and inferences made on the performance of each of the residential property segments and each of the asset classes over the study period according to ranking order.

The results of unit root tests were presented to conclude on the stationarity of the dependent variables (residential property segments) and independent variables (economic factors) before applying the autoregressive distributed lag method (ARDL). Post-estimation tests were also performed to test the validity and reliability of the model.

3.6.1. Descriptive Statistics

As the data were time-series oriented, descriptive statistics were used to analyse measures of central tendency, dispersion and normality for all variables being investigated from the first quarter of 2010 to the fourth quarter of 2019. The descriptive statistics were analysed for all of the property segments, all of the asset classes, and all of the economic factors under investigation.

3.6.2. Sharpe Ratios

The performance of each residential property segment was analysed using the mean and median returns over the ten-year study period. Similarly, the performance of other asset classes (equities, bonds and cash) was analysed on the basis of the mean and median returns of each asset class. To account for the different risk attributes, risk-adjusted returns were computed using the Sharpe ratio method, which considers the excess returns of each asset class relative to its volatility (standard deviation). According to Lee & Higgins (2009), Sharpe ratios are the benchmark measure of risk-adjusted performance. For the purposes of computing Sharpe ratios, the risk-free rate was proxied by 91-day treasury bills as suggested by Stefan (2017). The performances of each asset class were ranked based on the computed Sharpe ratios. The Sharpe ratios were computed using the Sharpe ratios formula adapted from Lee & Higgins (2009):

$$\mathbf{Y_A} = \frac{\mathbf{R_A} - \mathbf{R_f}}{\mathbf{R_f}}$$

Where

$\mathbf{Y_A}$ represents the risk-adjusted return of an asset class

$\mathbf{R_A}$ represents the nominal returns of each asset class

$\mathbf{R_f}$ represents the risk-free rate, proxied by 91-day treasury bills

3.6.3. Tests for Normality

To apply statistical and econometric techniques, it is important to test the data for normality. This allows a researcher to assess whether the data are normally distributed. There are numerous methods that can be applied to test for normality. This study applied the graphical method as this is a powerful tool that is commonly used to test for normality (Rani Das, 2016). Histograms were drawn to depict the bell-shaped nature, skewness, and kurtosis of the data.

3.6.4. Tests for Stationarity

In time-series analysis, it is often important to assess the stationarity of a data series. A data series process is stationary if its mean and variance converge to a certain value over time. With a stationary process, the effects of any shock eventually die out over time as the process reverts

to its constant statistical properties. A non-stationary data process usually has an upward or downward trend, such that its variance and mean are not constant over time (Nkoro & Uko, 2016). A stationary data process is one that does not have a unit root while a non-stationary data process has a unit root.

The ARDL model can only be applied to variables that are either level stationary or first difference stationary. Level stationary variables are also said to be integrated of order zero, denoted by I(0), while variables that are stationary at first difference are said to be integrated of first order, denoted by I(1). Unit root tests are thus necessary to assess that none of the variances are stationary at second difference, I(2), as this would lead to spurious regression.

This study used the Augmented Dickey-Fuller (ADF) test, which is a benchmark test for stationarity (Baumohl & Lyocsa, 2011). More specifically, the ADF test was used to assess the existence of unit roots in both the dependent and independent variables. The ADF tests the null hypothesis that a time series has a unit root (non-stationary). The alternative hypothesis is that the time series has no unit root and is thus stationary (Nkoro & Uko, 2016).

3.6.5. Autoregressive Distributed Lag Model

To examine the short-run and long-run cointegration relationship between residential property returns and economic factors, this study employed the Autoregressive Distributed Lag (ARDL) model, proposed by Pesaran and Shin (1995) and used by many scholars such as Inglesi-Lotz & Gupta (2013). The ARDL model is superior to other regression models because it produces good reliable results irrespective of the sample size. Unlike other models which require all variables to be of the same integration order, the ARDL model accommodates both variables of I(0) or I(1) integration order or a combination of both. The ARDL model also allows for the specification of lags for each variable, which is not possible with other models like the Johansen cointegration method (Musa, Usman & Zoramawa, 2014).

To implement the model efficiently, bounds tests are performed to evaluate the existence of long-run cointegration amongst the variables. The null hypothesis of the bounds test is that there is no cointegration amongst the variables. This null hypothesis can be rejected based on the computed F- and t-statistics. When the computed F- and t-statistics are greater than the upper bound critical values at the 5% level of significance, then the null hypothesis (H_0) is rejected, implying that the variables are long-run cointegrated. If the F- and t-statistics are below the lower bound critical values at the 5% level of significance, then the H_0 cannot be

rejected as there is no cointegration among the variables. If the computed F- and t-statistics fall between the lower bound and upper bound critical values, then long-run cointegration amongst the variables is inconclusive (Nkoro & Uko 2016).

Where the existence of a long-run cointegration is confirmed, the ARDL model is estimated using the error correction option to bring together both the short-run and long-run dynamics and to assess the speed of adjustment from equilibrium deviations in prior periods. Optimal lags are selected using the conventional Akaike information criterion (AIC). Where the long run cointegration is rejected, only short-run results are provided. The ARDL model adapted from Larsson & Haq (2016), can be specified as follows:

$$\Delta P_t = \beta_0 + \sum_{i=1}^{P_0} \mu_i \, \Delta P_{t-i} + \sum_{i=0}^{P_1} \tau_i \, \Delta GDP_{t-i} + \sum_{i=0}^{P_3} \theta_1 \, \Delta CPI_{t-i} + \sum_{i=0}^{P_4} \emptyset_i \, \Delta PR_{t-i} + \eta_0 P_{t-1} + \eta_1 GDP_{t-1} + \eta_2 CPI_{t-1} + \eta_3 PR_{t-1} + \epsilon_t$$

Where

$\boldsymbol{\beta_0}$ represents a constant (intercept)

P represents residential property returns (dependent variable)

GDP represents economic growth (independent variable)

CPI represents inflation (independent variable)

PR represents the prime lending rate (independent variable)

$\boldsymbol{\epsilon_t}$ represents white noise/error term

t represents time (in quarters)

$\boldsymbol{\mu}$, $\boldsymbol{\tau}$, $\boldsymbol{\theta}$, and $\emptyset$ represent short-run coefficients

$\boldsymbol{\eta}$ represents long-run coefficients

This ARDL model posits that the value of the dependent variable is explained by lagged values of the dependent variable itself, and current and lagged values of the independent variables (Menegaki, 2019). In the context of this study, ARDL cointegration amongst the variables would suggest that residential property returns are explained partly by historical residential property returns, and partly by current and past values of the relevant economic factors.

3.6.6. Post-Estimation Diagnostic Tests

For the results of the ARDL model to be relied upon, diagnostic tests must be performed after estimating the model. In particular, one of the underlying assumptions of the error term in the ARDL model is that the term must be serially independent, homoskedastic and normally distributed (Menegaki, 2019). Serial correlation was tested using both the Durbin Watson's alternative test and Breusch-Godfrey tests for autocorrelation. Heteroskedasticity was tested using the Breuch-Pagan and Cook-Weisburg tests. Normality was tested using the skewness and kurtosis tests. Model stability was tested using the cumulative sum (cusum) tests for parameter stability to assess whether there were any structural breaks. Finally, multicollinearity was tested using variable inflation factors to assess whether there was any linear correlation amongst the independent variables.

3.7. Summary

This chapter detailed the strategy and plan followed to collect, analyse and present data. Based on the stated research paradigm and the objectives of the study, a quantitative research design was chosen. The population and sampling of the variables being studied were explained and the sources of those variables were established. The statistical instruments used to analyse the data were discussed and the relevant diagnostic tests were also explained. In Chapter Four the results of the data analysis are presented and discussed.

CHAPTER FOUR: DATA PRESENTATION AND ANALYSIS

4.1. Introduction

The previous chapter discussed the research methodology followed in this study. In this chapter, the research methodology is applied to analyse the research data. The results of the data analysis are presented in the form of graphs, charts and tables.

To evaluate and assess the performance of residential property segments over the study period, the descriptive statistics of each property segment are presented and analysed, followed by a trend analysis of all the segments over the study period. Pairwise correlations for all the property segments are also presented to analyse the growth patterns of all property segments further. The overall performance of each property segment is then evaluated using the summary descriptive statistics for each segment.

To evaluate and assess the performance of residential property investments against other asset classes over the study period, the descriptive statistics of each asset class are presented and analysed, followed by a trend analysis of each asset class. Sharpe ratios are then computed and analysed to establish the performance of residential property segments against other asset classes on a risk-adjusted basis. The overall performance of each asset class is then evaluated using the summary descriptive statistics of each asset class.

To establish the economic factors affecting residential property investments over the study period, the ARDL model is employed. This begins with the ADF tests for unit roots and stationarity. The long-run and short-run relationships between the economic factors and each of the residential property segments are then tested using the ARDL method.

4.2. The Performance of Residential Property Segments in South Africa from 2010 to 2019

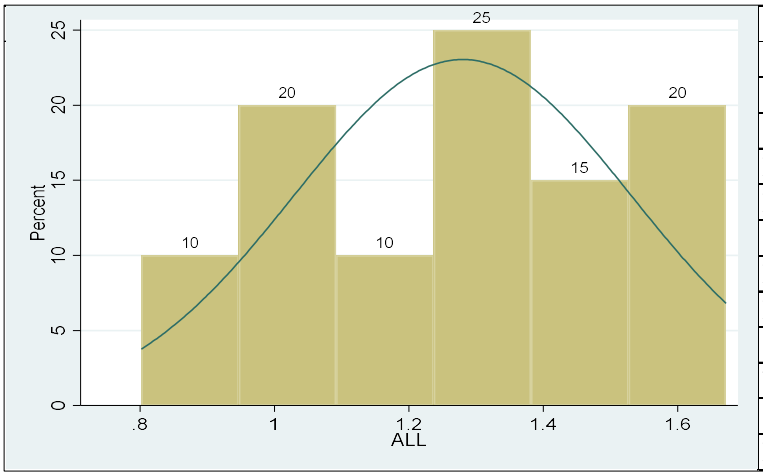
The first objective was to evaluate and assess the performance of residential property segments in South Africa from 2010 to 2019. This section presents the descriptive statistics, pairwise correlations and trend analysis.

4.2.1. Descriptive statistics of residential properties

The descriptive statistics are presented below for each of the residential property segments.

4.2.1.1. All property segments

The descriptive statistics for the low-value property segment may be seen in Figure 4.1.



DESCRIPTIVE STATISTICS	
Observations	40
Median	1.28
Mean	1.28
Std. dev.	0.25
Min	0.80
Max	1.67
Variance	0.06
Skewness	-0.12
Kurtosis	1.91

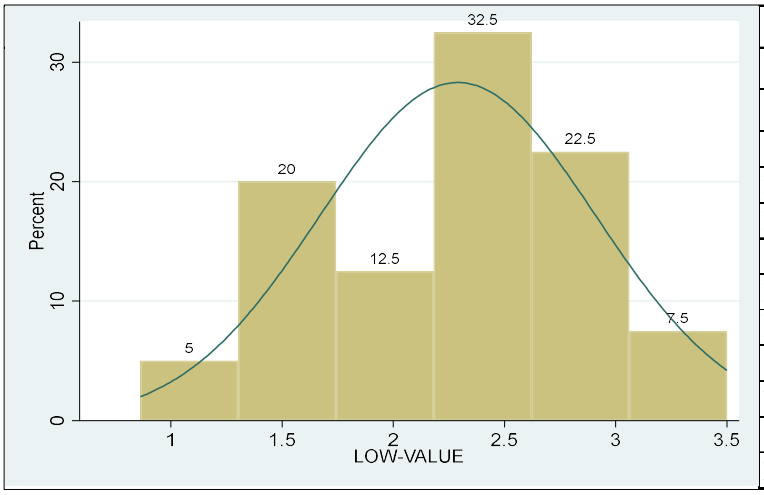
Figure 4.1: Descriptive statistics of all residential properties
Source: *Compiled by author*

Figure 4.1 represents the distribution of quarterly returns from all residential properties combined from 2010 to 2019. As can be seen from the histogram, the returns are slightly skewed to the left (-0.12) with a kurtosis of 1.91. All properties had a median and mean quarterly return of 1.28 for the period. The difference between the minimum of 0.8 and a maximum of 1.67 was not too large, with a standard deviation of 0.25. The joint test for skewness and kurtosis returned a chi-square probability of 0.10, which indicates that the deviation from normality was not significant.

While overall residential properties appeared to be normally distributed, the distribution for each segment varied slightly.

4.2.1.2. Low-value property segment

The descriptive statistics for the low-value property segment may be seen in Figure 4.2.



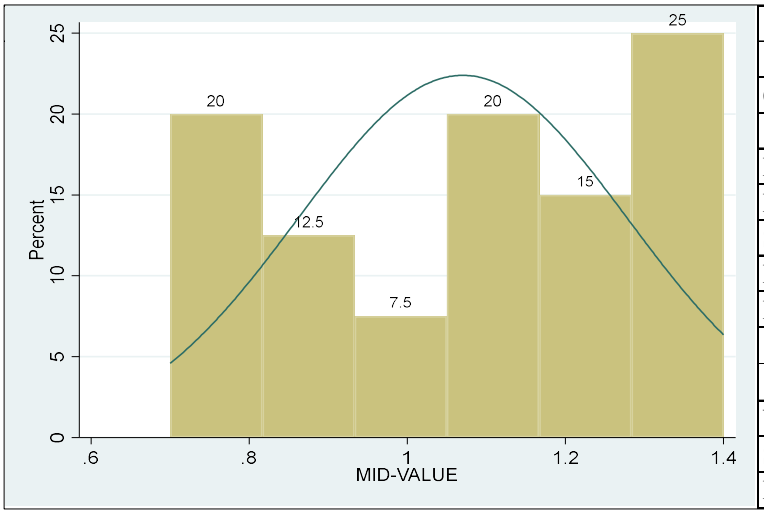
DESCRIPTIVE STATISTICS	
Observations	40
Median	2.14
Mean	2.29
Std. dev.	0.62
Min	0.86
Max	3.50
Variance	0.38
Skewness	-0.30
Kurtosis	2.68

Figure 4.2: Descriptive statistics of the low-value property segment
Source: *Compiled by author*

Figure 4.2 indicates that the low value property segment had a mean return of 2.29 and median return of 2.41. The difference between the minimum (0.86) and the maximum (3.50) was not too large, and the standard deviation was 0.62. The returns were slightly skewed to the left (-0.30) with a kurtosis of 2.68, not far from a kurtosis of 3 found in a normal distribution. The joint test for skewness and kurtosis returned a chi-square probability of 0.65, which indicates that deviations from normality were not significant.

