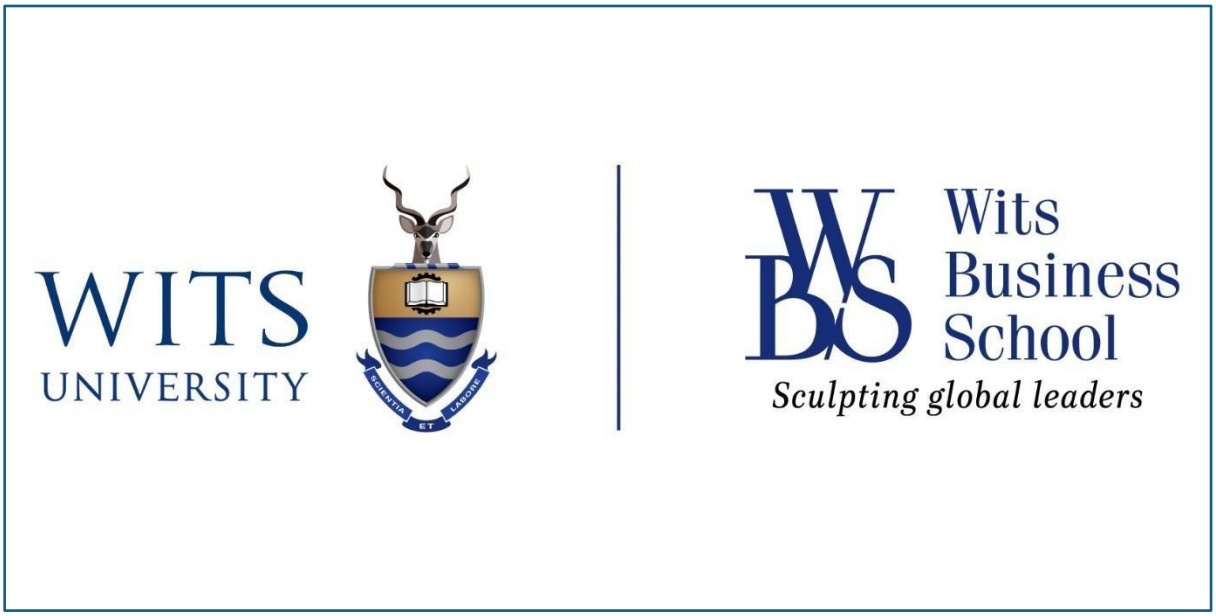
University of the Witwatersrand

Financing low-cost housing developments in the proximity of economic hubs: The case of RDP settlements in South Africa

Masters of Management in Finance and Investment

Research report



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Declaration

I, Samuel Theu, hereby declare that this research paper, titled, *financing low-cost housing developments in the proximity of economic hubs: The case of RDP settlements in South Africa*, is my original work. I affirm that all the content herein has been developed based on my own research, analysis, and understanding, except where explicitly referenced. Proper citations have been provided for all sources consulted and used during the preparation of this work, in compliance with academic integrity standards.

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Chapter 1: Introduction

1.1 Background:

South Africa's housing dilemma is a complex issue that stems from the country's apartheid past. The legacy of spatial planning and discriminatory housing regulations has left a serious scarcity of affordable housing, particularly in cities. The Reconstruction and Development Programme (RDP), which began in the early 1990s, sought to solve this issue by providing low-cost housing to millions of South Africans living in informal settlements and overcrowded housing conditions. While great progress has been made, many obstacles remain, including the location of RDP housing complexes away from economic possibilities (Tshimomola, 2024). Several factors are responsible for the spatial mismatch that currently exists between RDP developments and significant economic hubs, including the country's apartheid history.

Prior to 1994, South Africa's housing regulations were marked by racial segregation and inequality (Terreblanche, 1999). The apartheid administration deliberately divided space, confining black people to congested and destitute townships and rural areas. The Group Areas Act of 1950 imposed zoning, which limited where people may reside based on their race. This method caused a significant housing shortage and poor housing conditions for the black majority (Kerr, 2017).

The post-apartheid government recognized the urgent need to address the housing situation and made housing a core component of the RDP. According to the white paper (1994), the RDP is a set of guidelines for continuous and comprehensive socioeconomic development. It aims to mobilise all South African individuals and resources to completely remove the effects of apartheid. Its purpose is to create A future that is democratic and non-racial that reflects a vision for South Africa's fundamental transformation (white paper, 1994). The program was designed to provide one million dwelling units within five years of its launch (white paper, 1994). Tshimomola (2024) goes on to argue that while this lofty goal was not entirely met, the RDP did make considerable gains in expanding access to housing for low-income households.

South Africa continues to have a high need for affordable housing. A sizable section of the populace resides in informal settlements or overcrowded housing, which lacks essential services including sewerage, water, and power (Kerr, 2017). These conditions exacerbate a variety of social and economic issues, including poor health, crime, and unemployment. Furthermore, increased urbanization has exacerbated city-wide housing shortages. Many people move to cities in quest of greater economic

possibilities, but many cannot afford decent housing (Kerr, 2017). This has resulted in the expansion of informal communities and slums, generating new issues for urban governance.

The fast expansion of informal settlements in South Africa's economic hubs presents considerable implications for housing and urban development. Gobillon et al. (2007). States the towns are frequently characterized by congestion, a shortage of essential services, and susceptibility to disasters. Residents of informal settlements have restricted access to jobs, education, and healthcare, which perpetuates a cycle of poverty. In addition to putting pressure on municipal resources and infrastructure, informal settlements create problems with waste management, sanitation, and transportation. In addition, the expansion of informal settlements into valuable land can impede economic growth and spark tensions between locals and landlords (Kerr, 2017).

A comprehensive strategy is needed to address the issue of informal settlements, one that focuses on improving current settlements while avoiding the emergence of new ones.
The growth of informal settlements is a result of legislative gaps; otherwise, the RDP program oversees the creation of affordable housing developments (Tshimomola, 2024). The creation and execution of housing policies and initiatives in South Africa are supported by the legal framework for affordable housing. However, the Housing Act of 1997 forms the basis, while additional significant pieces of legislation contribute to the regulatory environment (Tshimomola, 2024).

The provision of housing for the economically disadvantaged population in South Africa forms a huge role in accomplishing the goals outlined in the white papers, particularly those benefiting from the Reconstruction and Development Program (RDP), is a critical concern for sustainable urban development (Masuku, Mtapuri, Sabela, & Mlondo, 2022). In year 2017, 23 years into the RDP, 1.92 million households were first time recipients of government subsidized RDP housing. A total 2.67 million households were residing in RDP housing. The figure includes households previously occupying government subsidized housing. Between 1988 and 1997, 263 128 RDP houses were built, 1998 to 2007, 887 588 were built; 2008 to 2012, 591 923 RDP houses were built and between 2013 to 2017, 293 471 RDP houses were built (Stats Sa, 2017). A total of over 2 million houses has been built over a 30-year period, averaging approximately 90,000 households per year (Stats Sa, 2017).

The National Housing Code establishes minimum standards for housing construction, ensuring that dwellings are safe and habitable, which are not adhered to by informal settlements (Kerr, 2017). Furthermore Kerr (2017) states that this code addresses issues such as building materials, structural

integrity, and sanitation facilities. Additionally, compliance with the National Housing Code is essential for obtaining building permits and securing funding for housing projects.

An important factor encouraging involvement of the private sector in low-cost housing development is the Finance Act. According to Kerr (2017), the government promotes investment in the housing sector through tax incentives and rebates. These incentives can come in several ways, including income tax deductions for private investors in affordable housing, tax credits for developers, and transfer duty exemptions (Kerr, 2017). The success of the Finance Act in increasing the supply of affordable housing is still up for debate, even though it has expanded private sector participation (Kerr, 2017).

Political issues have had a major impact on the implementation and success of affordable housing initiatives in South Africa, in addition to financial and regulatory factors. Public trust has been damaged, and growth has been hampered by corruption, patronage, and poor financial management. Politics has frequently been involved in the distribution of housing units, with recipients chosen more for party affiliation than for need (Tshimomola, 2024). This has resulted in inefficient housing allocation as well as social unrest and protests. The RDP initiative was introduced as official policy by the then-governing Government of National Unity (GNU), which was predominately dominated by the ANC. (Tshimomola, 2024) states that the RDP initiative was officially enacted into South African law on the 13th of July. 1994, becoming Act No. 7, known as the Reconstruction and Development Programme Fund Act

1.2 Context of the study

South Africa's history of forced relocations, the Group Areas Act, and other policies that have influenced the nation's urban and rural areas have contributed to high transportation expenses and long commutes between home and work (Terreblanche, 1999). Black, coloured, and Indian South Africans frequently reside far from economic centers due to the establishment of buffer zones brought about by a policy of racial segregation and forced relocations (Terreblanche, 1999). Although Group Areas Act was abolished at the dawn of independence, many blacks and coloureds still live in places far from the centers of economic activity. This has been reinforced by RDP housing, the bulk of which have been developed near apartheid era black and coloured neighbourhood. As explained, this has been problematic as beneficiaries of RDP housing must travel long distances in search of gainful employment and business. Thus, one crucial issue that deserves research attention is the need for supply of affordable housing in proximity to the main hubs of economic activity, specifically central business districts (CBDs), or places of employment for RDP occupants (Masuku et al., 2022).

The 2003 National Travel Survey found that black South Africans with low incomes commuted to and from work for an average of 88 minutes each day. In general, low-income South Africans commute farther than middle-class and upper-class individuals. Due to the spatial mismatch caused by affordable housing being located far from employment centers and economic hubs, a sign of the socioeconomic segregation imposed by the Apartheid regime, white South Africans commuted for 54 minutes less per day than black South Africans and an average distance of 17.8 km in Gauteng from RDP housing to main economic hubs (Lehohla, 2018) The 2011 OECD research, "How's life", compared commute times using information from time usage questionnaires conducted in 24 different nations. With an average travel of 56 minutes per day, South Africa had the longest commutes overall. Additionally, Geyer & Geyer (2017) states the average travel time in South Africa was 56 minutes per day, which was higher than the global average of 38 minutes Low-income commuters often travel between 20 and 30 kilometres each way, though this varies greatly depending on the area and availability of public transportation.

Low-income South Africans travel disproportionately long distances on average, taking a disproportionate amount of time. Lehohla (2018) states that average commute durations might vary from 60 to 120 minutes each way due to the reliance on ineffective transportation systems and the absence of direct routes. Due to decreased time for income-generating activities and increased transportation expenses, this longer journey time increases the financial pressure on low-income people.

Du Plessis (2002) states over the years, the average travel time for different modes of transportation has increased significantly, indicating that low-income South Africans are spending more time commuting. Lehohla (2018) supports Du Plessis (2002) observation in stating that walking time increased from 21.55 minutes in 1993 to 34.89 minutes in 2013. Similarly, commuting by train, which is often a necessity for those living far from economic centers, saw an increase from 60.31 minutes in 1993 to 81.92 minutes in 2013. Lucas (2011) adds that these increased travel times, particularly for those who walk or use public transport, reflect the growing challenges faced by low-income commuters in accessing job opportunities, often located far from affordable housing.

Low-income individuals who rely on public transport such as buses or minibuses face significant costs, which can consume a large portion of their income. For example, those commuting by bus or minibus not only experience long travel times (75.67 minutes by bus and 56.81 minutes by minibus in 2013) but also face considerable costs, often exacerbated by the long distances they need to cover (Lehohla,2018). These commuting costs, when combined with the lengthy travel times, underscore the economic and

temporal burdens on low-income South Africans, limiting their ability to improve their financial situation and reducing their overall quality of life (Lucas, 2011).

A wide range of stakeholders were to be brought together by the National Housing Accord, which was signed in October 1994. These stakeholders included officials, communities, civil society, new contractors, the building sector, suppliers of building materials, employers, developers, and the global community, in addition to representatives of the homeless (Shah & Sturzenegger, 2022). This accord's goal was to establish a consensus among these parties to cooperate to realize a shared housing vision in South Africa (Shah & Sturzenegger, 2022). Addressing housing issues and encouraging collaboration amongst different organizations in the housing industry required teamwork.

Average cost of travel using taxis has risen from a monthly average of R 515 to R 960 for taxis, R 371 to R 581 for trains and R 472 to R 745 for buses (Shah & Sturzenegger, 2022). The three modes of transportation are the most used amongst lower income households in South Africa. The salary to qualify for an RDP house is a salary of R 3500 a month or less, resulting in between 11% and 27% of the household income going towards travelling (Kerr, 2017).

The current financing model for housing and human settlements is based on the distribution of capital grants as highlighted by Mazhidunka et al. (2020), a bulk of which are detailed in the Housing Code 2009 (DHS,2023). These have evolved throughout time and are need of a more systemized implementation. Current grants include Urban Settlements Development Grant (USDG), Human Settlements Development Grant (HSDG), Upgrading of Informal Settlements Partnership Grant (UISPG) provincial and municipal (DHS,2023).