4.2.1.3. Mid-value property segment

The descriptive statistics for the mid-value property segment may be seen in Figure 4.3.



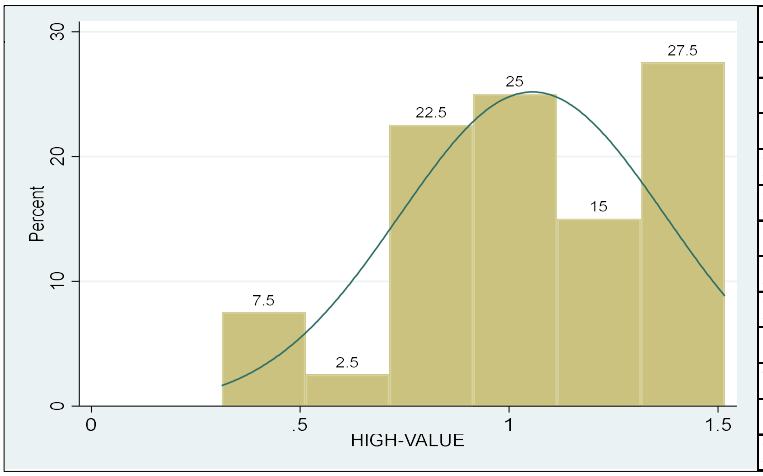
DESCRIPTIVE STATISTICS	
Observations	40
Median	1.10
Mean	1.07
Std. dev.	0.21
Min	0.70
Max	1.40
Variance	0.04
Skewness	-0.27
Kurtosis	1.90

Figure 4.3: Descriptive statistics of the mid-value property segment
Source: *Compiled by author*

The mid-value property segment had a mean return of 1.07 and a median return of 1.10, and a standard deviation of 0.21. The maximum of 1.40 was not too far off from the minimum of 0.70. The returns were slightly skewed to the left (-0.27) but still within the acceptable limit of ±1.96 (Irandu, 2017). Mid-value properties had a kurtosis of 1.90, indicating a lightly-tailed distribution. The joint test for skewness and kurtosis returned a chi-square probability of 0.05, which indicates that deviation from normality was not significant.

4.2.1.4. High-value property segment

The descriptive statistics for the high-value property segment may be seen in Figure 4.4.



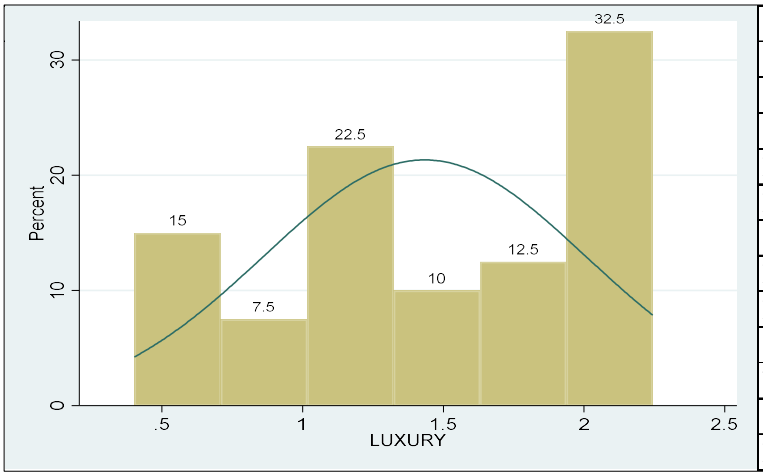
DESCRIPTIVE STATISTICS	
Observations	40
Median	1.05
Mean	1.06
Std. dev.	0.32
Min	0.31
Max	1.52
Variance	0.10
Skewness	-0.43
Kurtosis	2.60

Figure 4.4: Descriptive statistics of the high-value property segment
Source: *Compiled by author*

The high value property segment had a mean return of 1.06 and a median return of 1.05. The returns were slightly skewed to the left (-0.43) with a kurtosis of 2.60. During the study period, high value properties had a maximum return of 1.52 and minimum of 0.31, and a standard deviation of 0.32. The joint test for skewness and kurtosis returned a chi-square probability of 0.45, which indicates that deviation from normality was not significant.

4.2.1.5. Luxury property segment

The descriptive statistics for the luxury property segment may be seen in Figure 4.5.



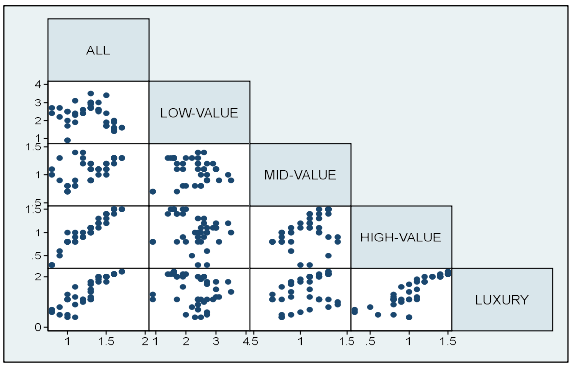
DESCRIPTIVE STATISTICS	
Observations	40
Median	1.43
Mean	1.43
Std. dev.	0.57
Min	0.40
Max	2.24
Variance	0.33
Skewness	-0.27
Kurtosis	1.79

Figure 4.5: Descriptive statistics of the luxury property segment
Source: *Compiled by author*

The luxury property segment had a mean and median return of 1.43 during the study period, with a minimum return of 0.40 and a maximum return of 2.24. The standard deviation was 0.58. The data were slightly skewed to the left (-0.27) and lightly tailed with a kurtosis of 1.79. The joint test for skewness and kurtosis returned a chi-square probability of 0.01 which indicates that the distribution was not normal. This should be borne in mind when interpreting the results.

4.2.2. Pairwise correlations of all property segments

The pairwise correlations may be seen in Figure 4.6. The pairwise correlations are illustrated in the scatterplots on the left for each residential property segment, and on the right as correlation coefficients. The correlations were used to to assess any linear relationships between the segments.



	LOW	MID	HIGH	LUXURY	ALL
LOW	1.00				
MID	-0.01	1.00			
HIGH	-0.25	0.42	1.00		
LUXURY	-0.25	0.39	0.84	1.00	
ALL	-0.16	0.55	0.96	0.89	1.00

Figure 4.6: Pairwise correlations of all property segments
Source: *Compiled by author*

The pairwise correlations in Figure 4.6 indicate a strong positive correlation between the growth patterns of the high-value segment and the luxury segment, the high-value segment and all properties, and the luxury segment and all properties. A moderate positive correlation was observed between the mid-value segment and all properties and there were weak positive correlations between the mid-value segment and the high-value and luxury segments. The low-value property segment appears to be distinct as it showed very weak negative correlations with the other segments. Based on this, the low-value property segment is expected to show some distinct results when contrasted to other segments.

4.2.3. Trend analysis of all residential property segments

This section provides the trend analysis for all property segments. This is presented in Figure 4.7 which summarizes the performance of all residential property segments from 2010 to 2019. It then gives a brief analysis of the movements in property returns over the study period.

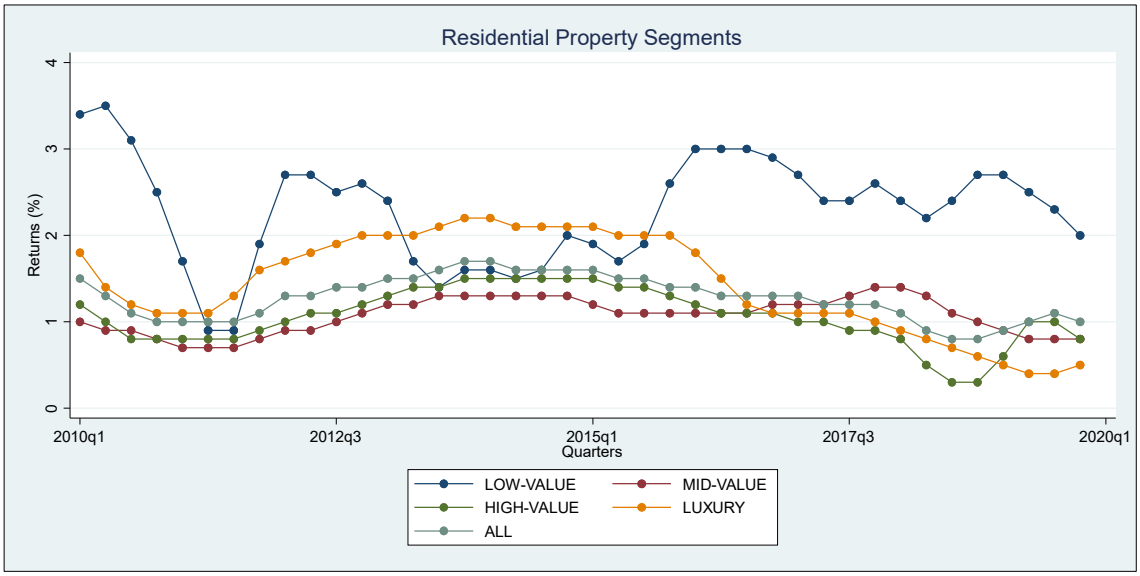


Figure 4.7: Trend analyses of all residential property segments from 2010 to 2019
Source: *Compiled by author*

The trend analysis for all property segments is presented in Figure 4.7 indicates that the performance of each of the residential property segments experienced positive but varying nominal growth over the study period. Generally, the nominal growth rates of all residential properties began with a sharp decline between 2010 and 2011, followed by steady increases between 2011 and 2014. From 2015 to 2018 there was a general decrease in property values which was followed by a sharp increase towards 2019. The growth trends followed a pattern

of ups and downs. However, the low-value segment deviated from other segments, declining between 2013 quarter 4 and 2013 quarter 3, while other segments were increasing. Similarly, the low value segment increased between 2015 quarter 3 and 2016 quarter 3, while the other segments declined. Mixed trends were observed from 2019 quarter 3.

The performance of each of the residential property segments over the study period may be seen in Table 4.1.

Table 4.1: Mean and median returns of residential property segments

Segment	Obs	Mean	Median	Std. Dev.	Rank
Low-value	40	**2.29**	2.41	0.62	1
Mid-value	40	**1.07**	1.10	0.21	3
High-value	40	**1.06**	1.05	0.32	4
Luxury	40	**1.43**	1.43	0.57	2
All	**40**	**1.28**	**1.28**	**0.25**	**N/A**

Source: *Compiled by author*

The low-value segment had the highest mean return (2.29) and median return (2.41) of all the segments during the study period. This was about twice as high as the mean and median returns from the mid-value segment (0.97; 1.01) and the high-value segment (1.06; 1.05). The low-value segment was followed by the luxury segment with a mean return of 1.44 and a median return of 1.43. The significant variations support the need to evaluate residential property on a segmental basis.

While the usage of the mean to compare performance is often criticised in favour of the median, the differences in the mean and median returns for each of the property segments appear to be negligible, suggesting that the distributions are relatively symmetrical. This makes it easier to compare the performance of the different segments as the same outcome is achieved when either of the two measures are used. In addition, Sharpe ratios were computed to account for the risk of each property segment as measured by volatility (standard deviation). This was informed by Ocran and Anyikwa (2013), who suggested that the risk of residential property should be treated like that of any other asset class from a risk perspective.

The Sharpe ratios were then computed. These can be seen in Table 4.2.

Table 4.2: Sharpe ratios of residential property segments

Segment	Obs	Mean	Median	Std. Dev.	Sharpe Ratio	Rank
Low-value	40	**2.29**	2.14	0.62	1.35	1
Mid-value	40	**1.07**	1.10	0.21	-1.80	4
High-value	40	**1.06**	1.05	0.32	-1.12	3
Luxury	40	**1.43**	1.43	0.57	-0.19	2
All	**40**	**1.28**	**1.28**	**0.25**	**-0.74**	**N/A**

Source: *Compiled by author*

The Sharpe ratios show that the low-value property segment was the best-performing segment, followed by the luxury segment. The high-value segment came third while the mid-value segment was the least-performing segment. It is also notable that the performance ranking based on the Sharpe ratios is the same as the ranking based purely on means and medians. The standard deviations (as a measure of volatility risk) of each property segment also seem to suggest that higher-risk properties provide higher returns and vice versa.

These findings are consistent with those of Kgano (2017), who found the low value segment to be the most resilient of all property segments throughout all business cycles. These findings also echo those of Qiao and Wong (2015) who found that small properties yielded investment returns superior to those of big properties in Hong Kong. Therefore a residential property investor can maximize profits by investing at the lower end of the market. This also supports the earlier expectation that low value property could be distinct from the other segments.

4.3. The Performance of Residential Property Investments against Other Asset Classes from 2010 to 2019

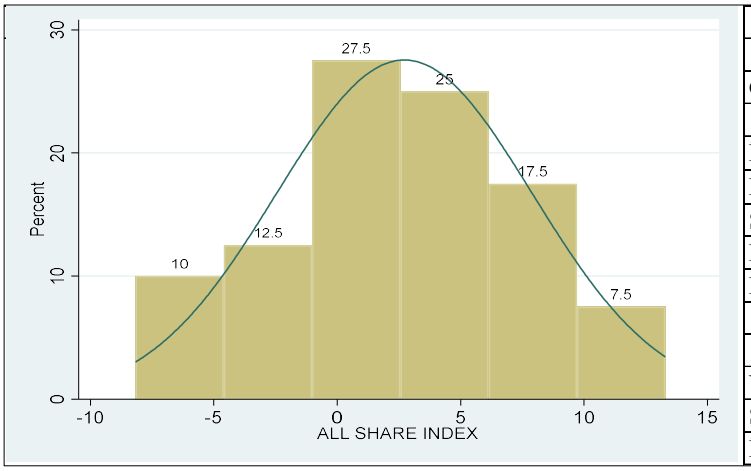
The second objective was to evaluate and assess the performance of residential property investments against other asset classes from 2010 to 2019. This section begins with descriptive statistics for all asset classes, followed by trend analysis and the performance comparisons.