Compared to the baseline as stated in the 2022/2023 budget, the current RDP housing 2023/24 budget of R34.9 billion represents an increase of R485 million (Jubane & Tshangana, 2023). In addition, Jubane and Tshangana (2023) indicate in a report by the Centre for Affordable Housing Finance in Africa (CAHF) that the national department distributes most of its money to municipalities and provinces as implementing bodies due to the concurrency of the human settlement’s role. 55% of the department budget is given to provinces in the form of conditional grants, with municipalities receiving the remaining 36%. The department only uses 3% of its whole budget, with an additional 5% going to entities.

Jubane & Tshangana (2023) break down the distribution and function of each fund for Human Settlements in February 2023 for the 2023/2024 fiscal year as follows:

1. HSCG: The purpose of the HSDG, with a budget share of R 14.94 billion, is tasked with allocating funds for the gradual realization of housing access. Additionally, it contains most of the funding needed to carry out national housing initiatives in accordance with the national housing law.
2. USDG: The purpose of the USDG, with a budget of R 8.15 billion, is to supplement the capital revenue of South African metropolitans, to enable the promotion of inclusive, integrated, productive and sustainable development in urban areas, through infrastructure project implementation.
3. UISPG – Provinces: The purpose of the UISPG (Provinces), with a budget share of R 4.3 billion, is to facilitate the upgrade informal settlements through systemized and inclusive methods.
4. UISPG – Municipalities: Like the function of the UISPG (Province), but on a municipal level, the function of the ISUPG (Municipalities) is to provide the funding to implement a municipality wide informal settlement upgrade. The ISUPG (Municipalities), has a budget share of R 4.36 billion.

The existing structure of the RDP programme relies heavily on government spending, with minimal private sector involvement. Involving the private sector has its usual benefits, but there are certain issues that should be carefully considered. When it comes to project capital financing, Social Housing Institutions (SHIs) may inadvertently oppose grant-based subsidies, particularly those meant to finance project capital for Comprehensive asset renewal budgeting (Mayne, 2024) .When capital commitments which can amount to as little as 30% of the overall building cost are fulfilled, social housing projects run the risk of collapsing into disrepair unless they have a feasible exit strategy, or a higher liability share for developers (Mayne, 2024).Innovative approaches are needed to address these issues, particularly since South Africa is classified as an emerging market.

1.3 Problem Statement

The issue of financing low-cost housing near economic hubs in South Africa is significant because the country faces a critical housing shortage, exacerbated by "spatial mismatch." This mismatch refers to the geographic separation of affordable housing from job opportunities, amenities, and essential services, leading to increased commuting costs, time burdens, and a negative impact on residents' quality of life. In the context of Reconstruction and Development Programme (RDP) settlements, this situation undermines the initiative's goal of improving living standards for low-income households.

Addressing these mismatches could contribute to socio-economic development, economic mobility, and inclusive growth, while reducing urban poverty (Turok, 2012).

There is a gap in understanding the factors that significantly influence private sector participation in affordable housing. While several studies have explored the general barriers to affordable housing development, few have specifically analysed the interaction between financial factors—such as inflation, construction costs, land acquisition, and rental returns—and private sector investment decisions in South Africa. Research in other regions, like Gyourko & Linneman (1990), shows that market conditions and financial constraints significantly affect private investment in housing. However, the local context may differ, as factors such as land ownership, historical inequalities, and policy environment influence South Africa's housing landscape in unique ways (Tomlinson, 2007).

Furthermore, existing literature has not thoroughly examined the impact of financing strategies and investment incentives on the sustainability and scalability of affordable housing projects. As a result, key stakeholders, including policymakers, developers, and investors, may lack the insights needed to structure effective partnerships and financial arrangements. Closing this gap is essential for unlocking private capital, which could address the housing crisis more effectively than public financing alone (Monkkonen, 2013). Understanding these factors could also enhance policy frameworks to attract more private sector participation, leading to more integrated and sustainable housing solutions.

By investigating these financial and market-related factors, the study will contribute to filling this gap in the literature and support evidence-based strategies for scaling up affordable housing near economic hubs in South Africa.

1.4 Research question:

Main research question

How can financing mechanisms for low-cost housing development in South Africa be improved to achieve a balance between affordability and proximity to economic hubs for RDP housing beneficiaries?

Sub-Questions

1. What are the limitations of current RDP financing mechanisms?
2. What economic and policy factors affect private sector participation in affordable housing?
3. How can financing mechanisms be structured to balance affordability and investor returns?

1.5 Objectives of study

Main objective

To empirically examine the key macroeconomic and policy factors influencing private sector participation in low-cost housing developments near South Africa's economic hubs.

Specific objectives of the study are.

1. To analyse historical trends and relationships between private sector involvement and key macroeconomic variables related to affordable housing investment.
2. To evaluate the influence of inflation, interest rates, property prices, social grants, and housing delivery on private sector participation in low-cost housing.
3. To assess the long-run and short-run dynamics between subsidised housing delivery and private sector investment using a VECM approach.
4. To provide policy recommendations based on empirical evidence to improve private sector participation in affordable housing near economic hubs.

1.6 Significance of study

This study aims to investigate the challenges of financing RDP housing developments near main economic hubs. The findings of the research are intended to aid the development of RDP settlements in areas where economic opportunities are higher. Being situated in areas near main economic hubs is expected to increase household disposable income, due to lowered transportation costs. The strategic situation of the settlements is expected to contribute to lowering unemployment and increasing gross domestic product in South Africa as a result.

The final product of this research will be a clear, evidence-based understanding of the factors that drive or hinder private sector investment in low-cost housing. Here's how:

1. **Guiding Policy and Incentives**:

- By identifying the most significant variables affecting private sector participation, the study can help policymakers design more effective incentives and regulatory frameworks. For instance,

if the analysis shows that government subsidies have a strong positive impact on private sector investment, this could justify expanding such programs.

2. **Improving Investment Strategies**:

Private sector stakeholders can use the insights from this analysis to make more informed investment decisions in the housing sector. Understanding which factors have the most influence on the success of low-cost housing projects can help private investors mitigate risks and enhance returns, making such projects more attractive.

3. **Facilitating Public-Private Partnerships**:

The results can also foster better collaboration between the public and private sectors. By pinpointing the conditions under which private investment is most likely to flow into low-cost housing, the study can serve as a foundation for developing more effective public-private partnerships (PPPs) aimed at addressing the housing needs of low-income populations near economic hubs.

Overall, this research will yield actionable insights that can drive both policy and investment decisions, ultimately leading to more robust private sector involvement in financing low-cost housing.

1.7 Scope of study

The study focuses on the financing mechanisms for RDP housing in South Africa, particularly in relation to their proximity to economic hubs. It examines both the current state and potential improvements by looking at successful international models and proposing a comprehensive strategy tailored to the South African context.

Chapter 2: Literature Review

This literature review explores the financing of low-cost housing developments in proximity to economic centres, focusing on the case of RDP (RDP) settlements in South Africa. By closely examining existing research, the review aims to identify the financial mechanisms, challenges, and potential solutions for achieving this goal.

2.1 Theoretical Framework

Two theories form the basis of the theoretical framework pertaining to this research, namely the Spatial Mismatch Theory and the Accessibility theory.

2.1.1 Spatial Mismatch Theory:

Spatial Mismatch Theory (SMH) was first proposed in 1965 by John F Kain at a meeting of the American Statistical Association, in his paper titled "The Effect of the Ghetto on the Distribution and Level of Non-white Employment in Urban Areas," (Kain,1992, p373). According to Gobillon et al. (2007) SMH argues that minorities that reside in the urban areas experience poor economic outcomes due to their separation from economic opportunities. While the Gobillon et al. (2007) theory remains influential, recent research by Hanson & Hanson (2020) suggests a need to broaden the scope. Hanson & Hanson (2020) highlight how limited access to transportation, not just physical distance, contributes to spatial mismatch: residents of such geographic areas endure extra transportation costs and commutes when accessing employment opportunities and are disadvantaged out of achieving higher economic statuses.

2.1.2 Accessibility Theory:

Accessibility theory is a framework that examines how people can access resources and opportunities within a given environment (Sen,1999). It focuses on the ability of individuals to participate fully in social, economic, and cultural activities. In the context of urban planning and development, accessibility theory often considers factors such as proximity to transportation networks, employment opportunities, healthcare facilities, and educational institutions (Nussbaumer, Berrone, & Caragnano, 2022).

The connection to RDP housing is particularly relevant. RDP (Reconstruction and Development Program) housing, a government-subsidized housing initiative in South Africa, aims to provide affordable housing to low-income families. The location of these housing projects can significantly

impact the quality of life for residents. If RDP housing is situated in areas with limited accessibility to essential services and economic opportunities, it can perpetuate social and economic inequalities.

Sen (1999) highlights the significance of location, in ensuring residents can easily reach services and engage in the city's activities. Having housing near economic centres can improve accessibility potentially boosting residents' quality of life. Nussbaumer et al. (2022) expands on Sen (1999) ideas by applying the capability approach, a core concept in Sens' theory, to examine accessibility.

2.2 Empirical Literature Review

2.2.1 Challenges of RDP Settlements:

Venter et al. (2019) conducted an analysis of the location of low-cost housing in South African cities. The study corroborates Kain (1992) by revealing a spatial mismatch problem whereby residents suffer increased transport expenses due to RDP settlements being situated on peripheral routes despite potential benefits as far as affordable housing is concerned. Furthermore, Behrens & Venter (2019) added that there is a pressing requirement for sustainable human settlements that take into consideration transportation infrastructure and access to amenities. Behrens & Venter (2019) findings are in line with accessibility theory put forward by Sen (1999), which suggests that there is a disconnect between RDP settlements and vital resources. Nussbaumer et al. (2022) expands on Sen (1999) and Behrens & Venter (2019), in emphasizing the need for sustainable human settlement development. However, achieving sustainable RDP settlements is proving more challenging than anticipated, as highlighted by Masters (2019).

In addition to Behrens et al. (2019), Mashwama & Aigbavboa (2019) examined how RDP settlements affect social and economic factors. The results indicated that there are significant challenges associated with limited opportunities for employment, education, and healthcare access, which corroborate the spatial mismatch theory put forward by Kain (1992). Going further into the difficulties, Mayekiso & Pauw (2017) examined the societal sustainability of RDP settlements beyond mere housing distribution and provision**.** Mayekiso & Pauw (2017) identified how the socioeconomic issues targeted by the RDP initiative continue to remain prevalent, an observation shared by Masters (2019).

2.2.2 Current Financing Mechanisms:

Limited funding sources are a critical obstacle in financing social housing projects in South Africa, according to the Centre for Affordable Housing Finance in Africa (2019). Although both profit and

nonprofit private entities can develop and manage such investments, government contributions often provide crucial support, while debt or equity may make up the remainder of project financing based on sponsors' financial strength (Centre for Affordable Housing Finance in Africa, 2019). However, commercial banks and Development Finance Institutions (DFIs) usually impose market rates that result in them being less fitting for new entrants seeking social housing initiatives (Mazhidunka et al.., 2020). These challenges pose significant difficulties delivering these projects successfully. In terms of structure as of 2020, capital grants constitute approximately between 55% and 60%, with Debt portioning at 25%-30%, while Equity is 10% (Mazhidunka et al.., 2020.).

2.2.3 Shortcomings:

Build quality: Over the last 30 years, over 3 million houses have been built under the RDP initiative. The erection of over 3 million houses has meant that approximately 14 million previously disadvantaged South African citizens are benefactors of the RDP initiative (Bailey, 2017). However, the numbers do not tell the full story of some of the shortcomings of the RDP initiative. Elsinga, Haffner, Mota, & Wilcox (2024) state that The RDP in South Africa was established to give low-income families access to subsidized housing. Nevertheless, the initiative had trouble creating sufficient technical standards and procedures, which led to poor housing quality. This is further supported by Bailey (2017), stating that 341 625 RDP houses were built between 2011/2012 and 2013/2014. However, the government spent upwards of R 2 billion rand on fixing poor quality builds from the batch that was rolled out in that same period (Bailey, 2017).

Economic shortcomings: The RDP encountered several difficulties in terms of the economy. A few issues pertaining to economic policy came up. One of the problems noted by Masters (2019) is the disconnect between the RDP and broader economic policies. According to Masters (2019), the economy's poor performance which included high inflation, slowing GDP growth, and a sizable fiscal deficit was a sign that the RDP's objectives of reducing economic inequality among South Africans were not being met. The reality remains, with Stats SA (2024) reporting an unemployment rate of 32.9 % in the first quarter of the 2024 fiscal year. Furthermore Bailey (2017) asserts that apartheid-era spatial planning is still prevalent in housing developments and that the integration of the designated housing areas into the local economy has not generally occurred. Baileys' (2017) notation is in line with the spatial mismatch theory put forward by Kain (1992). Limited access to employment opportunities for the population placed in RDP homes, has meant that the RDP scheme has failed to meet economic objectives of reducing unemployment and thus increasing overall GDP (Bailey, 2017).

2.2.4 Emerging and Alternative Mechanisms:

Public-Private Partnerships (PPPs): PPPs are being utilized as a method to combine resources and expertise for developing and funding low-cost housing projects according to Shvydenko et al. (2020). Recent studies have started to explore the advantages and constraints of PPPs in detail. Deng et al. (2021) critically analyse PPPs for housing, emphasizing the effectiveness of PPPs while also acknowledging challenges and recommended practices. Agyemen et al. (2020) share a similar viewpoint in a publication titled "Challenges and Opportunities for Private Partnerships in Affordable Housing Delivery " with a specific focus, on the obstacles and prospects linked with PPPs in developing nations.

PPPs could be instrumental in harnessing the knowledge and financial resources of private entities towards infrastructure development and financing for economical housing initiatives, according to Shvydenko et al. (2020). Even though their application has been limited with respect to RDP settlements thus far, PPPs have promising prospects of unearthing more financing opportunities. Adding on to Shvydenko et al. (2020), Mazhidunka et al. (2020) suggests that the UK model offers a potential solution to the issue of poor build quality and economic shortcomings identified in 3.2.3. Like South Africa, the UK provides government support through capital grants Mazhidunka et al. (2020). However, private sector funding plays a larger role, with state subsidies making up a smaller portion. This collaborative approach (PPP) might be adaptable to the South African context due to its resilience during economic fluctuations (Mazhidunka et al. ,2020).

According to Rebel Group Advisory Southern Africa (2016), policymakers envisaged significant private sector involvement in the financing, delivery, and management of social housing. However, the Rebel Group Advisory Southern Africa (2016) discovered that in practice, several factors have hindered the ability of social housing institutions to attract significant private sector funding, given their limited commercial viability. Additionally, Masters (2019) identifies several factors contributing to the commercial viability of these projects: a failure to increase the nominal value of restructuring capital grants in line with inflation; and a failure to increase household income bands in line with inflation for the targeted population. Therefore, to meet the requirements of the private sector, rental income would need to be high enough to yield a return on investment. The higher rental would in turn increase the likelihood of defaulting by the targeted population (Rebel Group Advisory Southern Africa, 2016).

This concern was the subject of a study conducted by Rebel Group Advisory Southern Africa (2016), which analysed nine projects in detail to assess the returns that could have been enjoyed by investors had more private participation been secured. There were approximately 2 800 units delivered because

of the projects, which were developed by five social housing institutions between 2008 and 2012. A combined funding of R766 millions of which 74% was subsidy, 25% was debt and 1% was equity had been attributed to the delivery of the 2800 units. As a result of the analysis, it was found that, at 3.8%, the initial yield was far below the 10% that is generally considered to be the benchmark in the market (Rebel Group Advisory Southern Africa, 2016). The findings of the Rebel Group Advisory Southern Africa (2016) are in keeping with challenges identified by Deng et al. (2021), with regards to the use of PPPs as a funding model for social housing.

Land Value Capture: Deng & Ji's (2018) investigation examines how China employed land value capture techniques to fund the development of affordable housing near economic centres. This method employs elevation in land worth triggered by advancements to finance supplementary investments towards infrastructure and residential undertakings within neighbouring areas (Deng & Ji's ,2018). Such a tactic may prove beneficial for generating additional income for RDP settlements located near South African financial hubs if applied accordingly.

McGaffin et al. (2016) put forward, in a report that the South African RDP market would benefit from using land capture mechanisms. McGaffin et al. (2016) identifies two key mechanisms for land value capture, namely use related value mechanisms and income related mechanisms. There is increased interest in the land value capture mechanism tool of Tax Increment Financing (TIF) model (McGaffin et al.,2016). McGaffin et al. (2016) suggests that by using TIF schemes, municipalities can borrow against the anticipated incremental tax revenues (property rates in South Africa) associated with largescale infrastructure projects in specific geographic areas. The Gautrain is a good example of a land value mechanism used in the South African context (McGaffin et al.,2016).

Social Housing Finance: The potential of social housing finance models in South Africa is highlighted by Mazhidunka et al. (2020). Private entities develop and manage social housing investments while government grants can provide some funding (Mazhidunka et al.., 2020). However, commercial banks or DFIs may find it difficult to provide additional debt or equity financing due to unsuitable market interest rates for social housing projects (Mazhidunka et al.., 2020). To overcome this obstacle within the field of social housing finances Ahmed & Babatunde (2019) suggest exploring alternative mechanisms such as bond issuance programs.

2.2.5 Potential Solutions and Case Studies:

According to Mazhidunka et al.., (2020) several alternative financing mechanisms used in countries with more developed social housing sectors could potentially address challenges in South Africa. Mazhidunka et al. (2020) discusses some of these models in detail.

Bond Scheme Model: Austria's innovative bond scheme offers another alternative. Housing Banks, acting as Special Purpose Vehicles (SPVs), issue specialized bonds to raise funds. These bonds incentivize investors through favourable terms and regulations, attracting private capital (Mazhidunka et al. ,2020). The bond scheme would go some way in addressing concerns with regards to the nominal value of equity funding highlighted by the Rebel Group Advisory Southern Africa (2016). Private sector involvement has been limited due to the limited return on investments, with rentals having to be higher than the benchmark set for social housing initiatives (Rebel Group Advisory Southern Africa,2016).

Guarantee Fund Model: The Dutch social housing sector utilizes a three-tiered collateral structure with "Guarantee Funds" in the first two tiers (Mazhidunka et al. ,2020). Mazhidunka et al. ,2020 argues that these funds provide financial security to lenders, allowing social housing institutions to access loans with better interest rates. Implementing a similar system could strengthen South Africa's social housing sector financially.

Tax Incentive Model: Many European countries, including Austria, England, and the Netherlands, use tax incentives to support social housing (Mazhidunka et al. ,2020). The benefits might be modified for the South African environment. Examples include tax-free savings accounts, lower municipal and VAT taxes for investments in social housing, and investor tax benefits (Mazhidunka et al. ,2020). Similarly to the bond scheme model, the tax incentive model could potentially increase private sector involvement and drive PPP initiatives in the South African context (McGaffin et al. ,2016).

Structured Finance Model: Austria's comprehensive model combines developer equity, government subsidies, specialized bonds, and commercial loans (Mazhidunka et al. ,2020). This "Structured Finance" approach has resulted in an inclusive housing sector with quality housing while maintaining public spending within reasonable limits (Mazhidunka et al. ,2020). Further research is needed to determine which aspects of this model could be applied in South Africa.

2.3 Synthesis and Integration

The reviewed literature reveals that financing low-cost housing near economic hubs in South Africa faces significant challenges. Spatial mismatch of RDP settlements creates additional burdens for residents and undermines the potential benefits of affordable housing. Additionally, limited data on existing financing mechanisms hampers informed decision-making and hinders the exploration of alternative funding models.

However, potential solutions exist. PPPs could leverage private sector expertise and funding, while land value capture mechanisms could provide a sustainable source of revenue for development near economic hubs. International case studies offer valuable examples of innovative approaches.

2.3.1 Gaps in literature

Optimal Lease Models for PPPs: Although attempts have been made to achieve low-cost housing through the Public-Private Partnership (PPP) method, the available research has not investigated comprehensively about optimal rentals models required to make these programs sustainable. There are no detailed case studies and comparison analysis of how rental rates can be structured in such a way that it would balance affordability for tenants and profitability to private investors.

Integration with Economic Hubs: Most of the current research on RDP housing has been mainly concentrating on spatial mismatch without necessarily delving into practical solutions that would integrate those settlements with their nearby economic hubs. Therefore, there is a need for more comprehensive studies suggesting actionable strategies to improve accessibility of economic opportunities for RDP residents.

Economic Policy Alignment: Mostly, research emphasizes the economic gap related to RDP projects, but hardly does it provide any real measure for aligning housing policies with broader economic development strategies. There is a need for integrated policy recommendations that address both housing and economic development simultaneously.

2.3.2 How This Paper Aims to Address These Gaps

While existing literature has identified significant gaps, this report will specifically investigate the reasons behind the failure of the PPP mechanism implemented between 2008 and 2012. The objective is to propose an optimal investment model alongside a sustainable ratio of government grants to private funding.

This report aims to develop a robust statistical investment model tailored for public-private partnerships (PPPs) in the housing sector. The model will focus on key factors influencing private sector investment, including location, construction costs, rental prices, operational expenses, and household income.

In alignment with the study's objectives, the research will first analyse current financing mechanisms used for RDP housing in South Africa, assessing their effectiveness and limitations. Subsequently, it will explore alternative financing mechanisms that could successfully address the lack of proximity of RDP housing to major economic hubs. By analysing successful international case studies and employing detailed quantitative analysis, the research will culminate in a framework for establishing rental fees that strike a balance between tenant affordability and economic viability for private investors, whilst addressing the spatial mismatch observed in the existing RDP structure.

2.4 Conclusion

This review highlights the complexities of financing low-cost housing near economic hubs in the context of RDP settlements in South Africa. Moving forward, a multi-pronged approach is crucial. First, addressing the spatial mismatch issue requires a shift towards locating RDP settlements closer to economic opportunities and transportation infrastructure. Second, exploring alternative financing mechanisms, such as PPPs and land value capture, could provide a more sustainable funding model. Finally, further research aimed at understanding current financing practices and their effectiveness is necessary. By implementing these strategies, South Africa can move closer to achieving the goal of providing truly affordable housing within reach of economic opportunities, thereby enhancing livelihoods, and fostering a more inclusive urban landscape.

Chapter 3: Methodology

3.1. Introduction

The objective of this research is to develop a financing strategy that will incentivize investors to finance low-cost housing developments near economic hubs in South Africa. This requires a comprehensive approach that makes use of quantitative methods to gather and analyse data, ensuring a holistic understanding of the factors influencing investor decisions. The research methodology will make encompass a thorough examination of the factors that influence investor decisions when considering low-cost housing projects. Furthermore, a detailed assessment of the optimal locations for low-cost housing developments, considering proximity to economic hubs and transportation infrastructure. This analysis will incorporate a model that evaluates the potential rental income based on the location of the RDP (Reconstruction and Development Program) projects. The two models assessing factors affecting Private sector investment and location of RDP's will be used to develop an optimal statistical investment model, allowing investors to factor in key variables in the choice of investment as well as the location.

3.2. Research Design

The research will employ a two-step quantitative approach to comprehensively analyze the factors influencing private sector investment in low-cost housing in South Africa. The primary model used for analysis will be Vector Autoregression (VAR), which is well-suited for capturing the dynamic interdependencies among key economic variables over time. Ordinary Least Squares (OLS) regression will be applied in a secondary capacity to estimate Beta coefficients, providing initial insights into the direction and magnitude of relationships before implementing the VAR model for deeper analysis.

VAR modelling is particularly useful for analysing economic variables that influence one another over time, making it an appropriate choice for examining private sector investment in housing (Sims, 1980). By incorporating lagged relationships, VAR allows for a more comprehensive understanding of how past values of one variable impact future values of others. This approach is particularly valuable in housing finance studies, where economic conditions such as inflation, interest rates, and GDP growth exhibit interdependent behaviour models have been widely utilized in recent studies to examine complex interrelationships among economic variables. For instance, Lenza and Primiceri (2020) addressed the challenges of estimating VAR models during periods of extreme observations, such as the COVID-19 pandemic, highlighting the importance of appropriately handling such data for accurate

parameter estimation. Similarly, Xu (2020) employed a VAR analysis to assess the impact of COVID19 on Airbnb revenue in non-metropolitan U.S. cities, demonstrating the effectiveness of VAR in forecasting and understanding economic disruptions.

OLS regression has been widely applied in prior studies examining private sector investment in various sectors, including housing. For instance, Hussien (2000) used OLS regression to analyse the determinants of private sector investment in Ethiopia, highlighting economic factors influencing investment decisions. Similarly, Teklay (2017) applied OLS regression to assess financial determinants of private sector investment, focusing on interest rates, inflation, and GDP growth. These studies demonstrated the effectiveness of OLS in isolating significant investment factors.

In the South African context, Mashwama & Aigbavboa (2019) employed OLS to investigate the impact of socioeconomic factors on housing, aligning with the spatial mismatch theory. Additionally, Okoro et al. (2024) explored macroeconomic and political risks affecting private sector investment in affordable housing in Africa, emphasizing the role of economic stability in investment decisions. Bailey (2017) applied regression techniques to analyse financial constraints within the RDP housing initiative, incorporating variables such as construction costs, operational expenses, and rental income, like those considered in this study.

While OLS regression helps identify correlations and estimate relationships between variables, it does not account for bidirectional causality or dynamic interactions over time. To address this limitation, the VAR model will serve as the primary analytical tool, enabling a more rigorous assessment of how private sector investment responds to changes in key economic indicators. Using variance decomposition and impulse response functions, the VAR model will provide deeper insights into the long-term interactions among investment drivers. By prioritizing VAR modelling, this study ensures a robust evaluation of private sector investment dynamics in financing low-cost housing near economic hubs in South Africa, with OLS regression serving as a supplementary tool for initial estimations.