4.3.1. Descriptive statistics for other key asset classes

This section presents descriptive statistics for other key asset classes.

4.3.1.1. Equities

The results of the descriptive statistics for equities are presented in Figure 4.8.



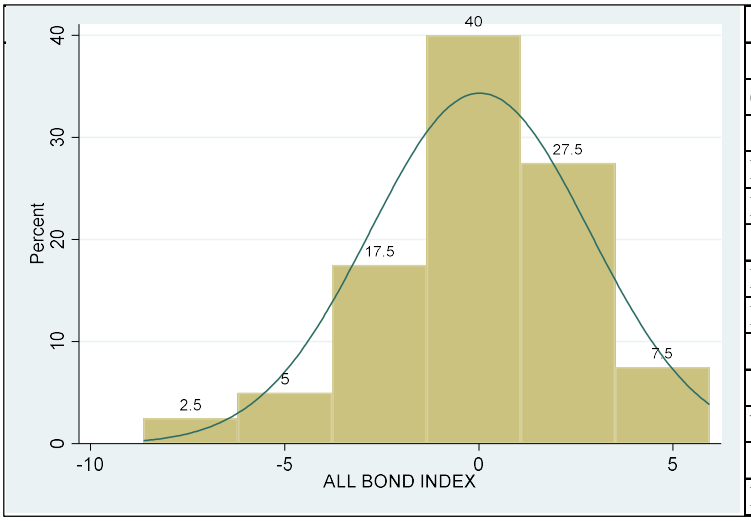
DESCRIPTIVE STATISTICS	
Observations	40
Median	3.13
Mean	2.72
Std. dev.	5.18
Min	-8.66
Max	12.18
Variance	26.83
Skewness	-0.03
Kurtosis	2.41

Figure 4.8: Descriptive statistics of equities
Source: *Compiled by author*

Equities, which were proxied by the all-share index yielded a mean return of 2.72 and median return of 3.13 during the study period. The difference between the minimum return (-8.66) and maximum return (12.18) was large, as was the standard deviation of 5.18. The returns were more evenly distributed with skewness of only -0.08 and a kurtosis of 2.41, which did not part much from the norm. The joint test for skewness and kurtosis returned a chi-square probability of 0.8, which indicates that deviation from normality was not significant.

4.3.1.2. Bonds

The descriptive statistics for bonds may be seen in Figure 4.9.



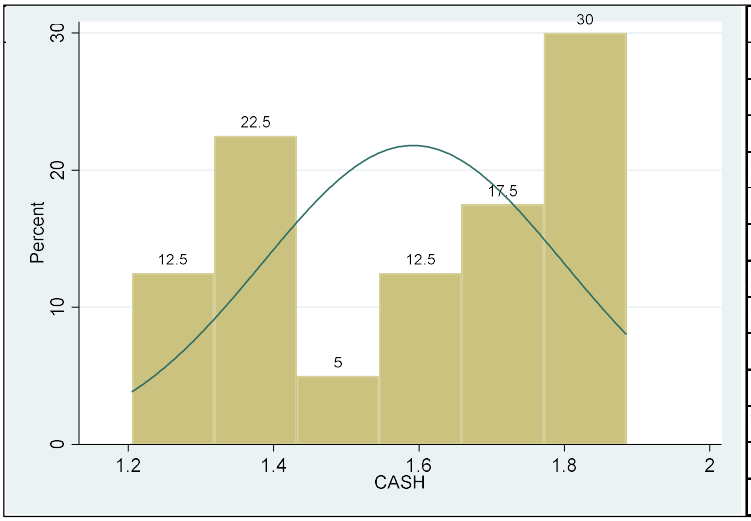
DESCRIPTIVE STATISTICS	
Observations	40
Median	0.29
Mean	0.03
Std. dev.	2.82
Min	-8.64
Max	5.94
Variance	26.83
Skewness	-0.56
Kurtosis	4.42

Figure 4.9: Descriptive statistics for bonds
Source: *Compiled by author*

Bonds, which were proxied by the all-bond index yielded a mean return of 0.03 and a median return of 0.29 during the study period. The minimum return was negative (-8.64) while the maximum return was positive 5.94, and the standard deviation was 2.82. The returns were negatively skewed (-0.56) and the distribution was more heavily tailed with a kurtosis of 4.42. Overall, the returns from bonds did not appear to be normally distributed. The joint test for skewness and kurtosis returned a chi-square probability of 0.06. The disparities between the mean and median returns also indicates that the distribution is quite skewed.

4.3.1.3. Cash

The descriptive statistics for cash may be seen in Figure 4.10.



DESCRIPTIVE STATISTICS	
Observations	40
Median	1.61
Mean	1.59
Std. dev.	0.21
Min	1.20
Max	1.88
Variance	0.04
Skewness	-0.22
Kurtosis	1.59

Figure 4.10: Descriptive statistics of cash
Source: *Compiled by author*

Cash investments, as proxied by the STEFI index, provided a mean return of 1.59 and median return of 1.61. The minimum return was 1.20 while the maximum return was 1.89. Based on the variance of the returns from the mean, the standard deviation was 0.21. The data were skewed to the left (-0.22) with light tails (1.59). Overall, the returns from cash investments did not appear to be normally distributed. This was confirmed by the skewness and kurtosis test, which returned a chi-square probability of 0.02.

4.3.2. Trend analyses of all asset classes

The trend analysis of the performance of all asset classes may be seen in Figure 4.11.

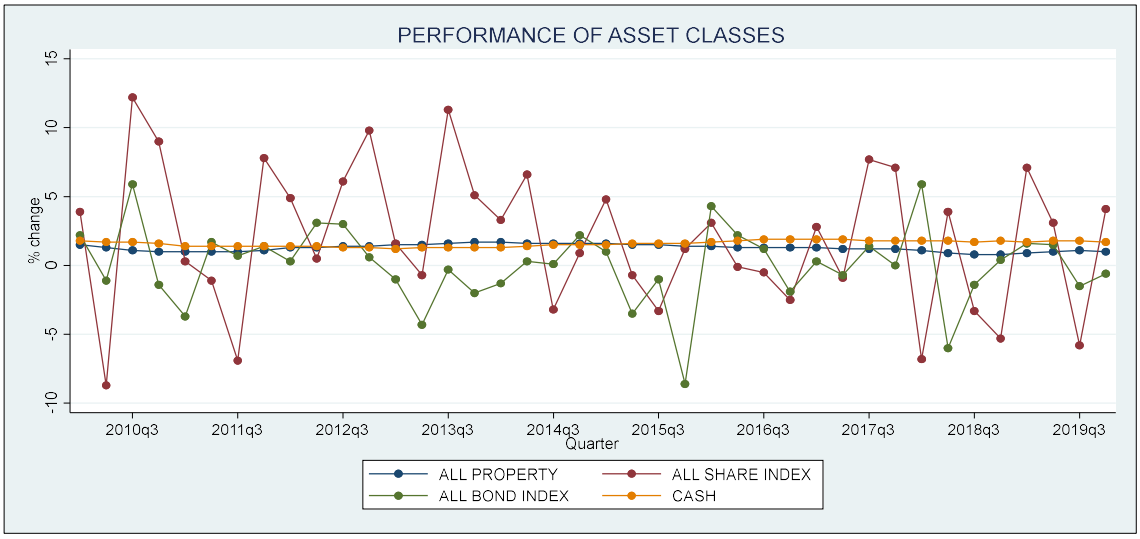


Figure 4.11: Trend analysis of the performance of all asset classes
Source: *Compiled by author*

Figure 4.11 illustrates that the returns from residential property investments and cash were less volatile than returns from equities and bonds. Furthermore, residential property and cash showed positive returns for all quarters. Equity returns proxied by the all-share index (ALSI) and bonds returns proxied by the all-bond index (ALBI) were more volatile throughout the study period with negative returns in some quarters. Due to the apparent disparities in returns, cash is analysed separately from equities and bonds to obtain a more vivid picture of the trends.

4.3.2.1. Low-value property compared to other asset classes

The comparison of low-value property and other asset classes may be seen in Figure 4.12.

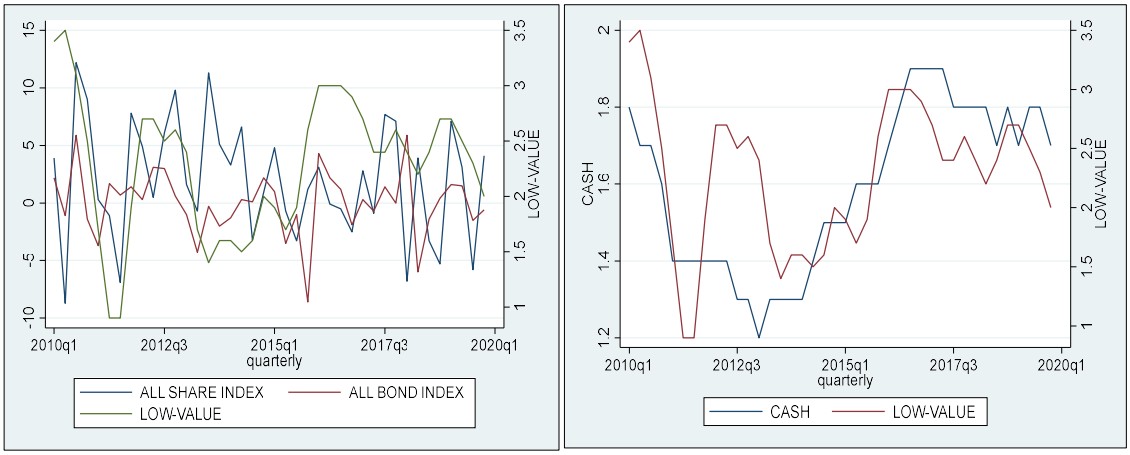


Figure 4.12: Movement pattern of low-value property against other asset classes
Source: *Compiled by author*

From Figure 4.12, there seemed to be a common pattern of movement between the low-value property segment, the ALSI and the ALBI during the study period. This began with a sharp decrease between 2010 quarter 1 and 2010 quarter 2, followed by a sharp increase between 2010 quarter 2 and 2010 quarter 3, dropping again from 2010 quarter 3 to 2011 quarter 3. A pattern of upward and downward movement can be observed for the entire period. The ALBI deviated from the ALSI and low-value property in some of the periods, more visibly from 2015 quarter 3 to 2015 quarter 4 and from 2017 quarter 4 to 2018 quarter 1. A close association was observed between low value property and cash over the study period. Both cash and low-value property appeared to move together throughout the quarters, although not at the same rate.

4.3.2.2. Mid-value property compared to other asset classes

The comparison of mid-value property and other asset classes may be seen in Figure 4.13.

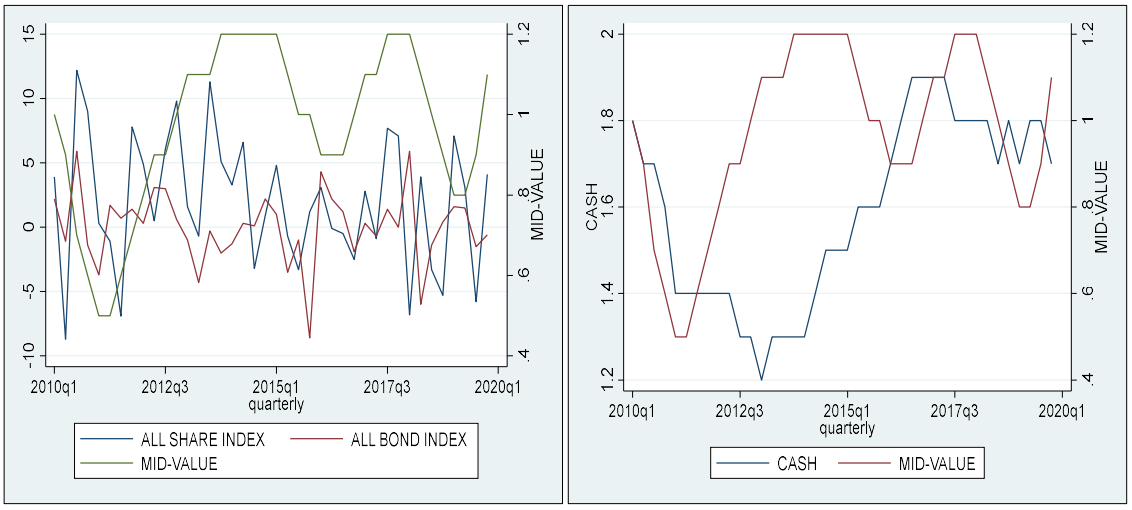


Figure 4.13: Movement pattern of mid-value property against other asset classes
Source: *Compiled by author*

Mid-value property, the ALBI and ALSI all began with a general decline from 2010 quarter 1 to 2011 quarter 1. The ALSI continued to decline from 2011 quarter 1 to 2011 quarter 3 while mid-value property and ALBI increased. Mid-value property was relatively flat between 2013 quarter 1 to 2015 quarter 1 while the ALBI and ALSI fluctuated during the same period. The ALBI also deviated from mid-value property and ALSI between 2017 quarter 4 and 2018 quarter 1, 2018 quarter 2 and 2019 quarter 1. The ALSI fluctuated much more than the ALBI and mid-value property. In comparison to cash, mid-value property appeared to be moving side-by-side throughout the study period. However, cash deviated from mid-value property

between 2012 quarter 4 and 2013 quarter 1, between 2015 quarter 4 and 2016 quarter 3 and in the last quarter of 2019.

4.3.2.3. High-value property compared to other asset classes

The comparison of high-value property and other asset classes may be seen in Figure 4.14.