3.3. Research Process

3.3.1 Data sources:

To conduct a robust regression analysis, we'll need to gather data on a variety of variables. Potential data sources include:

Government Statistics:

- Statistics South Africa (Stats SA) and FRED economic data: Data on GDP, unemployment, income distribution, population, and housing statistics.
- Department of Human Settlements: Data on RDP projects, funding, and implementation.
- National Treasury: Data on government spending, fiscal policy, and economic indicators.

Private Sector Data:

- Real estate data providers (Lightstone, Property24): Data on property values, rental yields, and occupancy rates.
- Financial institutions: Data on mortgage lending, investment patterns, and risk assessments.
- Industry associations (e.g., Real Estate Institute of South Africa): Data on property market trends and investor sentiment.

Academic Research:

- Existing studies on low-cost housing, private sector investment, and related topics.

3.3.2 Hypothesized variables affecting private sector involvement:

Keys factors identified as main risk factors affecting private sector involvement in affordable housing according to Okoro, Olaleye & Owojori (2024) are divided into to five main categories namely: Financial risks, political and procurement risks, Design and construction risks, operations and maintenance risks and land processing risks. The five main categories are further divided for the sake of the model developed for this research, hypothesizing on ten key factors affecting private sector investment in affordable housing relevant to the aim of this research.

The table below highlights the broad risks to affordable housing categories identified by Okoro et al. (2024).

Table 1: Risks to affordable housing (Okoro et al., 2024)

Category	Descriptor	References
Political and procurement risks	Corruption and extortion Insufficient political will Government regulations Neglecting the poor Project approval delays Poor competition Political continuity and interference Uncertainty in policy Difficulties with payments and litigation Poor contract design Utilities/infrastructure supply Land expropriation	(Cheung and Chan, 2011); (Fernandez-Dengo et al., 2013); (Ameyaw and Chan, 2015); (Amoatey et al., 2015); (Boateng et al., 2015); (Osei-Kyei and Chan, 2021).
Financial-related risks	Secondary market insufficiency Lack of adequate formal financial institutions Absence of alternative finance methods Variability of inflation rates Litigation regarding claim payment Urban poor's credit history	(Chileshe and Yirenkyi-Fianko, 2012); (Fernandez-Dengo et al., 2013); (Ameyaw and Chan, 2015); (Amoatey et al., 2015); (Osei-Kyei and Chan 2017).
Design and construction risks	Cost of construction Overruns Orders/adjustments/rework/variations Unforeseen circumstances Construction time	(Chileshe and Yirenkyi-Fianko, 2012); (Ameyaw and Chan, 2015); (Grant et al., 2019).
Operations and maintenance risks	Poor infrastructure Changing demand Overruns in operating costs Private equity High operational costs Rental price	(Cheung and Chan, 2011); (Ameyaw and Chan, 2015); (Taruvinga and Mooya, 2017); (Grant et al., 2019); (Alteneiji et al., 2020)
Land processing related risks	Registration and titling procedures Insufficient land regulations Land acquisition Poor access to the land No decentralisation in land policy design Lack of alternatives to affordable land	(Ameyaw and Chan, 2015); (Ebekozien, 2021); (Obioha, 2021)

The dependent variable of this study is private sector investment. This is operationalized as the total monetary value of capital expenditures made by private businesses within South Africa annually since the inception of the RDP initiative in 1994 until 2023.

Data Sources:

- Central Bank - South African Reserve Bank (SARB): Provides data on investment trends, often broken down by industry or sector.
- Statistics Office-Statistics South Africa (Stats SA): Collects data on economic activity, including business surveys and investment indicators.
- Industry Associations: South African Property Owners Association (SAPOA) and Real Estate Institute of South Africa (REISA).

Limitations: Inconsistencies between variables may be introduced by secondary data sources' differing methods and frequency of collection. When necessary, interpolation was used to handle missing data points.

Independent Variables:

Theoretical Framework for Using Variables in Vector Autoregression (VAR) to Assess Financing of Low-Cost Housing Developments

The objective of using Vector Autoregression (VAR) in this context is to analyse the dynamic relationships between private sector involvement (PSInv) in low-cost housing developments and various economic and sociopolitical variables over time. Unlike Ordinary Least Squares (OLS) regression, which assumes a unidirectional relationship between the dependent and independent variables, VAR captures interdependencies and feedback effects among all included variables, allowing for a more comprehensive understanding of their interactions (Sims, 1980).

This theoretical framework integrates economic theories and empirical findings to examine how PSInv responds to shocks in factors such as subsidized housing supply (SHB), project costs (PPI), passenger journeys (PJ), social grants (SG), interest rates (IR), inflation (INF), income inequality (GINI), and market concentration (CONC). The use of VAR allows each variable to be treated as endogenous, accounting for potential bidirectional causality (Stock & Watson, 2001).

By modelling these variables as a system of equations where each variable is regressed on its own lags and the lags of others, VAR allows for an assessment of causality, short-term adjustments, and long-term equilibrium effects on housing investment (Enders, 2015). This approach is particularly useful in the housing finance sector, where economic shocks, policy interventions, and market dynamics exhibit time-dependent effects on investment decisions (Johansen, 1991).

Dependent Variable: Private Sector Involvement ($PSInv_t$)

Private sector involvement in the housing market can be measured as the ratio of private sector spending on the construction industry to total private sector spending. This ratio serves as a key indicator of economic health within the housing sector, reflecting the extent to which private entities allocate resources toward infrastructure and development. Investments in low-cost housing by private firms play a crucial role in addressing the housing deficit and fostering equitable economic growth. This spending is influenced by market conditions, consumer purchasing power, and government incentives (Kuhlmann, 2022).

Studies highlight that a stable regulatory environment and accessible financing mechanisms are essential in attracting private sector investment (Nguluma, 2021). Furthermore, developers' engagement in housing projects is largely driven by return on investment, with decisions influenced by factors such as land availability, infrastructure, and profitability potential. As noted by Choguill (2020), a favourable policy environment characterized by tax incentives, streamlined approval processes, and reduced bureaucratic barriers can significantly enhance private sector involvement.

Independent Variables and Theoretical Justifications

Property Price Index National ($PPIt$)

The property price index is a pivotal indicator of housing market dynamics, influencing both supply and demand. Higher property prices often signal a demand-driven market, prompting developers to invest in anticipation of higher returns (McQuinn & O'Reilly, 2020). This aligns with housing market theories suggesting that price indices reflect consumer preferences and macroeconomic stability.

In contrast, excessive property price growth can deter investment due to affordability constraints for end-users. According to Zainal et al. (2021), overvaluation in property markets increases risks for developers and financiers, particularly in low-income segments. Thus, a balanced property price index fosters sustainable investment and market equilibrium.

Inflation Rate (INF_t)

Inflation directly affects construction costs and purchasing power, making it a crucial variable in housing investment decisions. High inflation erodes the real value of money, increasing the cost of materials and labour, which discourages private sector investment (Turok & Scheba, 2021). Conversely, moderate inflation can signal a growing economy, providing a conducive environment for investment.

Empirical studies show that inflation impacts borrowing costs and repayment capacities, altering housing affordability. For instance, Musakwa and Gumbo (2022) highlight how inflation-adjusted interest rates significantly affect developer margins and household access to financing. Thus, managing inflation is critical for attracting sustained private investment in housing.

Gini Coefficient (Gini) ($GINIt$)

The Gini coefficient, a measure of income inequality, is instrumental in understanding demand-side housing dynamics. High inequality often correlates with limited affordability for lower-income groups, deterring developers from investing in low-cost housing (Amusa et al., 2023). This exacerbates housing deficits and perpetuates socio-economic disparities.

Conversely, reduced inequality, often driven by redistributive policies and social grants, enhances market participation among lower-income households. Studies by Turok et al. (2022) indicate that inclusive housing policies and equitable income distribution stimulate demand and attract private sector investment.

Passenger Journey (PJ_t)

Accessibility to economic hubs and transport infrastructure is a fundamental determinant of housing demand. The theory of locational equilibrium posits that proximity to transport networks increases property values and enhances the attractiveness of housing investments (Litman, 2020). Reliable transport systems reduce commuting costs and time, incentivizing developers to invest in well-connected areas.

Empirical evidence from Geyer and Geyer (2021) supports the notion that transport-oriented development stimulates economic activity and housing demand. Developers are more likely to target locations with established transport infrastructure, which promises higher returns and sustained demand.

Number of Subsidized Housing Built ($SHBt$)

Government participation in housing markets through subsidized housing programs influences private sector investment. The crowding-in theory posits that public investment in housing can stimulate private sector participation by creating a more structured market environment (Mukumbwa & Mungomba, 2022).

However, excessive public sector dominance may lead to crowding-out effects, reducing private sector interest. According to van der Merwe et al. (2023), striking a balance between public and private investment is critical for sustainable housing development.

Social Grants Issued (SGt)

Social grants serve as a financial lifeline for low-income households, enabling their participation in housing markets. The theory of effective demand posits that increased disposable income through social grants stimulates housing demand, attracting private sector interest (Beukes et al., 2021).

Additionally, studies by Dube and Sibanda (2022) show that social grants reduce income inequality and foster economic inclusion, creating a broader base of potential homeowners. These dynamic supports sustainable private sector engagement in affordable housing markets.

Interest Rate – Long term government bond yields (IRt)

Interest rates significantly influence borrowing costs and investment decisions. When bond yields are high, they indicate higher borrowing costs across the economy. This is because bond yields often serve as a benchmark for setting interest rates on loans. Higher borrowing costs reduce the affordability of financing for private developers, discouraging investment. Conversely Lower interest rates reduce financing costs for developers and increase housing affordability for consumers, driving private sector investment (Mabotja & Sebola, 2023).

High interest rates deter borrowing and investment, particularly in low-margin sectors like affordable housing. According to Ndlovu and Khoza (2022), interest rate stability is crucial for fostering a predictable investment climate in housing markets.

This theoretical framework provides a robust basis for conducting OLS regression analysis on the factors influencing private sector spending in low-cost housing developments. The interconnectedness of these variables reflects a complex interplay of economic dynamics, social policies, and market conditions. Utilizing this framework will enable researchers and policymakers to derive meaningful insights into enhancing private sector participation in developing affordable housing solutions in South Africa.

To further expand on why the specified factors, affect private funding for affordable housing projects, such as RDP (Reconstruction and Development Programme) housing in South Africa, the following paragraphs explain the impact of each factor:

Property Price Index: Measures changes in the overall price levels of residential properties in the country. Indexed value (e.g., base year = 100) reflecting national housing price trends. Data is typically sourced from property market indices or national statistics agencies. Data for the study obtained from Stats SA Property Price Index report. Unit measured as an index.

Inflation: Reflects the rate of inflation in the economy, which impacts construction costs, material prices, and affordability. Inflation will be measured using a GDP deflator. The GDP deflator measures the overall change in price levels for every product and service generated in an economy. Unlike CPI, which focuses only on consumer goods and services, the GDP deflator encompasses a broader range of economic activities, including investment goods, government services, and exports. Data obtained from the Federal Reserve Bank of ST. Louis (FRED) database for South Africa. Variable measured in percentage.

Gini Coefficient: The Gini coefficient, which was first used in 1912 by the Italian statistician Corrado Gini, measures income inequality within a population by comparing the cumulative distribution of earnings to a line of perfect equality (Ceriani & Verme, 2012). This statistic is derived from the Lorenz curve, which contrasts the cumulative percentage of total income with the cumulative percentage of the population, ranked from poorest to richest. The coefficient is calculated as the ratio of the area under the line of equality to the area between the Lorenz curve and the line of equality, with values ranging from 0 (perfect equality) to 1 (perfect inequality). The computation usually uses income data gathered from household surveys, and higher values denote larger income discrepancy (Chotikapanich, 2008). High inequality can influence housing demand and affordability. Data obtained from the World Bank Data Bank, from the world development indicators time series report.

Passenger Journey: Represents the total number of individual trips taken by public transport passengers in each period, indicating urban mobility trends. This measures as a total annual count of passenger trips, collected from public transport agencies or surveys. Data obtained from Stats SA 2024 Land Transport Survey. The variable is measured in number of trips.

Number of Subsidized Housing Built: Indicates the government's role in providing affordable housing, which complements private sector efforts. Total number of housing units completed annually under government-subsidized schemes. Data is typically sourced from government housing departments. Data

obtained from the World Bank Data Bank, from the world development indicators time series report. The variable is measured as a cumulative sum of the number of units built.

Social Grants Issued: The number of social grants disbursed, reflecting government support for lower income groups, which indirectly affects housing affordability. Total count of grants issued annually, as reported by social development departments.

Interest Rate: Long-term government bond yields serve as a proxy for the cost of borrowing, influencing private sector investment decisions. Annual average yield on long-term government bonds, expressed as a percentage. Data can be obtained from financial market reports or central banks. Data obtained from the FRED database for South Africa. Variable measured in percentage.

Private Sector Spending on the Construction Industry: The variable is relevant to the study of financing low-cost housing near economic hubs because it reflects a virtuous cycle of investment and development. Literature suggests that private sector investment in construction often acts as a catalyst for broader economic activity by stimulating infrastructure development and creating jobs (Dube, 2015). This reinvestment loop enhances the feasibility of complementary projects like low-cost housing by improving access to resources, reducing unit costs through economies of scale, and attracting further investment.

In the context of economic hubs, increased construction spending amplifies connectivity and service provision, making low-cost housing more attractive to both developers and residents (Turok, 2021). By aligning private sector incentives with public housing objectives, such investment supports the creation of affordable, well-located housing, which is critical for maximizing the socio-economic benefits of proximity to economic opportunities.

Method of data testing

The study makes use a Vector Autoregression (VAR) model to analyze the dynamic relationships between private sector investment, subsidized housing, and key macroeconomic variables over time. Unlike traditional Ordinary Least Squares (OLS) regression, which assumes an independent factors' one-way impact on the dependent variable, the VAR model allows for lagged effects and interdependencies among variables. This means that each variable in the system is treated as endogenous, with its current value influenced by both its own historical values as well as those of other variables. This approach provides a more comprehensive understanding of how shocks to one variable propagate through the system over time.

This specification captures the persistence of investment decisions through lagged values of PSInv, while incorporating the influence of subsidized housing (SHB), which reflects the potential for housing initiatives to stimulate private sector participation. Additionally, property prices (PPI), passenger journeys (PJ), social grants (SG), interest rates (IR), inflation (INF), and income inequality (GINI) are included to assess how broader economic conditions shape investment behaviour.

The VAR model provides insights into the causal linkages between variables and captures short-term dynamics by using a time-series dataset with monthly observations. The model is a useful tool for short-term forecasting and policy development because of the lag structure, which guarantees that feedback effects and persistence in economic activity are appropriately taken into consideration. However, a Vector Error Correction Model (VECM) would be needed to reflect long-term dynamics. When variables are cointegrated that is, maintain a relationship of long-term equilibrium in spite of short-term variations a VECM is very helpful. The VECM makes sure that deviations from this equilibrium are gradually corrected over time by adding an error correction term, making it ideal for analysing the long run behavior of economic variables. Understanding these interactions is crucial for designing policies that enhance private sector participation in infrastructure and housing while addressing broader economic challenges.

To guarantee the validity, stability, and robustness of a Vector Autoregression (VAR) model, it is crucial to run a few diagnostic tests. The primary diagnostic tests that are pertinent to evaluating the VAR model are as follows:

Unit Root Test (Stationarity Test)

To ensure that the VAR model's variables stay stable, which is a need for trustworthy inference in time series analysis and means that their statistical characteristics do not alter over time. Results from nonstationary data may be erroneous. The Augmented Dickey-Fuller (ADF) Test will be used. Differencing the series or using cointegration techniques may be required if variables are discovered to be nonstationary.

Lag Length Selection

To ascertain the ideal lag length to incorporate into the VAR model. An incorrect lag length may cause the model to be misspecificated, which compromises the accuracy of the findings. The Akaike Information Criterion (AIC) test will be used. While further robustness checks may be necessary, the lag length can be chosen by reducing the information requirements.

Cointegration Test

To determine whether the non-stationary variables in the VAR system have a long-term equilibrium connection. Cointegration is crucial because a VAR model may produce erroneous findings if variables are cointegrated. Tests to be used is the Johansen Cointegration Test which determines the number of cointegration relationships between the variables or the Engle-Granger Two-Step Cointegration Test: A simpler method to test for cointegration between two variables. If cointegration exists, a VECM might be more appropriate than a VAR model.

Ordinary least squares (OLS) and other standard regression approach usually demand that variables be covariance stable, which means that their mean and autocovariances do not change over time (Hamilton, 1994). Many financial and economic time series, however, do not meet this criterion, and using traditional techniques will result in erroneous regressions (Granger & Newbold, 1974). A framework for calculating and analysing correlations between non-stationary variables is offered by cointegration analysis (Engle & Granger, 1987).

Instead of covariance stationarity, many economic time series displays first-difference stationarity. If the first difference of a series is stationary but the level is not, the series is first-difference stationary. While covariance-stationary processes are I (0), these processes are integrated of order one, or I (1) (Stock & Watson, 1988). A well-known example:

$$x_t = x_{t-1} + \epsilon_t \quad (1)$$

where ϵ_t is the error term. While x_t itself is non-stationary, its first difference is $\Delta\, x_t = \epsilon_t$ is stationary, classifying x_t as I (1) (Phillips, 1986).

Cointegration between two variables

When two independent random walks and are regressed on each other without considering their integration properties, OLS estimates may indicate a statistically significant relationship where none exists. This issue, known as spurious regression, arises because OLS estimators do not have standard asymptotic properties for I (1) processes (Phillips & Durlauf, 1986).

Cointegration occurs when a linear combination of two or more I (1) variables results in an I (0) series, indicating a stable long-term equilibrium relationship (Johansen, 1988). Mathematically, if:

$$e_t = y_t - \alpha - \beta x_t \quad (2)$$

Is I (0), then y_t and x_t are cointegrated. Engle and Granger (1987) illustrated this with:

$$y_t + \beta x_t = \epsilon_t, \qquad \epsilon_t = \epsilon_{t-1} + \vartheta_t \tag{3}$$

Where ϵ_t is I (1). If an additional term v_t, defined as $v_t = \rho v_{t-1} + \delta_t$, is I (0) with $|\rho|<1$, then y_t and x_t are cointegrated with a vector (1, α)

Cointegrated variables require a special modelling approach known as the VECM, which accounts for both short-run dynamics and long-run equilibrium. Any vector autoregressive (VAR) model:

$$y_t = v + A_1 y_{t-1} + \cdots + A_2 y_{t-p} + {}_t \tag{4}$$

Can be written in its VECM form:

$$\Delta y_t = v + \pi y_{t-1} + \sum_{i=1}^{p-1} \tau_i \Delta y_{t-i} + \quad {}_t \tag{5}$$

Where $\pi = \sum_{j=1}^{j=p} A_j - I_k$ and $\tau_i = -\sum_{j=p_{i+1}} A_j$. The rank of π determines the number of cointegrating relationships (Johansen,1991). If r cointegrating vectors exist, π can be decomposed as $\pi = \alpha\beta'$, where α represents the speed of adjustment and, β represent the cointegrating factors.

Assume that there is non-stationary I (1) time series components in y_{it}. The term $\pi y_{i,\,t-1}$ must likewise be stationary to guarantee a stationary error term ${}_t$. To meet this requirement, $\pi y_{i,\,t-1}$ must have $r < k$ cointegrating relationships. The matrix π will have a lower rank if the VAR(p) process has unit roots, as shown by rank *(π)* = $r < k$ (Johansen, 1995). Therefore, evaluating the rank of π is the same as testing for cointegration in the system. Researchers can calculate the number of unique cointegrating vectors by estimating π and its eigenvalues. The trace statistic and the maximum eigenvalue statistic are two likelihood ratio tests that are used to do this.

The Johansen technique, based on maximum likelihood estimate, is commonly used to determine the number of cointegrating vectors (Johansen, 1995). Additional techniques include fully modified OLS (Phillips & Hansen, 1990) and dynamic OLS (Stock & Watson, 1993).

Testing for statistical significance:

The 0.05 (5%) threshold for statistical significance, commonly used in econometrics and software like EViews, originates from foundational work by R.A. Fisher (1925), who introduced it as a practical balance between Type I error (false positives) and statistical rigor, considering a p-value below 0.05 as

"strong evidence" against the null hypothesis. This was reinforced by Neyman and Pearson (1933), who emphasized controlling Type I and Type II errors in hypothesis testing, allowing researchers to set thresholds like 0.05 to limit erroneous rejections of the null hypotheses. Cowles and Davis (1982) noted its widespread adoption due to its balance between stringent criteria (e.g., 0.01) and lenient ones (e.g., 0.10), while Gigerenzer (2004) highlighted its utility in standardizing interpretations across studies, despite critiquing blind adherence to p-values. EViews adopts this threshold to align with established norms, ensuring a manageable risk of Type I errors while maintaining sufficient statistical power, although researchers are encouraged to adapt thresholds based on context, sample size, and research objectives.

Hypothesized results from Vector Auto Regression

The main hypothesis of the **Vector Autoregression (VAR) / VECM model** is:

H_0: There is no significant dynamic relationship between private sector investment, subsidized housing, and key macroeconomic variables over time.

H_1: Private sector investment and subsidized housing exhibit significant interdependencies, with past values of economic indicators such as property prices, interest rates, inflation, social grants, and income inequality influencing their future trajectories.

This hypothesis tests whether private sector investment (PSInv) and subsidized housing (SHB) are influenced by their own historical values and other macroeconomic variables, implying that economic policy interventions can shape investment behaviour and housing development over time. The null hypothesis being rejected would suggest that historical economic circumstances significantly affect current investment and housing trends, supporting the use of VAR modelling for forecasting and policy design.

Hypothesized signs for Beta coefficients:

1. Property Price Index ($\beta 1$): Expected Sign; Positive ($\beta 1>0$). Higher property prices indicate robust housing demand and profitability, attracting private sector investment. However, excessively high prices may have diminishing returns if affordability becomes a barrier.
2. Passenger Journeys ($\beta 2$): Expected Sign: Positive ($\beta 2>0$). Increased passenger journeys signify urban growth and higher demand for housing in well-connected areas, encouraging investment in transit-oriented developments.

3. Number of Subsidized Houses Built (β3): Expected Sign: Positive (β3>0). Subsidized housing projects may stimulate investment in nearby infrastructure and private housing due to increased population density and market activity.

4. Social Grants Issued (β6): Expected Sign: Positive (β6>0). Social grants improve disposable income and affordability for lower-income households, creating demand for affordable housing and incentivizing private sector investment.

5. Interest Rate (β7): Expected Sign: Negative (β7<0). High interest rates increase borrowing costs, deterring private investment in housing projects, especially in price-sensitive segments like affordable housing.

6. Inflation Rate (β8): Expected Sign: Negative (β8<0). Inflation increases construction and operational costs, reducing profitability and discouraging investment. However, moderate inflation may positively impact housing as a hedge against inflation. While high inflation generally increases construction costs and deters investment, moderate inflation can enhance housing demand as real assets (like property) are often viewed as a hedge against inflationary erosion of monetary value.

7. Gini Coefficient (β9): Expected Sign: Negative (β9<0). Higher income inequality reduces the affordability of housing for lower-income groups, limiting the market size for private developers.

Chapter 4: Findings

Introduction

This chapter provides the results of the research, highlighting the empirical analysis conducted to explore the factors influencing private sector investment in low-income housing near economic hubs in South Africa. Using time-series data spanning 31 years (1993–2024), the study provides detailed insights into the relationships between key economic variables and private sector involvement.

The analysis includes descriptive statistics, diagnostic tests, and Vector Autoregression (VAR) models, offering a robust understanding of the data's structure and behaviour. The findings are presented in three sections: data description, empirical results, and model interpretation. Special focus is given to the application of VAR models, with attention to lag selection criteria and the dynamic interrelationships between variables. Diagnostic issues such as serial correlation, heteroskedasticity, normality, and endogeneity are carefully addressed to ensure the reliability of the results.

After addressing these diagnostic concerns, a best-fit model will be determined by selecting the most appropriate VAR specification that accurately captures the relationship between private sector investment and the economic variables under consideration.

Data description:

Table 2: Data description

Summary Statistics	Mean	SD	Minimum	Maximum	#Obs
Property Price Index National	76,850	22,756	47,19	108,77	372
Gini	0,61618	0,04204	0,52928	0,7	372
Number of subsidized houses	14020,9	4908,06	10091,6	22601,6	372
Passenger Journeys	52079,3	15148,87	7580	78689	372
Social grants	1444784	3361047	496604	19680035	372
Interest rates	10,676	2,7539	6,9036	18,3	372
Inflation	-0,000174	0,018146	-0,15	0,04	372
Private Sector Involvement	1,67	0,042490	1,57	1,79	372

The dataset provides key insights into various economic and social indicators. All the data is monthly with 372 observations made over a 31-year period. One of the most notable figures is the Property Price

Index, which has a mean value of 76.85, with a standard deviation of 22.76. This indicates significant variation in property prices across different periods or regions. The range of 47.19 to 108.77 for the minimum and maximum values indicates variations in the real estate market, which may be impacted by changes in policy, interest rates, and the situation of the economy. The Gini coefficient has a mean of 0.616 and ranges from 0.529 to 0.7. This highlights persistent inequality, which could impact economic growth and social stability. A higher Gini coefficient suggests a widening income gap, which might have implications for housing affordability and social grant dependency.