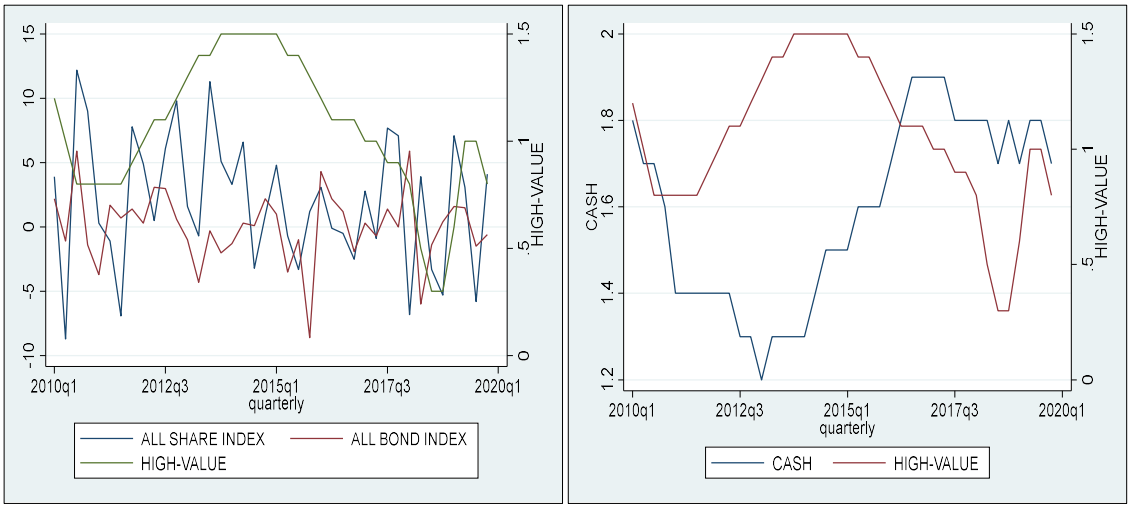


Figure 4.14: Movement pattern of high-value property against other asset classes
Source: *Compiled by author*

There appeared to be no clear pattern of movement between high-value property, ALSI and ALBI. Generally, high-value property was smoother over the study period while ALSI and ALBI were characterised by short term spikes. High-value property declined for the first two quarters of 2010 and remained stable until 2011 quarter 3. From 2011 quarter 3, high-value property was on an upward trend, peaking between 2013 quarter 4 and 2015 quarter 1. From 2015 quarter 1, high-value property declined steadily until reaching a record low in 2018 quarter 3. This was then followed by a partial recovery lasting until 2019 quarter 3.

Meanwhile, the ALBI and ALSI fluctuated from quarter to quarter throughout the period. The movement of high-value property and cash also showed no clear pattern with either asset class remaining constant while the other trended upward or downward. Negative trends were also observed between cash and high value property, particularly from 2015 quarter 3 to 2016 quarter 3.

4.3.2.4. Luxury property compared to other asset classes

The comparison of luxury property and other asset classes may be seen in Figure 4.14.

Figure 4.15: Movement pattern of luxury property against other asset classes
Source: *Compiled by author*

The pattern of movement between luxury property, the ALSI and ALBI was also not clear. Luxury property declined for the first three quarter of 2010. From 2011 quarter 2 to 2013 quarter 4 luxury property was on an upward trend. A moderate decline in luxury property returns is observed between 2014 quarter 1 and 2015 quarter 4. This downward trend accelerated from 2015 quarter 4 until reaching a record low in 2019 quarter 3. During that period, the ALBI and ALSI fluctuated with no specific trend. Negative associations were observed between cash returns and luxury property.

4.3.3. Overall performance of residential property against other asset classes

The performance of all residential property segments was contrasted with the performance of equity investments, bonds and cash investments and the results are presented in Table 4.3.

Table 4.3: Mean and median returns of residential property and other asset classes

Asset Class	Obs	Mean	Median	Std. Dev.	Rank
All properties	40	**1.28**	1.28	0.25	3
Equities	40	**2.72**	3.13	5.18	1
Bonds	40	**0.03**	0.29	2.82	4
Cash	40	**1.59**	1.61	0.21	2

Source: *Compiled by author*

Based on the mean and median returns of the four asset classes (property, equities, bonds and cash), it is very clear that equities outperformed all the asset classes over the study period. This was followed by cash investments, with a mean return of 1.59 and a median return of 1.61. Residential property was third with a mean and median return of 1.28 while bonds were the least-performing asset class with a mean return of only 0.03 and a median return of 0.29. However, when residential property was segmentalized, the results changed slightly as observed in Table 4.4.

Table 4.4: Mean and median returns of residential property segments and other asset classes

Asset Class	Obs	Mean	Median	Std. Dev.	Rank
Low-value	40	**2.29**	2.14	0.62	2
Mid-value	40	**1.07**	1.10	0.21	5
High-value	40	**1.06**	1.05	0.32	6
Luxury	40	**1.43**	1.43	0.58	4
Equities	40	**2.72**	3.13	5.18	1
Bonds	40	**0.03**	0.29	2.82	7
Cash	40	**1.59**	1.61	0.21	3

Source: *Compiled by author*

Table 4.4 shows that residential property returns had significantly lower standard deviations compared to bonds and equities. This suggests that equities and bonds tended to be more volatile than residential property. For an investor, this implies that residential property investments provide more stable returns than equities and bonds, thus exposing the investor to lower risk. The Sharpe ratios were computed to determine the risk-adjusted returns, with the risk-free rate being proxied by ninety-one-day treasury bills. The risk-adjusted returns, as represented by the Sharpe ratio, may be seen in Table 4.5.

Table 4.5: Sharpe ratios of residential property and other asset classes

Asset Class	Obs	Mean	Median	Std. Dev.	Sharpe Ratio	Rank
All properties	40	**1.28**	1.28	0.25	-0.74	4
Equities	40	**2.72**	3.13	5.18	0.22	2
Bonds	40	**0.03**	0.29	2.82	-0.55	3
Cash	40	**1.59**	1.61	0.21	0.35	1

Source: *Compiled by author*

Based on the Sharpe ratios computed for each of the asset classes, cash investments were the best-performing asset class, followed by equities and bonds. This implies that the high risk of equities was not adequately compensated by higher returns. Similarly, the low risk of cash did did not lead to proportionately lower returns. Thus, the principle of risk-return trade-off does not hold for equities and cash. Residential property was the least performing asset class on a risk-adjusted basis. However, the performance of residential property across segments varied, as detailed in Table 4.6.

Table 4.6: Sharpe ratios of residential property segments and other asset classes

Asset Class	Obs	Mean	Median	Std. Dev.	Sharpe Ratio	Rank
Low-value	40	**2.29**	2.14	0.62	1.35	1
Mid-value	40	**1.07**	1.10	0.21	-1.80	7
High-value	40	**1.06**	1.05	0.32	-1.12	6
Luxury	40	**1.43**	1.43	0.58	-0.19	4
Equities	40	**2.72**	3.13	5.18	0.22	3
Bonds	40	**0.03**	0.29	2.82	-0.55	5
Cash	40	**1.59**	1.61	0.21	0.35	2

Source: *Compiled by author*

On a risk adjusted basis, low-value property was the best-performing asset class, outperforming equities, bonds and cash. The finding on low value property is in line with the findings of Asmal (2003), who found that property returns exceeded equity returns in South Africa. Sun, Liu and Zheng (2004) also found that property outperformed equities in Shanghai. Luxury property was the only other property segment to outperform another asset class, outperforming bonds on a risk-adjusted basis.

4.4. The relationship between residential property segments and key economic indicators from 2010 to 2019

The fourth objective was to establish the relationship between residential property segments and key economic indicators from 2010 to 2019.

4.4.1. Descriptive Statistics

To analyse the tendency of the economic factors, descriptive statistics were computed and analysed and are presented in Table 4.7.

Table 4.7: Descriptive statistics for the economic factors

Variable	Obs	Mean	Median	Std. dev.	Min	Max	Skewness	Kurtosis
GDP	40	1.63	1.75	2.18	-3.20	5.30	-0.43	2.38
CPI	40	5.18	5.20	0.88	3.47	6.60	-0.14	1.86
Prime rate	40	9.58	9.58	0.70	8.50	10.50	-0.16	1.60

Source: *Compiled by author*

As can be seen from Table 4.7, the distributions of all of the economic factors were negatively skewed (to the left). The kurtosis of GDP did not part much from the norm of 3, however the kurtosis of CPI (1.86) and prime rate (1.60) indicate that the distributions were not normal. This was confirmed by the skewness and kurtosis test, which returned joint chi-square probabilities of 0.33, 0.033 and 0.00 for GDP, CPI and prime rate respectively. The standard deviations also indicate that prime rate did not fluctuate much while GDP fluctuated the most.

4.4.2. Trend Analysis of Economic Factors

The movement in economic factors from 2010 to 2019 may be seen in Figure 4.16.

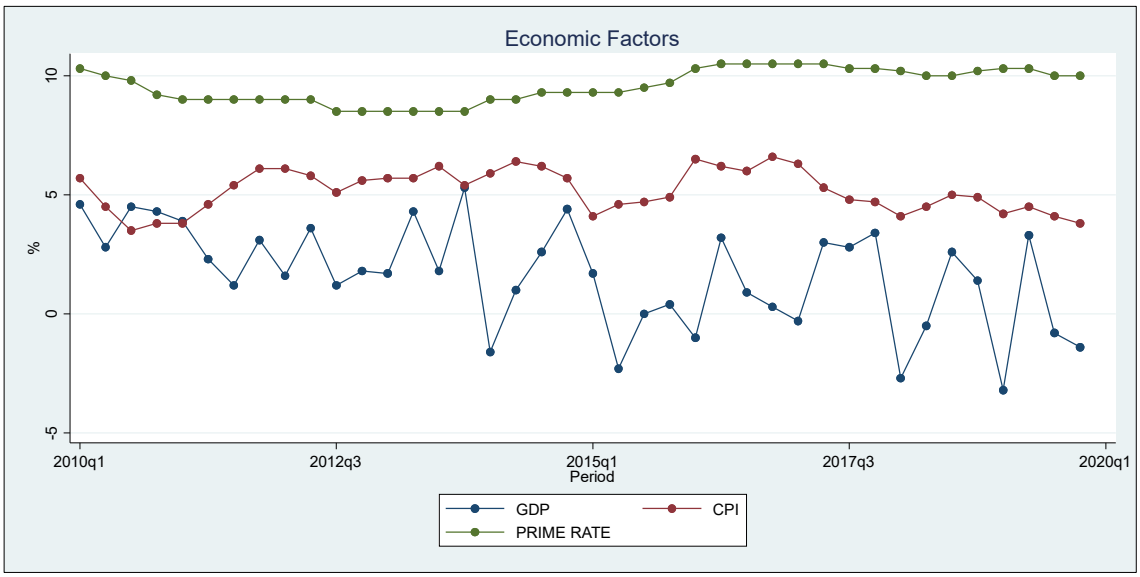


Figure 4.16: Movement in economic factors over the study period

Source: *Compiled by author*

The economic growth rate as proxied by GDP growth rate averaged 0.0163 for the study period, with a median of 0.0175. The inflation rate, as measured by CPI averaged 0.0518 during the period while the general interest rate, as proxied by the prime rate averaged 0.0958. The CPI

and prime rate were relatively flat throughout the period, while GDP appeared to be more volatile and slightly down-trending.

As all variable inflation factors did not part much from 1, it can be concluded that there was no multicollinearity amongst the variables.

4.4.3. Tests for Stationarity

To apply ARDL to investigate the relationship between residential property segments (dependent variables) and economic factors (independent variables), unit root tests were performed to ascertain the stationarity and integration order of each variable. The unit root test was performed using the ADF test. The ADF tests the null hypothesis that a unit root is present in a time series sample. The results of the ADF tests are presented in Table 4.8.

Table 4.8: Augmented Dickey Fuller Unit Root Test

Variable	Test Statistic (t)	5% Critical Value	MacKinnon p-Value	Unit Root	Integration Order
All	-3.601	-2.966	0.0057	Yes	I(1)
Low-value	-5.549	-2.966	0.0000	Yes	I(1)
Mid-value	-3.355	-2.964	0.0126	Yes	I(1)
High-value	-4.729	-2.966	0.0001	Yes	I(1)
Luxury	-3.131	-2.966	0.0244	Yes	I(1)
GDP	-3.625	-2.964	0.0053	No	I(0)
CPI	-4.809	-2.966	0.0001	Yes	I(1)
Prime rate	-3.616	-2.969	0.0055	Yes	I(1)

Source: *Compiled by author*

The ADF tested the null hypothesis that a time series data had a unit root (the data were not stationary), which would imply that the series is trended. A variable has a unit root if the absolute value of its test statistic (t) is above the absolute value of its 5 percent critical value and its p-value is significant (less than 0.05). At level I(0), only GDP was found to be stationary while the other variables were non-stationary. The non-stationarity of residential property segments is in line with the findings of Ocran & Anyikwa (2013), who found that house prices in South Africa generally follow a random pattern rather than a mean-reverting pattern. The non-stationary variables were found to be stationary at first difference, which implied that the ARDL model could be applied to investigate both the short-run and long-run relationships amongst the variables.

4.4.4. Application of the ARDL model

The ARDL model was applied to each of the property segments (all, low-value, mid-value, high-value and luxury), where each property segment was the dependent variable and the independent variables were the economic factors (GDP, CPI, Prime Rate).

The application of the ARDL model began with a bounds test to assess whether there was any long-run cointegration between the dependent variable and independent variables. Once cointegration was confirmed, the model was estimated using the equilibrium correction model. Optimal lags were selected using the AIC criteria. Post-estimation diagnostics were performed to test the model for serial correlation, heteroskedasticity, normality and model stability.

4.4.4.1. Model 1: To establish the relationship between the all-property segment and key economic indicators from 2010 to 2019.

The bounds test was performed to assess the existence of long-run co-integration between the all-property segment and the economic factors of GDP, CPI and Prime Rate. The computed F-statistic of 7.300 was well above the upper bound critical value of 5.208 at the 5 percent significance level, which means that the null hypothesis of no long-run cointegration can be rejected. This was supported by a t-statistic of 4.455, which was above the upper critical value of 3.816 at the 5 percent significance level. On the basis that long-run cointegration existed, the ARDL model was estimated with the equilibrium correction option, using the AIC selection criteria for optimal lags. The results of the tests are presented in the Table 4.9.