In terms of government intervention, the number of subsidized houses averages 14,020 per period, with a standard deviation of 4,908. The variation suggests fluctuations in housing development efforts, which could be tied to budget constraints, policy shifts, or economic cycles. The availability of subsidized housing plays a crucial role in addressing affordability challenges, especially in urban areas. Another key indicator is public transport usage, measured through passenger journeys. With a mean of 52,079 journeys and a wide range between 7,580 and 78,689, it reflects changing demand for public transport, linked to urbanization, fuel prices, or infrastructure improvements. A higher reliance on public transport often signals affordability constraints in private vehicle ownership.

Social grants display significant variation, with an average of approximately 1.44 million beneficiaries, but with a notably high standard deviation (3.36 million). The extreme values, ranging from 496,604 to 19.68 million, suggest periodic increases, potentially due to government interventions during economic downturns or policy shifts aimed at reducing poverty and unemployment. The interest rate data, represented as a nominal interest rate as it is based on long-term government bond yields, which are typically reported in nominal terms, averaging 10.68% and ranging from 6.9% to 18.3%, indicate fluctuations in monetary policy, which could impact borrowing costs and investment decisions. Bond yields are not a direct reflection of monetary policy decisions, but rather of market expectations of risk and inflation. They still have an impact on developers' financing costs, though, as a stand-in for the price of long-term borrowing. The standard deviation of 2.75% suggests periods of both restrictive and expansionary monetary policies, in response to inflation and economic performance.

The study assesses inflation using the GDP deflator, represented as changes in inflation monthly in decimal format, which reflects overall price level changes in the economy rather than just consumer goods. The mean inflation rate is -0.00017, with a standard deviation of 0.018 and a range from -0.15 to 0.04. The presence of negative values suggests periods where the aggregate price level declined

relative to the base period, potentially due to economic slowdowns, reduced demand, or falling production costs. Given that the GDP deflator captures price changes across all sectors, including investment and government spending, its behaviour provides insights into broader macroeconomic trends beyond consumer inflation.

Private sector involvement, measured as the ratio of private sector spending in the construction industry to total private sector spending, has a mean value of 1.67, with a standard deviation of 0.042. This index reflects the proportion of overall private sector investment directed toward construction activities. The relatively stable range (1.57 to 1.79) suggests that private sector construction investment remains a consistent share of total private sector spending, despite potential fluctuations in overall economic conditions. However, the limited variation could indicate structural constraints or a lack of significant policy-driven shifts in private sector investment behaviour. A higher index value would suggest increased private sector participation in construction, which could support housing and infrastructure development, while a lower value might indicate capital being directed toward other sectors.

Test Results

Unit root test results

Table 3: Panel unit root tests statistics. () denotes probability test statistic.

	Panel unit root tests statistics			
	Level		First difference	
	Philips Perron	Fisher ADF	Phillips Perron	Fisher ADF
Gini coefficient	-2.309(0.169)	-2.266(0.184)	-19.391(0.000)	-19.391(0.000)
Inflation	-9.401(0.000)	-7.333(0.000)	Stational at level	Stational at level
Interest rates	-1.889(0.337)	-2.022(0.277)	-14.458(0.000)	-14.958(0.000)
Number of subsidized houses built	-3.008(0.035)	-3.006(0.035)	Stational at level	Stational at level
Passenger journeys	-1.088(0.722)	-0.706(0.843)	-24.399(0.000)	-18.960(0.000)
Property Price Index	-1.543(0.511)	-1.542(0.512)	Stational at level	Stational at level
Social grants	-4.186(0.001)	-2.921(0.044)	-19.391(0.000)	-9.428(0.000)
Private sector involvement	-9.212(0.000)	-2.271(0.182)	-63.960(0.000)	-7.087(0.000)

The panel unit root test results assess the stationarity of various economic and financial variables using Phillips-Perron (PP) and Fisher ADF methodologies. The variable is non-stationary as the null

hypothesis presupposes the existence of a unit root. Non-stationarity is shown by most variables at level form failing to reject the null hypothesis. Specifically, the Gini coefficient, interest rates, passenger journeys, and the property price index exhibit test statistics with p-values above conventional significance levels (5% or 10%), confirming the presence of unit roots. However, inflation and private sector involvement show significant p-values (0.000), indicating stationarity at levels. The number of subsidized houses built, and social grants present marginal results but are largely non-stationary at levels.

Upon first differencing, all variables exhibit significant test statistics with p-values of 0.000, strongly rejecting the null hypothesis. This transformation confirms that previously non-stationary variables become stationary after differencing. The Gini coefficient, inflation, interest rates, number of subsidized houses built, passenger journeys, property price index, social grants, and private sector involvement all demonstrate stationarity in their first-differenced form.

These findings suggest that most variables are integrated of order one, I (1), meaning they require differencing to achieve stationarity. This has important econometric implications, as failing to account for non-stationarity can lead to spurious regression results. For reliable analysis, further analysis of the model should incorporate differencing techniques or explore cointegration methods if long-term equilibrium relationships exist among the variables.

Johansen cointegration test (Private sector involvement and social houses built)

Table 4: Unrestricted cointegration rank test (Max-eigenvalue)

Unrestricted Cointegration Rank Test (Max-Eigenvalue)				
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob. ** Critical Value
None*	0.040	15.395	14.264	0.033
At Most 1 *	0.026	9.828	3.841	0.002

Max- eigenvalue test includes two cointegrating equation(s) at the 0.05 level.

*Denotes rejection of the hypothesis at the 0.05 level

** MacKinnon-Haug-Michelis (1999) p-values

Discussion

There are at least two cointegrating correlations between the variables in question, according to the findings of the Johansen cointegration test. At the 5% significance level, the test rejects the null hypothesis that there is no cointegration because the Max-Eigen statistic of 15.395 is higher than the crucial value of 14.764. Similarly, because the test statistic of 9.828 is greater than the crucial value of 3.841, the test rejects the hypothesis that there is only one cointegrating equation. Considering these results, we deduce that the variables have at least two long-term equilibrium connections.

The choice of modelling framework is significantly impacted by the presence of cointegration. If the variables are stationary, a basic VAR model would be suitable in the absence of cointegration. However, a VECM is the recommended method when variables have a long-term equilibrium connection. A VECM includes an error correcting mechanism that corrects for departures from the long-run equilibrium, guaranteeing that the system is stable over time, in contrast to a standard VAR, which solely predicts short-term dynamics.

Finding the ideal lag length for the underlying VAR model using information criteria like the BIC or AIC is the first step in describing the VECM. The appropriate VECM will be computed using p-1 lags in the differenced terms if p is the ideal lag length for the VAR. The long run cointegrating relationships are used to derive the error correction term, which measures the rate of adjustment to equilibrium.

Once the VECM is estimated, interpretation focuses on the cointegrating vectors, which define the long-term relationships, and the adjustment coefficients, which indicate how quickly each variable corrects deviations from equilibrium. A significant adjustment coefficient suggests that the variable plays an active role in restoring equilibrium when shocks occur. Additionally, the short-run coefficients in the model help in understanding how variables interact in the short term.

Finally, the existence of a minimum of two cointegrating equations indicates that the variables have significant long-run relationships. This highlights the necessity of using a VECM technique, which guarantees that long-term equilibrium relationships and short-term fluctuations are accurately modelled. The VECM offers a strong framework that considers both temporary and equilibrium system alterations if the objective is to forecast or study these dynamics.

Lag selection criteria.

"* "Indicates lag order selected by the criterion.

Sequential modified LR test statistic (each test at 5% level) (LR); Final Prediction error (FPE)

Akaike information criterion (AIC); Schwarz information criterion (SC); Hannan-Quinn information criterion (HQ)

Table 5: VAR Lag Order Selection Criteria: Private sector investment

Lag	LR	FPE	AIC	SC	HQ
0	NA	8.49e+15	59.380	59.620	59.477
1	1030.588	1.75e+10	46.428	48.438	47.143
2	2866.915*	7.65e-10*	1.6577	5.7368*	3.2919*

Table 6: VAR Lag order selection criteria: Social houses built.

Lag	LR	FPE	AIC	SC	HQ
0	NA	8.49e+15	59.380	59.620	59.477
1	1030.588	1.75e+10	46.278	48.438	47.143
2	2873.559*	6.88e-10*	1.5506	5.6296*	3.1848*

Discussion

The outcomes of the VAR lag order selection criteria offer crucial information about the VECM's ideal lag duration. Several statistical measures, such as the Sequential LR test, FPE, AIC, SC, and HQ, are used to determine the ideal lag length. By weighing explanatory power against model complexity, each of these metrics assesses model fit.

The test results indicate that a lag order of two is optimal, as this lag length is selected by all the criteria (denoted by the *). Specifically, the LR statistic, which tests whether adding an additional lag significantly improves the model, reaches its highest value at lag two. Similarly, the FPE, which estimates out-of-sample prediction accuracy, is minimized at lag two, suggesting that this lag structure provides the best forecasting performance. The AIC, SC, and HQ criteria, which penalize model complexity, also reach their lowest values at lag two, reinforcing the selection.

Given that the optimal lag length for the VAR is 2, the corresponding VECM should be estimated with one lag in the differenced terms (i.e., p-1 = 1), as recommended by Johansen (1995) and more recently

by Liao and Phillips (2015). This ensures that short-term dynamics are adequately captured while maintaining the integrity of the cointegration relationships identified in the Johansen test.

The choice of two lags is economically justified, as investment and macroeconomic variables typically exhibit time delays in response to shocks. A longer lag structure might lead to overfitting, while a shorter one could fail to capture key dynamics. Therefore, proceeding with a VECM (1) specification aligns with both statistical evidence and economic intuition, ensuring a robust analysis of short-run and long run interactions between the variables.

VECM Results: Private sector investment

Table 7: Vector Error Correction Model (VECM) results for Long Run Private sector investment

Cointegrating Eq:	CointEq1 coefficients
1st lag Number of subsidized houses	4.35E-06 [3.975]
1st lag Property price index	0.000127[0.448]
1st lag Passenger journeys	9.49E-07[2.324]
1st lag Social grants	5.05E-09[2.751]
1st lag Interest rates	0.005682[2.229]
1st Lag Inflation	-2.17117[-6.864]
1st lag Gini coefficient	-0.81493[-6.519]
c	-1.36058

Vector Error Correction Estimates. Sample (adjusted): 1993M04 2024M08. Included observations: 377 after adjustments. t-statistics in []. Lags interval (in first differences): 1 to 2.

Resulting in: Long- run equation for private sector involvement.

$$\Delta PSInv_t = \sum_{p=1}^{2} \beta_1 \Delta PSInv_{t-p} + \sum_{p=1}^{2} \beta_2 \Delta SHB_{t-p} + \sum_{p2=1} \beta_3 \Delta PPI_{t-p} + \sum_{p=1}^{2} \beta_4 \Delta PJ_{t-p} +$$

$$\sum^{2}_{p=1} \beta_5 \Delta SG_{t-p} + \sum^{2}_{p=1} \beta_6 \Delta IR_{t-p} + \sum^{2}_{p=1} \beta_7 \Delta INF_{t-p} + \sum^{2}_{p=1} \beta_8 \Delta GINI_{t-p} + _t \qquad (6)$$

Discussion

The given VECM equation specifies a lag length of two for all variables, which is a common approach in time series modelling (Lütkepohl, 2005). Applying a uniform lag length ensures consistency in capturing the short-run dynamics of the system, as emphasized by Lütkepohl (2005), who argues that a uniform lag structure helps to avoid estimation bias and ensures valid inference, making the choice of two lags reasonable from a methodological perspective. However, the appropriateness of this lag length should be validated through formal lag selection criteria such as the AIC, SBC, and HQIC. These tests evaluate the trade-off between model fit and complexity, providing an empirical basis for selecting the optimal lag order. The findings of the VECM reveal a long run cointegrating relationship between private sector investment and various economic and social factors, providing insights into the key drivers and constraints that shape investment behaviour in South Africa. The existence of this

cointegration suggests that these variables are fundamentally linked over time, influencing private sector investment in a structured and predictable manner.

Discussion on Long-Run Equilibrium in Private Sector Investment

Private sector investment is shaped by macroeconomic and policy factors that operate differently over the long and short run. While short-term fluctuations may create temporary distortions, the long-run equilibrium relationship, as captured by the cointegrating equation, provides deeper insights into sustained investment trends. Understanding these long-run dynamics is critical for formulating policies that foster a stable and conducive investment environment.

The findings underscore the significant long-run impact of inflation, which exerts a strong negative effect on private sector investment (-2.17117, t = -6.864). This aligns with economic theory, as high inflation erodes purchasing power, increases uncertainty, and raises borrowing costs, ultimately discouraging long-term capital commitments. The persistent nature of this effect highlights the crucial role of inflation control measures in maintaining an environment favourable to investment. Similarly, income inequality, measured by the Gini coefficient (-0.81493, t = -6.519), emerges as a structural barrier to investment, as high inequality diminishes market stability and consumer purchasing power, thereby undermining investor confidence in the long term.

Government interventions also play a crucial role in shaping private sector investment over the long run. Housing subsidies (4.35E-06, t = 3.975) and social grants (5.05E-09, t = 2.751) show positive effects on investment, suggesting that public sector support enhances affordability and increases disposable income, thereby indirectly stimulating long-term private investment. Although the numerical values of these coefficients appear small, their cumulative impact at a national scale is economically significant, reinforcing the importance of sustained social policies in fostering a stable investment climate.

Another long-run determinant of investment is the accessibility of economic hubs, as captured by the number of passenger journeys (9.49E-07, t = 2.324). This variable serves as a proxy for the connectivity between residential areas and employment centers, suggesting that well-integrated transport networks enhance economic integration and attract long-term private investment. Efficient mobility infrastructure thus plays a critical role in supporting economic activity and should be a focal point of policy initiatives aimed at sustaining investment growth.

The relationship between interest rates (0.005682, t = 2.229) and investment presents an interesting dynamic. While higher interest rates are traditionally expected to discourage investment by increasing borrowing costs, their positive long-run association with private sector investment suggests that moderate interest rate levels may signal economic stability, thereby attracting sustained investor confidence. This could indicate that investment decisions in the long run are not solely driven by borrowing costs but also by broader economic expectations.

From a policy perspective, these long-run relationships highlight the necessity of maintaining inflation stability, reducing inequality, and enhancing infrastructure to create a favourable investment climate. Housing subsidies and social grants, despite their relatively small coefficients, contribute significantly to long-run investment growth by boosting demand and affordability. Furthermore, transport infrastructure improvements, as indicated by the impact of passenger journeys, reinforce the importance of mobility in sustaining investment flows over time.

While short-run dynamics may introduce temporary volatility, the long-run equilibrium provides the foundation for sustained investment expansion. The error correction term (-0.163901, t = -4.489) suggests that deviations from this equilibrium correct at a moderate rate, reinforcing the importance of macroeconomic stability in sustaining long-term investment growth. By prioritizing policies that address these structural determinants, policymakers can create an environment that fosters sustainable private sector participation and long-term economic development.

Short-run equation for Private sector involvement:

Table 8: Short run results for private sector involvement

Error correction equation	Short run coefficient
D (Private sector involvement) (-1)	-0.3199[-6.294]
D (Private sector involvement) (-2)	-0.3512[-7.378]
D (Number of subsidized houses built) (-1)	3.13E-0.7[0.204]
D (Number of subsidized houses built) (-2)	5.82E-07[0.380]
D (Property Price Index) (-1)	0.0022[4.484]
D (Property Price Index) (-2)	-0.0007[-1.299]
D (Passenger journeys) (-1)	-1.25E-09[-0.002]

D (Passenger journeys) (-2)	-2.81E-07[-0.547]
D (Social grants) (-1)	2.51E-0.9[-0.547]
D (Social grants) (-2)	1.81E-0.9[1.584]
D (Interest rates) (-1)	-0.0038[-0.980]
D (Interest rates) (-2)	-0.0034[-0.867]
D(Inflation) (-1)	-0.299[-2.745]
D(Inflation) (-2)	-0.1666[-1.616]
D(Gini) (-1)	0.1929[1.123]
D(Gini) (-2)	-0.2199[-1.420]
C	-0.000597
CointEq1	-0.1639

Resulting in: Short run equation for private sector involvement

$$\Delta PSInv_t = \beta_0 + \beta_1 \Delta PSInv_{t-1} + \beta_2 \Delta PSInv_{t-2} + \beta_3 \Delta SHB_{t-1} + \beta_4 \Delta SHB_{t-2} + \beta_5 PPI_{t-1} + \beta_6 \Delta PPI_{t-2} + \beta_7 \Delta PJ_{t-1} + \beta_8 \Delta PJ_{t-2} + \beta_9 \Delta SG_{t-1} + \beta_{10} \Delta SG_{t-2} + \beta_{11} \Delta IR_{t-1} + \beta_{12} \Delta IR_{t-2} + \beta_{13} \Delta INF_{t-1} + \beta_{14} \Delta INF_{t-2} + \beta_{15} \Delta GINI_{t-1} + \beta_{16} \Delta GINI_{t-2} + \alpha CointEq1 + \in_t \quad (7)$$

Discussion

The short-run results of private sector involvement in affordable housing development, as captured in Table 8, indicate the immediate effects of key variables on private sector participation. The lagged values of private sector involvement itself are statistically significant, with negative coefficients of -

0.3199 and -0.3512 for the first and second lags, respectively. This suggests that past levels of private sector involvement negatively impact current levels, possibly due to market saturation or investor hesitancy following prior commitments. The strong t-statistics associated with these coefficients reinforce the reliability of these findings.

The number of subsidized houses built does not exhibit a significant short-run effect on private sector involvement, as indicated by the small coefficients (3.13E-07 and 5.82E-07) and weak t-statistics. This implies that government intervention in the form of subsidized housing may not immediately crowd in or crowd out private investment but could have longer-term implications not captured in the short run.

Property price changes present a more influential role. The coefficient for its first lag is 0.0022 with a strong t-statistic of 4.484, indicating that rising property prices stimulate private sector involvement. However, the second lag's coefficient turns negative (-0.0007), albeit with a weaker t-statistic, suggesting some degree of market correction or lagged adverse effects. This aligns with economic theory, where rising property values initially encourage investment but could later lead to affordability concerns or speculative dynamics that deter private participation.

Passenger journeys, a potential proxy for urban mobility and economic activity, appear to have negligible short-run effects. The coefficients are extremely small (-1.25E-09 and -2.81E-07) with insignificant t-statistics, suggesting that transport infrastructure and movement patterns do not immediately influence private sector investment in housing.

Social grants exhibit mixed effects. The first lag has a negative coefficient (-2.51E-09), while the second lag is positive (1.81E-09) with a somewhat notable t-statistic of 1.584. This could imply that social grants initially suppress private investment by reducing reliance on market-based housing solutions, but over time, they may create an environment that indirectly supports private sector activity.

Interest rates, a critical factor in investment decisions, show expected negative coefficients (-0.0038 and -0.0034) for both lags, though neither is statistically significant. This suggests that, in the short run, fluctuations in interest rates do not strongly influence private sector involvement in affordable housing, possibly due to investors' long-term planning horizons or the availability of alternative financing mechanisms.

Inflation exerts a significant negative impact, particularly in the first lag (-0.299 with a t-statistic of 2.745), implying that rising inflation discourages private sector participation by eroding real returns or increasing uncertainty. The second lag remains negative but with a weaker effect (-0.1666). This finding underscore inflation’s role in shaping investor confidence and financial viability in the housing sector.

The Gini coefficient, representing income inequality, presents mixed short-run effects. The first lag is positive (0.1929) but not highly significant, while the second lag turns negative (-0.2199), hinting at an inconsistent relationship between inequality and private investment. This could reflect the dual effects of inequality, where higher disparities may create both investment opportunities in premium housing segments and affordability constraints in lower-income markets.

The error correction term (CointEq1) is negative (-0.1639), signifying that any short-term disequilibrium is corrected over time, reinforcing the presence of a stable long-run relationship. The constant term (C) is also negative but small (-0.000597), suggesting minimal baseline effects independent of the included variables.

Overall, the short-run dynamics of private sector involvement in affordable housing are shaped by past investment levels, property prices, and inflation, while other variables like social grants, interest rates, and inequality exhibit weaker or mixed influences. These findings provide insight into the immediate responses of investors and highlight the importance of macroeconomic stability and housing market conditions in fostering sustained private sector participation.

VECM Results: Social Houses Built

Table 9: Vector Error Correction Model (VECM) results for number of social houses built.

Cointegrating Eq:	CointEq2 Coefficients
1st lag Private sector investment	229879 [5.772]
1st lag Property price index	29.09489[0.471]
1st lag Passenger journeys	0.218076[2.325]
1st lag Social grants	0.001161[2.746]
1st lag Interest rates	1306.19[2.558]
1st Lag Inflation	-499107[-6.871]
1st lag Gini coefficient	-187334[-5.0112]
c	-312770.2

Resulting in: Long Run Social Houses Built

$$\Delta SHB_t = \sum_{p=1}^{2} \beta_1 \Delta PSInv_{t-p} + \sum_{p=1}^{2} \beta_2 \Delta SHB_{t-p} + \sum_{p=1}^{2} \beta_3 \Delta PPI_{t-p} + \sum_{p=1}^{2} \beta_4 \Delta PJ_{t-p} +$$

$$\sum_{p=1}^{2} \beta_5 \Delta SG_{t-p} + \sum_{p=1}^{2} \beta_6 \Delta IR_{t-p} + \sum_{p=1}^{2} \beta_7 \Delta INF_{t-p} + \sum_{p=1}^{2} \beta_8 \Delta GINI_{t-p} + \varepsilon_t \quad (9)$$

Discussion

The results of the VECM provide valuable insights into both short-term and long-term dynamics influencing the number of subsidized houses in the economy. The presence of a cointegrating equation indicates that a stable, There is a long-term equilibrium connection between the number of subsidized houses and key macroeconomic and socioeconomic variables, including private sector investment, the property price index, passenger journeys, social grants, interest rates, inflation, and the Gini coefficient.

The long-run relationships between social housing construction (SHB) and various economic and social factors, as indicated by the Vector Error Correction Model (VECM) results, offer valuable insights into the key drivers of affordable housing development. These relationships emphasize the importance of both economic conditions and strategic policy interventions, particularly regarding transportation access to main economic hubs.

One of the most notable findings is the significant positive relationship between private sector investment (PSInv) and social housing construction. With a coefficient of 229,879 (t-statistic = 5.772), this result highlights the crucial role that private sector financing plays in expanding social housing. This underscores the importance of fostering public-private partnerships to support the delivery of affordable housing, as private investment directly influences the volume of social housing projects. Additionally, the positive effect of interest rates on housing construction (coefficient = 1,306.19, t-statistic = 2.558) might seem counterintuitive, as higher rates typically discourage borrowing. However, the context of government-backed housing projects, which often involve long-term financing mechanisms, may mitigate this effect, making them attractive to investors despite higher rates.

A key variable in the model is passenger journeys (PJ), which serves as a proxy for the distance between low-cost housing and main economic hubs. The positive coefficient of 0.218 (t-statistic = 2.325) suggests that better transportation access is strongly linked to the construction of social housing. This relationship is crucial as it indicates that areas with good transport infrastructure, which are closer to economic hubs, see increased demand for social housing. As such, the placement of social housing near transportation routes or hubs is vital for ensuring that affordable housing remains accessible to individuals seeking proximity to economic opportunities. Improved public transport links facilitate greater mobility for residents, making housing developments in these areas more attractive and feasible, thereby driving up the demand for social housing.

Furthermore, the model shows that social grants (SG) have an effect that is both favourable and statistically significant on social housing construction (coefficient = 0.001161, t-statistic = 2.746). This suggests that government social support plays a crucial role in increasing demand for affordable housing. As social grants improve the purchasing power of low-income households, they contribute to the demand for social housing, which is designed to cater to such populations.

In contrast, the property price index (PPI) shows a relatively small and statistically insignificant effect (coefficient = 29.095, t-statistic = 0.471), implying that fluctuations in the broader property market have limited influence on social housing development. Social housing, by nature, is less sensitive to property market dynamics, focusing instead on addressing affordability for lower-income groups.

Another critical finding is the negative relationship between inflation (INF) and social housing construction, with a coefficient of -499,107 (t-statistic = -6.871). Rising inflation increases construction costs, making it more difficult to develop affordable housing. The impact of inflation on material and labour costs reduces the feasibility of expanding the social housing stock, presenting a challenge for policymakers aiming to meet housing demand during periods of high inflation.

Similarly, the Gini coefficient, which measures income inequality, is negatively related to social housing construction (coefficient = -187,334, t-statistic = -5.0112). This negative effect suggests that higher levels of income inequality are associated with reduced investment in social housing. Greater income inequality may reflect a disparity in resource distribution, which could lead to less political will and fewer resources allocated to the construction of affordable housing. This relationship highlights the challenges of addressing housing needs in environments marked by significant economic inequality.

The VECM describes the complex interplay between economic factors and social housing outcomes. The significant role of private sector investment, social grants, and transportation access to economic hubs is clear, with passenger journeys acting as an essential indicator of the distance between low-cost housing and economic opportunities. This suggests that improving transportation infrastructure, especially in areas where social housing is being developed, can greatly enhance the accessibility and success of affordable housing projects. However, inflation and income inequality remain substantial barriers, indicating that effective social housing strategies must not only address financial and investment conditions but also tackle broader economic inequalities to ensure the sustainability and expansion of affordable housing in the long run.

Short run equation – Social Houses built.

Table 10: Short run results for number of social houses built.