Table 4.9: Results of the ARDL-EC model for all property

D.all	Coefficient	Std. err.	t	P>t	95% conf. interval	
ADJ						
All						
L1.	-0.3716	0.0834	-4.4600	0.0000	-0.5462	-0.1970
Long-run						
GDP	0.0010	0.0383	0.0300	0.9790	-0.0791	0.0812
CPI	0.1641	0.0664	2.4700	0.0230	0.0250	0.3031
Prime Rate	-0.3298	0.0748	-4.4100	0.0000	-0.4864	-0.1732
Short-run						
All						
LD.	0.2794	0.1600	1.7500	0.0970	-0.0556	0.6143
L2D.	0.1178	0.1821	0.6500	0.5260	-0.2634	0.4989
L3D.	-0.3207	0.1766	-1.8200	0.0850	-0.6902	0.0489
GDP						
D1.	0.0021	0.0107	0.1900	0.8500	-0.0204	0.0245
LD.	0.0088	0.0063	1.3900	0.1810	-0.0045	0.0221
CPI						
D1.	-0.0595	0.0267	-2.2300	0.0380	-0.1154	-0.0035
LD.	-0.0332	0.0248	-1.3400	0.1970	-0.0851	0.0187
L2D.	-0.0687	0.0226	-3.0400	0.0070	-0.1161	-0.0214
Prime Rate						
D1.	0.1556	0.0829	1.8800	0.0760	-0.0179	0.3292
LD.	0.0689	0.0655	1.0500	0.3060	-0.0682	0.2060
L2D.	0.1467	0.0597	2.4600	0.0240	0.0217	0.2717
L3D.	0.0916	0.0629	1.4600	0.1610	-0.0400	0.2232
_cons	1.3178	0.3341	3.9400	0.0010	0.6186	2.0171

R-squared = 0.7675; Adjusted R-squared = 0.5717; Root MSE = 0.0542; log likelihood =65.369716

Source: *Compiled by author*

The first part of Table 4.9 shows the negative speed of adjustment (ADJ). A negative speed of adjustment, as indicated by -0.3716 indicates that 37.16 percent of prior-period deviations from equilibrium converge back to equilibrium in the current period.

The long-run coefficients are reported in the long-run section of Table 4.9 and represent the long-run equilibrium effects of the economic factors on the all-property segment. There was evidence, at 5 percent statistical level of significance that CPI and prime rate had effects on all

property returns. The results suggest that a 1% increase in the CPI in the current period would likely trigger a 0.16% increase in all property returns in the long run, *ceteris paribus*. The results further suggest that a 1% increase in the prime lending rate in the current period would likely lead to a 0.33% decrease in all property returns in the long run. GDP did not have any statistically significant effect on all property returns, which was in line with the findings of Kwangware (2009) and Tyranes (2006). However, the findings contradicted those of Vogel (2012) and Boshoff and Cloete (2012), who found GDP to have a statistically significant relationship to house prices in South Africa.

The short-run coefficients are reported in the short-run section of Table 4.9 and represent short-run fluctuations not due to deviations from long-run equilibrium. The results indicate that CPI and prime rate had effects on all property in the short run. Increases in CPI in the previous quarters had negative but minimal effects on all property returns in the current quarter. Increases in the prime rate in the previous three quarters had a favourable effect on all property returns in the current period. In other words, the prime rate had a favourable effect on all property in the short run, but a negative effect in the long run. In contrast, CPI had an adverse effect on all property returns in the short run but a favourable effect in the long run. These findings were in line with those of Sibanda (2013) and Inglezi-Lotz and Gupta (2013) but contradicted those of Haworth (2005), who found inflation to have no effect on house prices in Namibia.

4.4.4.2. Model 2: To establish the relationship between the low-value property segment and key economic indicators from 2010 to 2019.

The bounds test was performed to assess the existence of long-run co-integration between the low-value property segment and the economic factors of GDP, CPI and prime rate. The computed F-statistic of 10.633 was well above the upper bound critical value of 5.126 at the 5 percent significance level, so the null hypothesis that there is no long-run cointegration can be rejected. This was supported by a t-statistic of 6.458, which was above the upper critical value of 3.828 at the 5% significance level. On the basis that long-run cointegration exists, the ARDL model was estimated with the equilibrium correction option, using the AIC selection criteria for optimal lags. The results of the tests are shown in Table 4.10.

Table 4.10: Results of the ARDL-EC model on low-value property segment

D.lowvalue	Coefficient	Std. err.	t	P>t	95% conf. interval	
ADJ						
lowvalue						
L1.	-0.6721	0.1041	-6.4600	0.0000	-0.8880	-0.4563
Long-run						
GDP	0.0115	0.0209	0.5500	0.5890	-0.0319	0.0548
CPI	0.2186	0.0740	2.9500	0.0070	0.0651	0.3721
Prime Rate	0.5060	0.0647	7.8300	0.0000	0.3719	0.6401
Short-run						
LD.	1.3903	0.1244	11.1700	0.0000	1.1322	1.6483
L2D.	-0.7728	0.1507	-5.1300	0.0000	-1.0853	-0.4604
L3D.	0.8854	0.1410	6.2800	0.0000	0.5929	1.1779
CPI						
D1.	0.0820	0.0590	1.3900	0.1780	-0.0403	0.2043
LD.	-0.0764	0.0547	-1.4000	0.1760	-0.1898	0.0370
Prime Rate						
D1.	-0.6430	0.1795	-3.5800	0.0020	-1.0152	-0.2708
LD.	0.1659	0.1908	0.8700	0.3940	-0.2297	0.5615
L2D.	-0.2744	0.1947	-1.4100	0.1730	-0.6781	0.1293
L3D.	-0.4898	0.1763	-2.7800	0.0110	-0.8554	-0.1243
_cons	-2.5179	0.7191	-3.5000	0.0020	-4.0093	-1.0265

R-squared=0.9112; Adjusted R-squared=0.8588; Root MSE=0.1435; log likelihood=27.673708

Source: *Compiled by author*

The negative speed of adjustment (ADJ=-0.6721) indicates that prior-period deviations from the long-run equilibrium relationship converged to equilibrium in the current period.

The long-run results indicate that CPI and prime rate had a strong long-run relationship with low-value property returns at the 1% statistical significance level. A 1% increase in CPI in one quarter was likely to lead to a 0.23% long-run increase in low-value property. Similarly, a 1% increase in the prime rate was likely to trigger a 0.51% increase in low-value property returns in the long run, *ceteris paribus*. GDP did not have any statistically significant relationship with low-value property returns, which was in line with the findings of Kwangware (2009) and Tyranes (2006). However, the findings contradicted those of Vogel (2012) and Boshoff and Cloete (2012), who found GDP to have a statistically significant relationship to house prices in South Africa.

The short-run results indicate a strong relationship between low-value property and prime rate at the 1% statistical significance level. *Ceteris paribus*, a 1% increase in the prime rate in the previous quarter would be likely to decrease low-value property returns by 0.64% in the current quarter. Similarly, a 1% increase in the prime rate in the previous four quarters would be likely to trigger a 0.49% decrease in low-value property returns. In other words, the prime rate had a negative and significant effect on low-value property returns in the short run while having a positive but smooth effect in the long run. CPI and GDP did not have any statistically significant effects on low-value property returns in the short run. The findings were in line with those of Haworth (2005), but contradicted those of Sibanda (2013) who found CPI to have sifgnificant relationship on residential properties.

4.4.4.3. Model 3: To establish the relationship between the mid-value property segment and key economic indicators from 2010 to 2019

The bounds test was performed to assess the existence of long-run co-integration between the mid-value property segment and the economic factors of GDP, CPI and prime rate. The computed F-statistic of 4.584 fell within the upper bound and lower bound critical values of 5.016 and 3.573 respectively, at 5 percent significance level. This implies that we cannot reject the null hypothesis as the long-run cointegration relationship is inconclusive. This was confirmed by a t-statistic of 3.246 which fell within the upper bound and lower bound critical values of 3.843 and 2.891, at 5% significance level. In the absence of any long-run relationship between, the ARDL model was estimated with only short-run coefficients. The ARDL model results can be seen in Table 4.11.

Table 4.11: Results of the ARDL model for Mid-value property

D.mid-value	Coefficient	Std. err.	t	P>t	95% conf. interval	
SR						
LD.	0.4721	0.1422	3.3200	0.0030	0.1797	0.7645
GDP						
D1.	-0.0077	0.0049	-1.5900	0.1240	-0.0177	0.0023
CPI						
D1.	-0.0195	0.0204	-0.9600	0.3470	-0.0614	0.0224
LD.	-0.0305	0.0180	-1.6900	0.1020	-0.0674	0.0065
L2D.	-0.0397	0.0173	-2.2900	0.0300	-0.0753	-0.0041
_cons	-0.1888	0.1655	-1.1400	0.2640	-0.5291	0.1515

R-squared = 0.6441; Adjusted R-squared=0.5209; Root MSE = 0.0523; log likelihood = 60.987478
Source: *Compiled by author*

The short-run results indicate that CPI has an adverse effect on mid-value property returns, ceteris paribus. A 1% increase in the CPI in the previous 3 quarters was likely to lead to a 0.04% decrease on mid-value property returns in the short term. This short-run effect is in line with the findings of Sibanda (2013) and Inglezi-Lotz and Gupta (2013) but contradicted those of Haworth (2005), who found inflation to have no effect on house prices in Namibia. The findings also indicate that positive increases in mid-value property returns in the previous quarter were likely to have a positive effect on mid-value property returns in the current quarter. GDP and Prime rate do not have any statistically significant effect on mid-value property, which was in line with the findings of Kwangware (2009) and Tyranes (2006). However, the findings contradicted those of Vogel (2012) and Boshoff and Cloete (2012), who found GDP to have a statistically significant relationship to house prices in South Africa.

4.4.4.4. Model 4: To establish the relationship between the high-value property segment and key economic indicators from 2010 to 2019

The bounds test was performed to assess the existence of long-run co-integration between the high-value property segment and the economic factors of GDP, CPI and prime rate. The computed F-statistic of 7.311 was well above the upper bound critical value of 5.153 at the 5% significance level, so the null hypothesis that there was no long-run cointegration can be rejected. This was supported by a t-statistic of 4.336, which was above the upper critical value of 3.824 at the 5% significance level. On the basis that long-run cointegration existed, the ARDL model was estimated with the equilibrium correction option, using the AIC selection criteria for optimal lags. The results of the tests are shown in Table 4.12.

Table 4.12: Results of the ARDL-ECM model for high-value property

D.high-value	Coefficient	Std. err.	T	P>t	95% conf .interval	
ADJ						
High-value						
L1.	-0.3030	0.0699	-4.3400	0.0000	-0.4484	-0.1577
Long-run						
GDP	0.0027	0.0373	0.0700	0.9430	-0.0749	0.0803
CPI	0.1781	0.0793	2.2500	0.0360	0.0132	0.3430
Prime Rate	-0.4093	0.0971	-4.2200	0.0000	-0.6112	-0.2074
Short-run						
LD.	0.6199	0.1376	4.5100	0.0000	0.3337	0.9060
L2D.	-0.0196	0.1701	-0.1100	0.9100	-0.3732	0.3341
L3D.	-0.3850	0.1782	-2.1600	0.0420	-0.7556	-0.0144
GDP						
D1.	0.0091	0.0075	1.2000	0.2430	-0.0066	0.0248
CPI						
D1.	-0.1064	0.0299	-3.5600	0.0020	-0.1686	-0.0442
LD.	-0.0614	0.0256	-2.4000	0.0260	-0.1148	-0.0081
L2D.	-0.0466	0.0266	-1.7500	0.0950	-0.1021	0.0088
Prime Rate						
D1.	0.3741	0.0871	4.2900	0.0000	0.1929	0.5552
LD.	0.0870	0.0852	1.0200	0.3190	-0.0902	0.2642
L2D.	0.1079	0.0774	1.3900	0.1780	-0.0530	0.2689
_cons	1.2064	0.3191	3.7800	0.0010	0.5428	1.8700

R-squared = 0.8215; Adjusted R-squared = 0.7025; Root MSE = 0.0690; log likelihood = 54.877379

Source: *Compiled by author*

The speed of adjustment (ADJ=-0.3030) indicates that 31 percent of prior-period deviations from equilibrium were corrected in the current period.

The long-run results indicate that CPI and prime rate had a strong relationship with high-value property returns. A 1% increase in CPI had a positive long-run effect of 0.18% in high-value property returns*, ceteris paribus*. These findings were in line with those of Sibanda (2013) and Inglezi-Lotz and Gupta (2013) but contradicted those of Haworth (2005), who found inflation to have no effect on house prices in Namibia. In contrast, a 1% increase in prime rate had a negative long-run effect of 0.41% on high-value property returns, *ceteris paribus*. GDP did not have any statistically significant effect on high-value property returns, which was in line with

the findings of Kwangware (2009) and Tyranes (2006). However, the findings contradicted those of Vogel (2012) and Boshoff and Cloete (2012), who found GDP to have a statistically significant relationship to house prices in South Africa.

The short-run results indicate strong but opposite effects of CPI and prime rate on high-value property at 1% statistical significance level, *ceteris paribus*. A 1% increase in CPI in the previous quarter resulted in a 0.11% decrease in high-value property returns in the current quarter. A 1% increase in CPI in the previous two quarters resulted in a 0.06% decrease in high value property returns in the current quarter. In contrast, a 1% increase in the prime rate resulted in a 0.37% increase in high-value property returns. GDP had no effect on high-value property.

4.4.4.5. Model 5: To establish the relationship between the luxury property segment and key economic indicators from 2010 to 2019

The bounds test was performed to assess the existence of long-run co-integration between the luxury property and the economic factors of GDP, CPI and prime rate. The computed F-statistic of 4.965 was above the upper critical value of 4.961 at the 5% significance level, the null hypothesis that there was no long-run cointegration can be rejected. As long-run co-integration existed, the ARDL model was estimated with the equilibrium correction option, using the AIC selection criteria for optimal lags. The results of the tests may be seen in Table 4.13.

Table 4.13: Results of the ARDL-EC Model on luxury property

D.luxury	Coefficient	Std. err.	t	P>t	95% conf. interval	
ADJ						
Luxury						
L1.	-0.0976	0.0319	-3.0600	0.0050	-0.1630	-0.0323
Long-run						
GDP	-0.0245	0.0634	-0.3900	0.7020	-0.1544	0.1053
CPI	0.2961	0.1653	1.7900	0.0840	-0.0425	0.6346
Prime Rate	-1.1859	0.3351	-3.5400	0.0010	-1.8724	-0.4994
Short-run						
LD.	0.6399	0.1563	4.0900	0.0000	0.3198	0.9600
L2D.	-0.3278	0.1466	-2.2400	0.0330	-0.6280	-0.0275
CPI						
D1.	-0.0324	0.0223	-1.4500	0.1580	-0.0782	0.0133
_cons	1.0883	0.2650	4.1100	0.0000	0.5454	1.6311

R-squared=0.7408; Adjusted R-squared= 0.7408; Root MSE=0.0608; log likelihood=49.84429
Source: *Compiled by author*

The speed of adjustment (ADJ=-0.0976) was negative and significant, indicating that prior-period deviations from equilibrium were corrected in the current period. This provides evidence of long-run convergence towards equilibrium.

The long-run results indicate that there was a strong relationship between the prime rate and high-value property returns at the 1% statistical significance level, *ceteris paribus*. A 1% increase in the prime rate in the current period resulted in a 1.2% decrease in luxury property returns in the long run. This implies that luxury property returns were very sensitive to changes in the prime rate, much more so than all the other property segments. The GDP did not show any statistically significant effect on luxury property returns, which was in line with the findings of Kwangware (2009) and Tyranes (2006). However, the findings contradicted those of Vogel (2012) and Boshoff and Cloete (2012), who found GDP to have a statistically significant relationship to house prices in South Africa. Similarly, CPI was found to have no statistically significant relationship to luxury property.

The short-run results did not show any statistically significant relationship between luxury property returns and any of the economic factors. In the short-run, luxury property returns only appeared to be influenced by lagged values of themselves.

4.4.5. Validity and Reliability of the results

To assess the validity and reliability of the results, post-estimation diagnostic tests were performed for each of the ARDL models. Each of the models were tested for serial correlation, stability, heteroskedasticity and normality. This was to ensure that the results were valid and did not suffer from bias or spuriousness. The results of the diagnostic tests are presented in Table 4.14. The null hypothesis was that there is no serial correlation, heteroskedasticity or non-normality. The null hypothesis was rejected when the p-values were equal to or less than 0.05, indicating statistical significance.

Table 4.14: Summary of post-estimation diagnostic tests (p-values)

	Serial Correlation		Heteroskedasticity		Normality
	Breusch-Godfrey	**Durbin's alternative**	**Breusch-Pagan**	**White's Test**	**Skewness & Kurtosis**
Model 1: All	0.5128	0.6415	0.0799	0.4125	0.0756
Model 2: Low-value	0.1204	0.2194	0.9286	0.4125	0.9018
Model 3: Mid-value	0.1985	0.2726	0.9918	0.4125	0.1233
Model 4: High-value	0.9697	0.9774	0.1869	0.4125	0.0177
Model 5: Luxury	0.6391	0.6837	0.6009	0.4125	0.2591

Source: *Compiled by author*

Based on the above test results, the p-values of all of the diagnostic tests for all property, low-value property, mid-value property and luxury property were not significant at 5% statistical level, which implies that we cannot reject the null hypotheses. Accordingly, the results confirm that the models are not serially correlated or heteroskedastic and the distributions do not part much from normality. However, the p-value of the skewness and kurtosis test of high-value property is significant at 5% level of significance, implying non-normality of the residuals. Therefore, the model for high-value property is not as reliable as the other models, although still usable as it is not serially correlated or heteroskedastic.

The stability of the model was tested using the cumulative sum (cusum) test for parameter stability. Both OLS and recursive cusum plots were derived for each model. The null hypothesis was that the model contained no structural breaks. This null hypothesis can only be rejected where the computed test statistic is above the critical values at 5% level of statistical significance. The cusum plots may be seen in Appendix A. A summary of the test statistics from the cusum tests is presented in Table 4.15.

The test statistics were evaluated against the critical values for each of the five models. All but one of the test statistics were below critical values, which means that the models had no structural breaks. The exception was the model for mid-value property, which showed a structural break at a statistical significance level of 5%. As the model for mid-value property did not show any long-run cointegration, inferences on the long-run relationship between mid-value properties and economic factors cannot be made. However, all the other models were valid and upheld all the underlying assumptions of ARDL.

Table 4.15: Results of the cumulative sum tests for parameter stability

Recursive		Critical value			OLS	Critical value		
Model	**Test statistic**	**1%**	**5%**	**10%**	**Test statistic**	**1%**	**5%**	**10%**
All	0.4477	1.1430	0.9479	0.8499	0.3275	1.6276	1.3581	1.2238
Low-value	0.7705	1.1430	0.9479	0.8499	0.4166	1.6276	1.3581	1.2238
Mid-value	1.1293	1.1430	0.9479	0.8499	0.4237	1.6276	1.3581	1.2238
High-value	0.2806	1.1430	0.9479	0.8499	0.4367	1.6276	1.3581	1.2238
Luxury	0.4237	1.1430	0.9479	0.8499	0.4019	1.6276	1.3581	1.2238

Source: *Compiled by author*

Multicollinearity of the three economic factors was tested using variable inflation factors (VIF) to assess whether there was any significant correlation between the economic variables which could distort the results of the ARDL models. The VIFs were computed to be 1.07, 1.01 and 1.15 for GDP, CPI and prime rate respectively. The r-squared values were found to be 0.26, 0.07, 0.36 for GDP, CPI and prime rate respectively. As the VIFs do not part much from the normal value of 1, it can be confirmed that multicollinearity did not exist amongst the economic variables.

Based on the above tests, the results are considered valid. More specifically, the absence of serial correlation and heteroskedasticity confirm that the results are not biased. The results are also deemed reliable as the data used in this study is sourced from official and authoritative sources. Thus, other researchers can reproduce the study under the similar circumstances and obtain the same results.

4.4.6. Discussion of ARDL Results

Having applied the ARDL model to each of the residential property segments and the relevant diagnostic tests of the models, the results can be seen in Table 4.16.

The results above indicate that economic growth (GDP) did not have any statistically significant relationship with residential property prices both in the short-run and the long-run. This is consistent with the findings of Kwangware (2009) and Tyranes (2006), who found the GDP to have no statistically significant effect on house prices in South Africa. However, the findings contradict those of Vogel (2012) and Boshoff and Cloete (2012), who found the GDP to have a statistically significant effect on house prices in South Africa.

Table 4.16: Summary of the relationships between property segments and economic factors

Property segment	Economic Growth (GDP)		Inflation (CPI)		Interest Rates (Prime)	
	Short-run	Long-run	Short-run	Long-run	Short-run	Long-run
All	X	X	(-)	(+)	(+)	(-)
Low-value	X	X	X	(+)	(-)	(+)
Mid-value	X	I	(-)	I	X	I
High-value	X	X	(-)	(+)	(+)	(-)
Luxury	X	X	X	X	X	(-)

(+) = Positive relationship; (-) = Negative relationship; X = Statistically insignificant relationship; I = Inconclusive relationship

Source: *Compiled by author*

The mixed findings confirm the nuanced effect of the GDP on residential properties as observed in Luus (2005). On the one hand, the GDP growth may contribute to house price growth through excess demand for housing. On the other hand, the GDP growth may also stimulate property supply in the long-run and thereby suppress property prices. As the study period was characterized by sustained low GDP growth in South Africa, it is not inconceivable that the effect of the GDP on both demand and supply of residential property was insignificant.

Inflation as measured by the CPI was found to influence all property segments except the luxury segment. The effect was negative in the short run and positive in the long run, with the long-run effect being more pronounced on the low-value segment. This finding is consistent with that of Sibanda (2013), who found that inflation shocks had an adverse short-run effect and a favourable long-run effect on house prices. Gupta (2010) also found inflation to have a negative short-run effect on house prices while Inglesi-Lotz and Gupta (2013) found inflation to have a positive long-run effect on house prices.

This finding also supports the preference of residential property as a hedge against inflation in the long run as observed by Erasmus (2015). In the context of this study, low-value property appears to have been a more effective hedge against inflation compared to other property segments. However, Haworth (2005) found inflation to have no effect on house prices in Namibia. This seems to suggest that property is also subject to country-specific dynamics. This notion was echoed by Ekemode (2019) who found that the inflation-hedging attributes of property may vary across geographical locations and property types. Accordingly, cross-

country generalizations on the relationship between inflation and residential property should be made with caution.

Interest rates were found to have a statistically significant effect on all residential property segments except the mid-value segment. The effect was generally positive in the short-run and negative in the long-run except for low-value property where the effect was in direct contrast to other segments. In line with the findings of Gupta, Jurgilas and Kabundi (2010), the long-run effect was more pronounced on the luxury property segment, suggesting that the luxury property segment was more responsive to changes in the prime rate than other segments.

The negative long-run effect of prime rate on residential property is in line with the long-held view that the prime rate affects property affordability as property is usually financed through a mortgage bond. Thus, an increase in the prime rate tends to reduce affordability and demand, which has an adverse effect on property prices. However, this finding was rebutted on low-value property as an increase in the prime rate led to an increase in low-value property prices in the long run. This could be because many of the properties in the low-value segment are usually not financed (CAHF, 2020). Furthermore, an increase in the prime rate could shift affordability and demand towards low-value properties, thus increasing prices.

It must also be noted that the South African Reserve Bank follows an inflation-targeting policy in setting the repurchase rate (repo rate), which has a direct impact on the prime rate. Increases in inflation beyond target are usually countered by increasing the prime interest rate. Thus, short-run effects of inflation are likely to be reversed in the long-run in response to monetary policy interventions.

4.5. Summary

In this chapter, the research methodology developed in Chapter Three was applied to meet the research objectives stated in Chapter One. Descriptive statistics were analysed and historical returns were analysed. The performance of the various residential property segments was evaluated using mean returns, median returns and Sharpe ratios. The results suggested that low-value property was the best-performing of all segments. The performance of residential property was also benchmarked against equities, bonds and cash over the study period on a nominal basis and on a risk-adjusted basis. The results showed that low-value property was the best-performing of all asset classes, on a risk-adjusted basis. Finally, the relationship between residential property and economic factors was evaluated at an overall level and at segmental

level. The results showed no statistical relationship between GDP and any of the property segments, while inflation and prime rate showed mixed results with the various property segments. Diagnostic tests such as unit root tests were performed before applying the ARDL model. Post-estimation diagnostic tests were also conducted to assess the validity and reliability of the results. Finally, the results of the ARDL model were summarised. The following chapter will summarise the findings, draw conclusions and make recommendations for future studies.

CHAPTER FIVE: SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1. Introduction

The preceding chapter provided a detailed analysis of the data to meet the research objectives. Data were analysed in line with the research methodology and the results were presented for each of the objectives. This chapter summarizes the study, draws conclusions, and makes recommendations for further studies.

5.2. Summary of the Study

In this study, the performance of residential property investments in South Africa for the ten-year period beginning from January 2010 to December 2019 was analysed. In South Africa, this period was characterized by sustained low economic growth (Faure, 2017). Using data from Lightstone property, the performance of residential property was analysed at an overall level and across the property value segments of low-value, mid-value, high-value, and luxury. Descriptive statistics and Sharpe ratios were employed to ascertain the best-performing residential property segment over the study period. Parallels and differences were drawn between the findings of current and previous studies.

The study also contrasted the performance of residential property investments with that of alternative asset classes available to a South African investor such as equities, bonds and cash. To do this, equities, bonds and cash investments were proxied by the ALSI, the ALBI, and the STEFI respectively. The analysis was performed for residential property in general and for each of the value segments. The performance of each asset class was determined using the measures of central tendency and the Sharpe ratios to account for the risk of each asset class. The results were compared with findings of previous studies.

Lastly, the relationship between residential property investments and economic factors such as economic growth, inflation and interest rates was investigated. Once again, this investigation was performed for residential property in general and for each of the value segments. Economic growth was measured using the GDP, inflation was measured using the CPI, and interest rates were measured using the prime rate. The ARDL model was used to investigate the short-term and long-term relationships.

5.3. Conclusions

This study analysed the performance of residential property investments in South Africa with particular focus on the performance of the different value segments. As residential property investments is one of the various asset classes available to investors, a comparison was drawn between the performance of residential property investments and other key asset classes. The study also evaluated the relationship between key economic factors and residential property investments. To conclude the study, the research questions (RQ) are revisited, followed by a summary of the findings, which are essentially answers to the research question.

5.3.1. Objective 1: To evaluate and assess the performance of residential property segments in South Africa from 2010 to 2019

To meet this objective, the performance of residential property segments in South Africa was evaluated and assessed using both descriptive statistics over the study period. The mean and median returns were computed for each residential property segment. To take into account the level of volatility risk, Sharpe ratios were computed to evaluate the risk-adjusted returns of each segment. The results of the performance of residential property segments suggest that the low-value residential property segment outperformed all the other segments, followed by the luxury segment. The luxury segment was followed by the high-value segment while the mid-value segment was the least-performing of all segments. The results are consistent in nominal terms and on a risk-adjusted basis. Thus, while the low-value and luxury property segments carried higher risk than other property segments, the risk was commensurate with the returns. Mid-value and high-value property segments carried lower risk commensurate with lower returns. This supports the long-held principle of risk-return trade-off. Therefore, residential property investors could maximize returns by allocating more capital to low-value property as opposed to other property segments, *ceteris paribus*.

5.3.2. Objective 2: To evaluate and assess the performance of residential property investments against other asset classes in South Africa from 2010 to 2019

To meet this objective, the returns from residential property, equities, bonds and cash were evaluated and assessed using descriptive statistics. Mean and median returns of each asset class were computed and evaluated. To account the volatility risk of each asset class, the Sharpe ratios were computed and evaluated. As residential property is the focal point of the study, the evaluation was performed for all properties and for each of the individual segments. The results

suggest that equities outperformed all asset classes, followed by cash investments. Cash investments were followed by residential investments while bonds were the lowest-performing asset class. On a risk-adjusted basis, cash investments outperformed all asset classes, followed by equities. Equities were followed by bonds while residential property investments were the lowest-performing asset class. These findings imply that the high risk of equity investments has not been adequately compensated by higher returns. Similarly, the low risk of cash investments has not been commensurate with the lower return.

When evaluating residential property according to its value segments and adjusting for risk, different results were observed. Low-value property emerged as the best-performing of all asset classes, followed by cash and then equities. Bonds and all other residential property segments were the lowest-performing asset classes during the study period. Thus, to diversify one's investment portfolio across the four asset classes of residential property, equities, bonds and cash, an investor could benefit from including low-value property in the portfolio. Investors wishing to hedge against the effects of inflation can also benefit from investing in low-value property.

5.3.3. Objective 3: To establish the relationship between residential property segments and key economic indicators in South Africa from 2010 to 2019

To meet this objective, economic growth (GDP), interest rates (prime rate) and inflation (CPI) were selected as key economic indicators. The ARDL model was used to establish the relationship between the different residential property segments and key economic indicators both in the short term and long term. The results of the tests for long-run relationships were conclusive for the luxury, high-value and low-value residential property segments, but not for the mid-value property segment. Diagnostic tests confirmed the existence of a structural break on the ARDL model of the mid-value property segment. Accordingly, no conclusion could be drawn on the long-run relationship between mid-value residential property and the key economic factors. The results for the other models were conclusive, but mixed results were observed between the various residential property segments.

Economic growth was found to have no statistically significant relationship with any of the residential property segments in either the short run or the long run. In the short run, the inflation rate was found to have a negative relationship with all properties in general, and mid-value property and high-value property. In the long run, the inflation rate was found to have a

positive relationship with all properties in general, low-value property, and high-value property. Interest rate movements were found to have a short-run positive relationship with all properties in general, and high-value properties, while the short-run relationship with low-value property was negative. In the long run, the interest rate was found to have a negative relationship with all properties in general, high-value properties, and luxury properties, while the long-run relationship with low-value property was found to be positive.

5.4. Recommendations

This study has shown that different segments of the residential property market yield different returns over time. It has shown that low-value properties tend to outperform other residential property investments in nominal terms and on risk-adjusted basis. It is therefore recommended that property investors should include low-value properties in their property investment portfolios. As low-value property is generally more affordable, it is also recommended that first-time property investors should consider 'starting small' by investing in low-value property as this has potential to provide the best returns at lower credit risk. Financial institutions should also consider offering financial products tailor-made for the low-value property segment.

This study also showed that equities tend to outperform all asset classes in a low economic growth environment. However, on a risk-adjusted basis, low-value properties tend to outperform all other asset classes in such an economic environment. In the interests of maintaining a diversified investment portfolio, it is recommended that investors in general should consider including low-value properties in their investment portfolios to achieve better risk-adjusted returns. Furthermore, investors should take into consideration their risk appetite and time horizons as various asset classes carry different volatility risks. In all cases, due consideration of other factors should be made when deciding on the appropriate asset mix as investing directly in physical property also comes with its own unique challenges, compared to investing in financial assets such as equites, bonds and cash.

Various economic factors were also shown to have different relationships to individual segments of the residential property market. Economic growth was found to have no significant relationship to the property market while inflation and prime rate had short-run and long-run relationships with the property market. It is recommended that property investors should consider both current and expected economic dynamics when making investment decisions. It

is further recommended that policy makers consider the potential effects on the residential property market when making decisions pertaining to interest rates.

5.5. Suggestions for Further Study

This study compared the performance of the different residential property segments. The segments were defined based on the different value-bands. Previous studies have already highlighted location as one of the key differentiators of residential property. Future studies could segmentalize residential property across various locations in the country to evaluate their performance dynamics.

It must also be noted that this study focused on a ten-year period characterized by low economic growth. Subject to the availability of data, future studies could focus on a longer period to capture other market dynamics. The recent Covid-19 pandemic has also provided scope to study the pandemic effects on residential property.

As this study compared residential property investments with other asset classes on a segmental basis, future studies could also dissect equities and bonds in terms of their various segments.

There is also scope to study the relationships between the economic factors and other asset classes such as equities and bonds.

While this study selected economic growth, inflation and interest rates as economic factors of interest, the studies referred to in the literature review have shown that there are other factors that affect residential property investments. These include socio-political dynamics, population dynamics, infrastructural dynamics, location factors, environmental factors, and other economic factors. Future studies could focus on assessing the effect of some of these factors on the performance of residential property investments.

5.6. Concluding Summary

This chapter summarised the study and provided recommendations and suggestions for future studies. Overall, the study has shown that residential property is a significant and important asset class for wealth-creation. The study also demonstrated that the performance of residential property investments is heterogenous rather than homogenous. Thus, generalized conclusions about the performance of residential property investments could be misleading as there are significant variations across segments and the interrelations between residential property

segments and economic factors also vary across segments. Essentially, this study has rebutted the common misconception that all residential property investments are equally profitable. This adds to the existing body of knowledge by demonstrating that the potential of residential property investments to create wealth for investors and serve as a protection against inflation should be evaluated in the context of each residential property segment. These significant findings should assist investors to make better-informed decisions and avoid residential property investment pitfalls.

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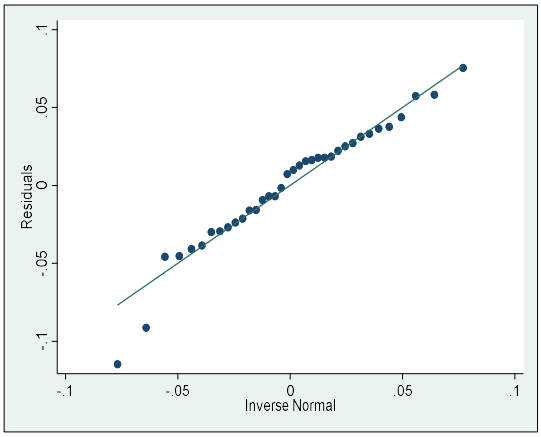
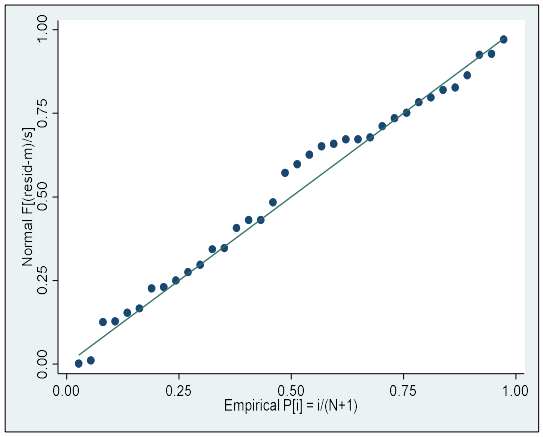
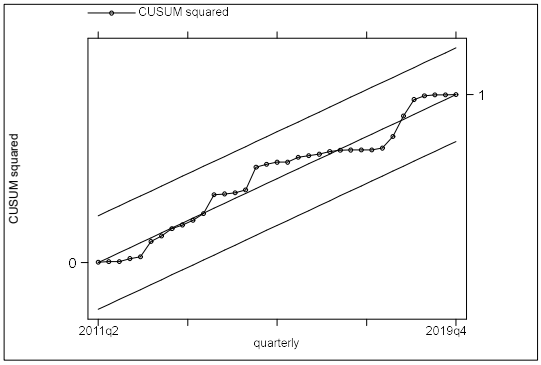
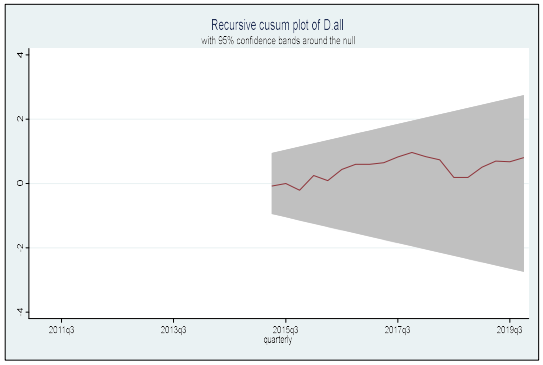
APPENDIX A: GRAPHS OF CUMULATIVE SUM PLOTS AFTER ARDL MODEL ESTIMATION

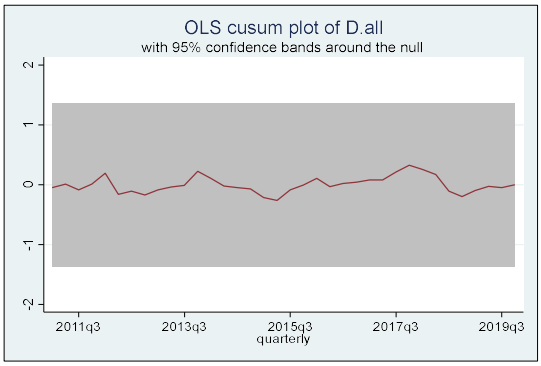
CUSUM plots: all property



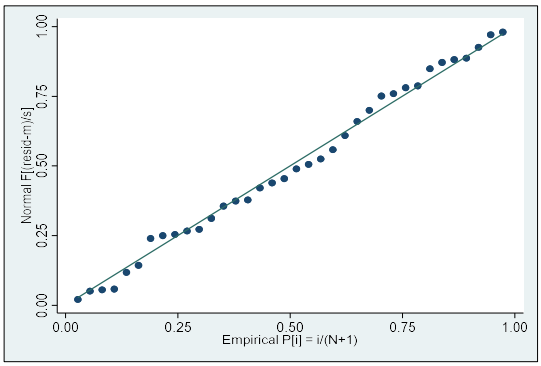


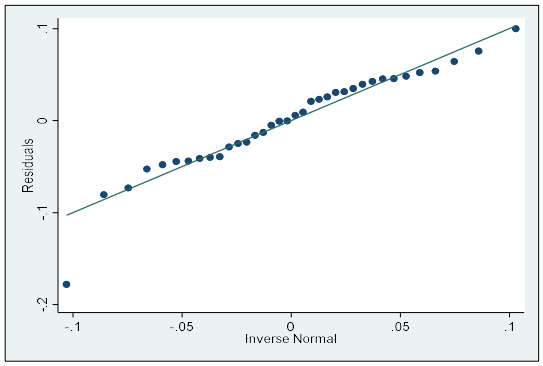


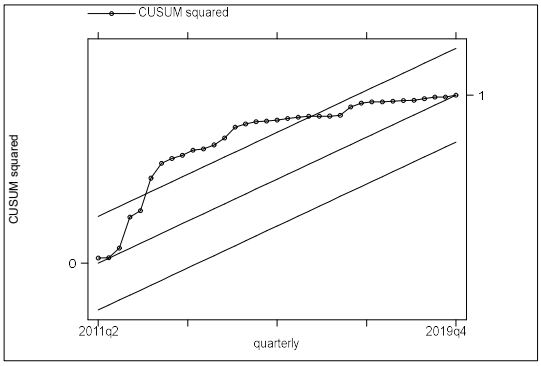


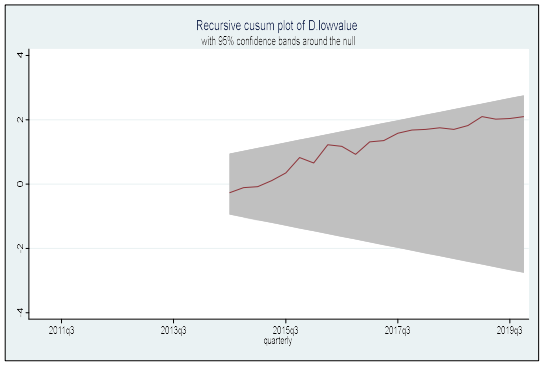


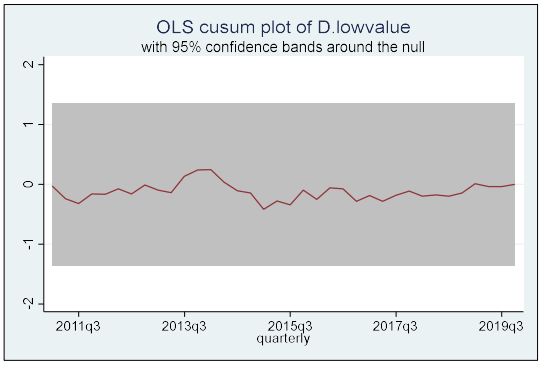
CUSUM Plots: Low-value property



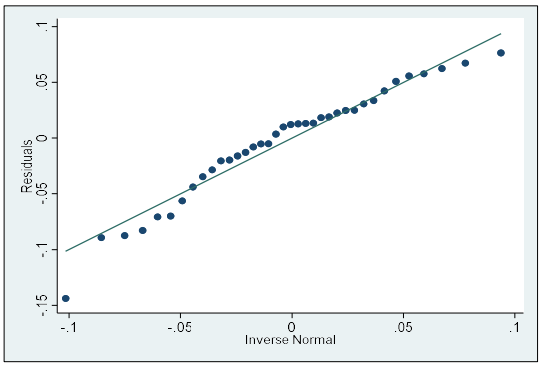


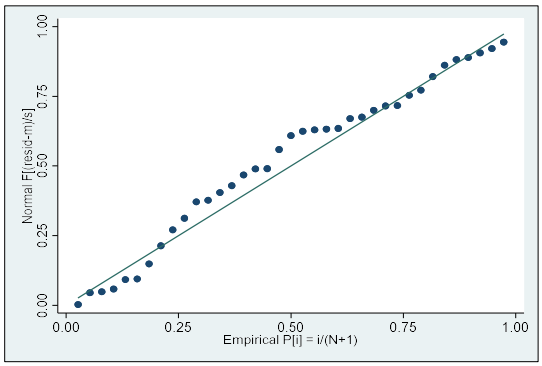


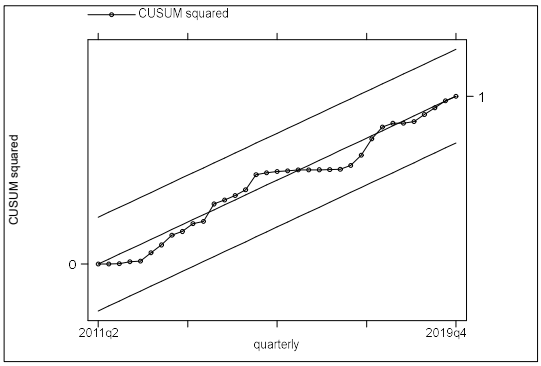


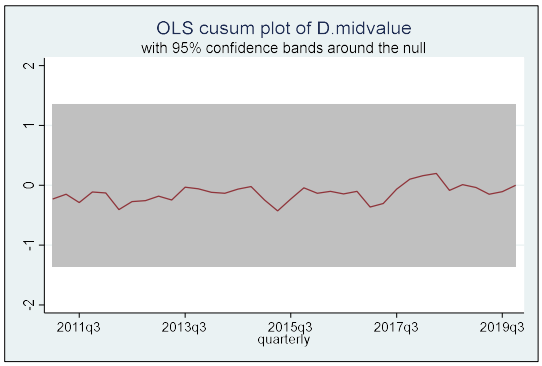


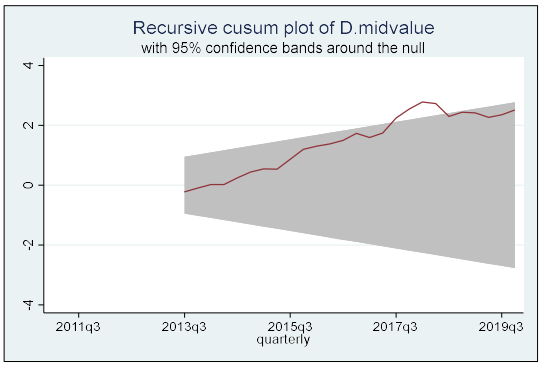
CUSUM Plots: mid-value property



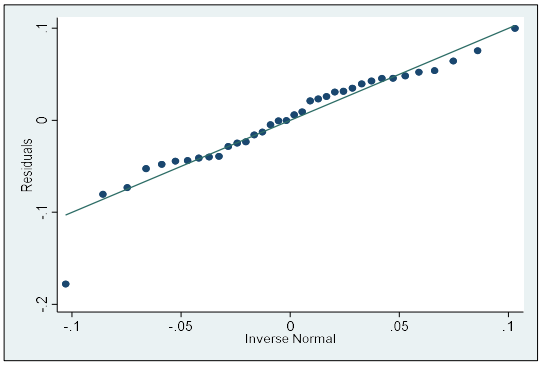


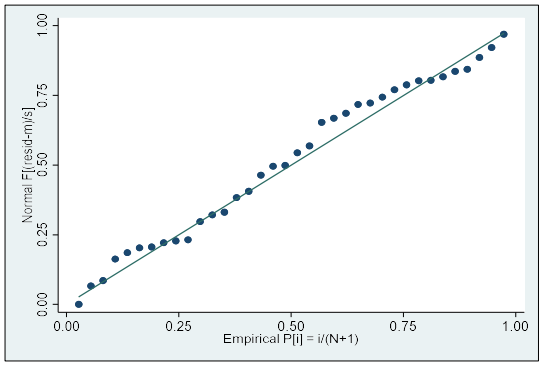


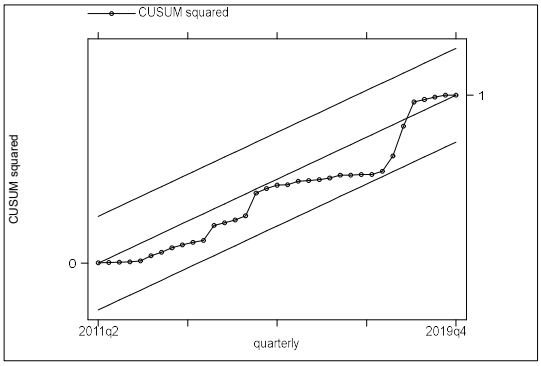


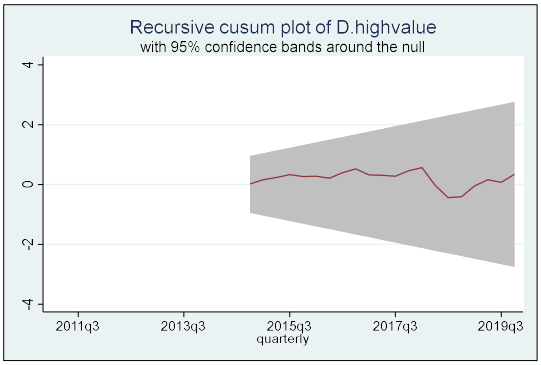


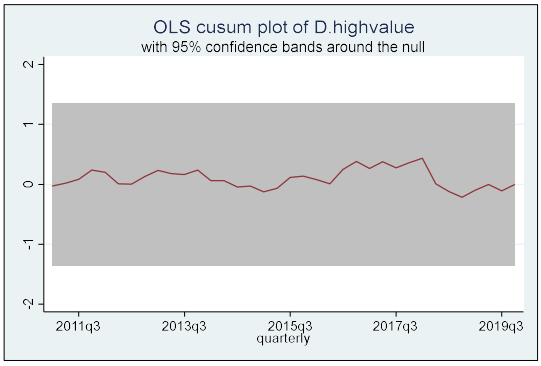
CUSUM Plots: high-value property



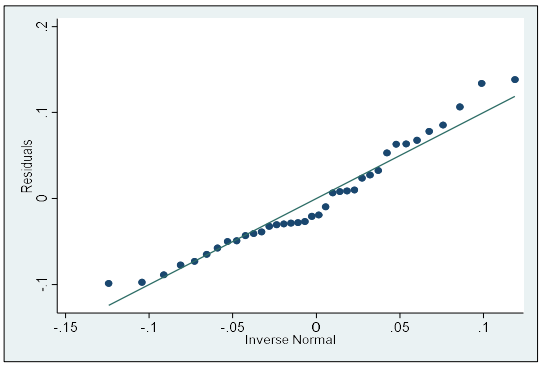


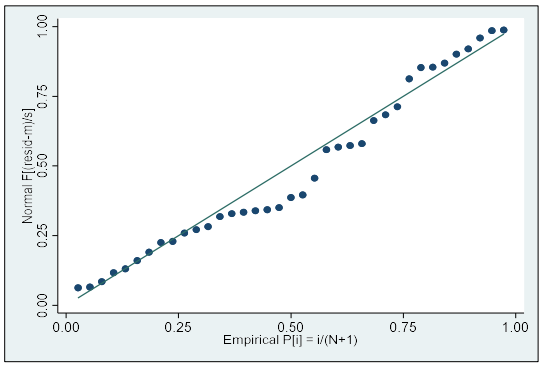


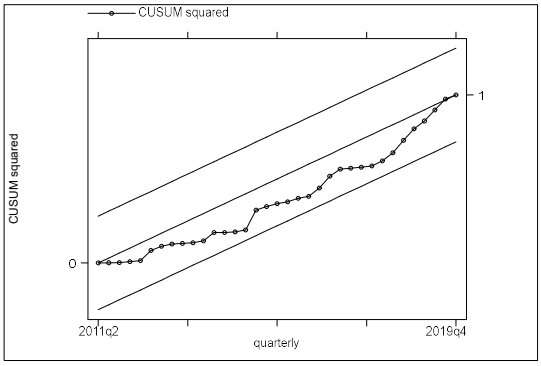


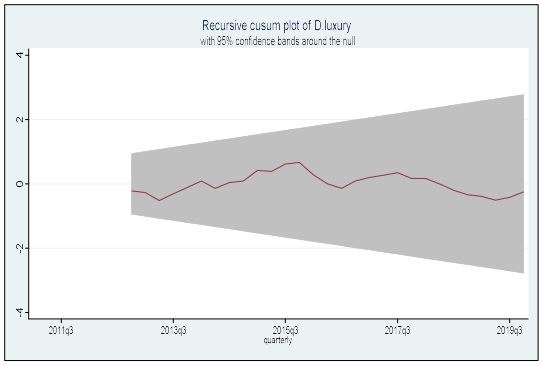


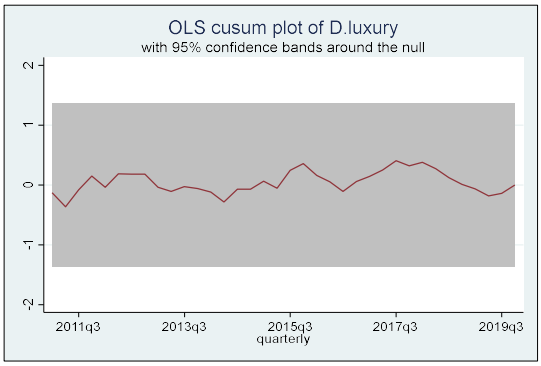
CUSUM Plots: Luxury property



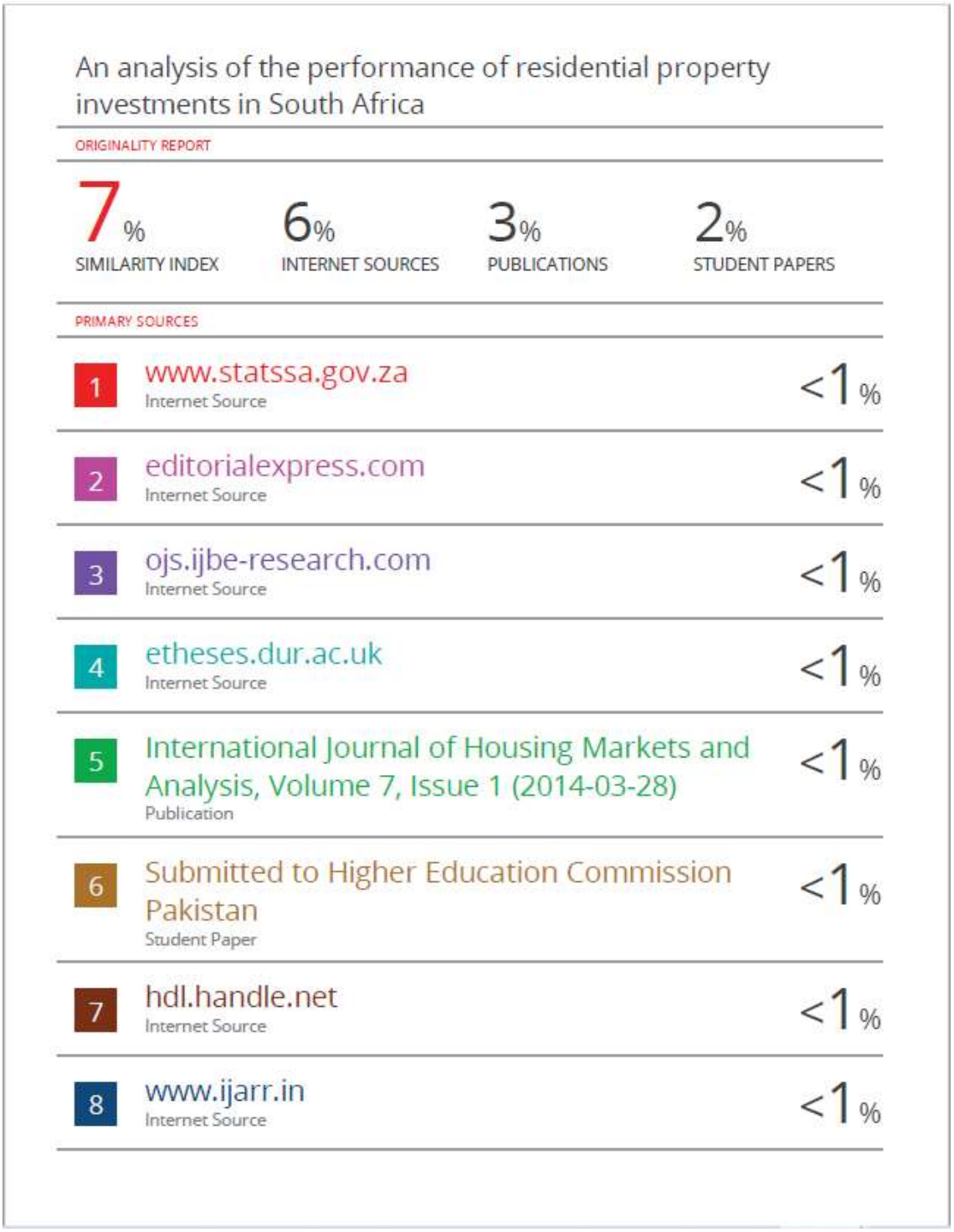








APPENDIX B: TURNITIN REPORT SUMMARY



An analysis of the performance of residential property investments in South Africa

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APPENDIX C: EXEMPTION FROM ETHICS REVIEW

8 June 2021

Mr Edwin Mashaba (218082749)
School Of Acc Economics&Fin
Westville

Dear Mr Edwin Mashaba,

Protocol reference number: 00010901
Project title: An analysis of the performance of residential property investments in South Africa

Exemption from Ethics Review

In response to your application received on 7 June 2021 , your school has indicated that the protocol has been granted **EXEMPTION FROM ETHICS REVIEW.**

Any alteration/s to the exempted research protocol, e.g., Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through an amendment/modification prior to its implementation. The original exemption number must be cited.

For any changes that could result in potential risk, an ethics application including the proposed amendments must be submitted to the relevant UKZN Research Ethics Committee. The original exemption number must be cited.

In case you have further queries, please quote the above reference number.

PLEASE NOTE:
Research data should be securely stored in the discipline/department for a period of 5 years.

I take this opportunity of wishing you everything of the best with your study.

Yours sincerely,

8 June 2021

_____

Prof Josue Mbonigaba
Academic Leader Research
School Of Acc Economics&Fin