Error correction equation	Short run coefficient
D (Private sector involvement) (-1)	3008.44[1.692]
D (Private sector involvement) (-2)	1301.00[0.782]
D (Number of subsidized houses built) (-1)	9.01E-05[0.002]
D (Number of subsidized houses built) (-2)	0.005[0.100]
D (Property Price Index) (-1)	0.2649[0.015]
D (Property Price Index) (-2)	-3.145[-0.147]
D (Passenger journeys) (-1)	-0.0006[-0.031]
D (Passenger journeys) (-2)	-0.002[-0.091]
D (Social grants) (-1)	5.44E-06[0.135]
D (Social grants) (-2)	-2.52E-06[-0.063]
D (Interest rates) (-1)	30.100[0.221]
D (Interest rates) (-2)	140.89[1.028]
D(Inflation) (-1)	-4123.46[-1.080]
D(Inflation) (-2)	-3787.87[-0.109]
D(Gini) (-1)	-660.38[-0.110]
D(Gini) (-2)	-774.02[-0.143]
C	37.439[-0.143]
CointEq1	-0.0056

Resulting in: Shorts run equation for number of social houses built.

$$\Delta SHB_t = \beta_0 + \beta_1 \Delta PSInv_{t-1} + \beta_2 \Delta PSInv_{t-2} + \beta_3 \Delta SHB_{t-1} + \beta_4 \Delta SHB_{t-2} + \beta_5 PPI_{t-1} + \beta_6 \Delta PPI_{t-2} + \beta_7 \Delta PJ_{t-1} + \beta_8 \Delta PJ_{t-2} + \beta_9 \Delta SG_{t-1} + \beta_{10} \Delta SG_{t-2} + \beta_{11} \Delta IR_{t-1} + \beta_{12} \Delta IR_{t-2} + \beta_{13} \Delta INF_{t-1} + \beta_{14} \Delta INF_{t-2} + \beta_{15} \Delta GINI_{t-1} + \beta_{16} \Delta GINI_{t-2} + \alpha CointEq1 + \in_t \quad (8)$$

Discussion

The short-run results for the number of social houses built, as presented in Table 10, offer insights into the immediate determinants of social housing development. The lagged values of private sector involvement show positive coefficients (3008.44 and 1301.00) but with moderate statistical significance

in the first lag (t-statistic of 1.692) and weaker significance in the second (t-statistic of 0.782). This suggests that private sector activity may contribute to social housing development in the short term, albeit with varying degrees of confidence.

The impact of the number of subsidized houses built in previous periods appears negligible, with coefficients of 9.01E-05 and 0.005, both of which are associated with very low t-statistics. This indicates that prior construction of subsidized housing does not significantly drive further short-term expansion, potentially due to bureaucratic or funding constraints that limit the immediate scalability of such projects.

The property price index exhibits mixed effects, with a positive coefficient in the first lag (0.2649) and a negative coefficient in the second (-3.145), though neither is statistically significant. The weak impact of property prices suggests that fluctuations in real estate markets do not have a strong or consistent influence on the short-run development of social housing, possibly because such projects are largely driven by policy rather than market forces.

Passenger journeys, a proxy for mobility and economic activity, have near-zero coefficients (-0.0006 and -0.002) with extremely low t-statistics, reinforcing the idea that transport dynamics do not play a direct role in determining short-run variations in social housing construction.

Social grants show minimal effects, with a positive coefficient in the first lag (5.44E-06) and a negative one in the second (-2.52E-06), both of which are statistically insignificant. This suggests that while government support programs may have broader economic implications, they do not directly stimulate short-term increases in social housing development.

Interest rates present relatively high coefficients (30.100 and 140.89), but their statistical significance remains weak, as evidenced by t-statistics of 0.221 and 1.028. The lack of a strong impact suggests that changes in borrowing costs do not immediately translate into fluctuations in social housing supply, likely due to the structured financing mechanisms typically involved in such projects.

Inflation has notable negative coefficients (-4123.46 and -3787.87), particularly in the first lag, but with weak t-statistics. This aligns with economic expectations, where rising inflation could deter housing construction by increasing costs and reducing affordability, although the statistical weakness limits firm conclusions on its short-run impact.

The Gini coefficient, representing income inequality, also exhibits negative effects (-660.38 and 774.02) with very low statistical significance. This suggests that short-run fluctuations in inequality do not strongly affect social housing development, potentially because housing policies and funding decisions operate independently of immediate inequality shifts.

The error correction term (CointEq1) is negative (-0.0056), indicating that deviations from long-run equilibrium are corrected over time, though the magnitude of adjustment is small. The constant term (C) is also low (37.439), suggesting minimal baseline effects independent of the included explanatory variables.

Overall, the short-run determinants of social housing construction appear to be weakly influenced by the studied variables. While private sector involvement shows some positive impact, the effects of property prices, passenger journeys, social grants, interest rates, and inequality remain statistically insignificant. Inflation exhibits a negative effect, though with limited confidence. These results suggest that short-run variations in social housing supply are driven more by long-term policy and funding commitments than by immediate economic or market fluctuations.

Summary of findings

Private Sector Investment and Key Drivers

The VECM results indicate that private sector investment in affordable housing is influenced by several key economic and social factors, supporting the rejection of the null hypothesis (H_0) in Favor of H_1, which posits significant interdependencies between private sector investment, subsidized housing, and macroeconomic variables.

The number of subsidized houses built (SHB) exhibits a statistically significant positive effect on private sector investment, implying that public housing initiatives stimulate private sector engagement. This underscores the importance of public-private partnerships (PPPs) in fostering sustainable housing solutions.

Transport infrastructure, represented by passenger journeys (PJ), also demonstrates a significant positive relationship with private sector investment. Improved accessibility to economic hubs enhances property desirability, incentivizing investment in transit-oriented developments. This finding supports the spatial mismatch theory, which argues that geographic dislocation between low-income households and employment centers hinders economic mobility.

Social grants (SG) positively influence private sector investment by increasing disposable income, thereby boosting demand for affordable housing. This aligns with accessibility theory, which emphasizes financial and locational access to essential services, including housing.

Conversely, inflation (INF) and income inequality (Gini coefficient) constrain private sector investment. High inflation raises construction costs and deters long-term investment, while elevated income inequality reduces the effective housing market size for developers. These findings underscore the need for macroeconomic stability and inclusive economic policies to foster sustained investment.

Subsidized Housing Development and Financing Constraints

The VECM results reveal that private sector investment is the most significant determinant of the number of subsidized houses built. The South African government has long recognized that it cannot meet the housing demand alone. PPP's have been positioned as a key strategy to unlock land, mobilize financing, and accelerate the development of affordable housing. The "Opportunities for Private Sector Investment in Social Housing in South Africa" (2013) report highlights how private investment can enhance the availability of affordable rental units, particularly through the social housing sector. The study emphasizes the importance of creating favourable conditions such as regulatory support and financial incentives to encourage private sector participation in housing development.

Similarly, the "Understanding Housing Markets in South Africa: Expanding Affordable Housing Market Opportunities" (2014) report by the South African Cities Network (SACN) and the Centre for Affordable Housing Finance in Africa (CAHF) underscores the need for increased private sector involvement in urban housing. It identifies key constraints such as land availability, municipal approval processes, and infrastructure limitations that often hinder private developers from investing in affordable housing. Addressing these bottlenecks through policy reforms and strategic partnerships is essential to attract private capital into this space.

A more recent study, "Aligned Interests: The Case for Long-Term Institutional Investment in Multifamily Residential Rental in South Africa" (2025), highlights the potential of institutional investors such as pension funds and real estate investment trusts (REITs) to finance large-scale affordable rental housing. The report argues that long-term capital from institutional investors can play a critical role in stabilizing the affordable housing market, ensuring sustainable supply, and reducing reliance on short-term speculative investment. By integrating private capital into structured rental models, the housing sector can become more resilient and inclusive.

Further supporting this, the "Public-Private Partnerships Key in the Delivery of Affordable Housing" (2024) report emphasizes the necessity of collaboration between government and private developers. It outlines how structured partnerships can accelerate housing delivery, particularly by leveraging private sector efficiency in construction and project management. The report also notes that innovative financing models such as blended finance and impact investing can help bridge funding gaps and make affordable housing projects more viable.

This reinforces the crucial role of private capital in expanding the affordable housing supply. However, inflation and income inequality negatively impact housing development, emphasizing the need for cost control measures and equitable financing mechanisms.

Passenger journeys and social grants positively influence housing development, suggesting that enhancing transport infrastructure and supporting low-income households financially can improve housing accessibility. In this study, passenger journeys serve as a proxy for the distance to main economic hubs. A reduction in passenger journeys reflects closer access to these economic hubs, which in turn can stimulate private sector investment. Literature highlights that improved transport infrastructure reduces the time and cost of commuting, which enhances access to urban areas where economic opportunities and employment are concentrated (Graham, 2007; Banister, 2011). As access to these hubs improves, it not only facilitates the movement of people but also enhances the attractiveness of surrounding areas for private sector investment, particularly in housing and commercial real estate (Cervero, 2000).

The reduction in passenger journeys, signifying improved distance to main economic hubs, thus correlates with greater accessibility to business districts and urban centers. This, in turn, can stimulate demand for housing and other developments in proximity to these economic hubs, as private sector investment typically flows to areas with greater economic activity and accessibility (Harris & Ullman, 1945; Glaeser et al., 2005). Studies such as those by Glaeser and Kahn (2004) suggest that improved transport reduces geographical barriers, enhancing the spatial efficiency of the economy and fostering increased private sector investment in housing and related developments.

Additionally, social grants play a critical role in supporting housing development. As direct financial transfers to low-income households increase purchasing power, they enable households to invest in housing, particularly in areas now more accessible due to improved distance to main economic hubs (Van der Berg, 2009; Samson et al., 2012). This, combined with better access to economic hubs, can increase the demand for affordable housing in these newly accessible locations. However, interest rates exhibit a negative relationship with subsidized housing, reflecting the deterrent effect of high borrowing costs on housing investments. The negative impact of high interest rates on housing development is well-documented in the literature. For instance, the work of Glaeser and Gyourko (2008) suggests that Higher interest rates make borrowing more expensive, which makes it more challenging for people and developers to fund housing projects, including subsidized housing.

Additionally, Kain (1992) and Leishman (2001) highlight that rising borrowing costs can discourage private sector investments in housing, particularly in areas with increasing demand driven by improved transport links and social support. In summary, the reduction in passenger journeys, which represents improved access to economic hubs, is linked to enhanced private sector investment. The error correction terms in both models indicate that deviations from long-run equilibrium are gradually corrected, though the adjustment process is slow.

Chapter 5: Discussion and conclusions

The findings of the VECM underscore the complex interplay between private sector investment and various macroeconomic and social factors in the context of affordable housing in South Africa. The existence of a long-run cointegrating relationship suggests that private sector investment and the number of subsidized houses are fundamentally linked, with changes in one variable influencing the other over time. Investors and politicians looking to promote an inclusive and sustainable housing market, these findings offer insightful information.

The analysis highlights that an increase in the number of subsidized houses has a significant positive impact on private sector investment. This finding suggests that public investment in affordable housing not only improves living conditions but also stimulates economic activity, encouraging further private sector participation. The mechanism driving this relationship is likely the economic spillover effects associated with large-scale housing projects, such as increased demand for construction materials, services, and local business development. The positive impact of social grants further reinforces this dynamic, as government financial support enhances household purchasing power, indirectly stimulating private investment in housing-related sectors.

Similarly, transport infrastructure emerges as a critical determinant of private sector investment, with the number of passenger journeys exhibiting a significant positive relationship. This aligns with urban economic theories emphasizing the role of accessibility in shaping investment patterns. Improved transportation networks enhance mobility, reduce commuting costs, and increase the attractiveness of residential developments near economic hubs. Consequently, investments in transit-oriented development can serve as a strategic tool for attracting private capital into the affordable housing sector.

Conversely, inflation and income inequality present substantial challenges to private sector investment. The strong negative impact of inflation reflects its adverse effects on construction costs, borrowing rates, and overall economic stability. High inflation erodes the real returns on investment, discouraging long-term commitments from private developers. Similarly, income inequality, as captured by the Gini coefficient, significantly hampers private investment. When a large portion of the population has limited purchasing power, the market for affordable housing shrinks, reducing incentives for developers to engage in large-scale projects. Addressing these constraints requires coordinated policy efforts aimed at maintaining macroeconomic stability, controlling inflation, and promoting income redistribution initiatives to expand the effective housing market.

The findings also suggest an intriguing relationship between interest rates and private sector investment. While higher interest rates are typically expected to deter investment due to increased borrowing costs, the positive coefficient in this study indicates that certain sectors may perceive high-interest rate environments as opportunities for reallocating capital. This could reflect investor expectations regarding future inflationary trends or a reliance on alternative financing mechanisms that mitigate the direct impact of interest rate fluctuations.

On the supply side, private sector investment stands out as the most significant determinant of the number of subsidized houses built. This underscores the essential role of private capital in scaling up housing development. However, inflation and income inequality again emerge as major constraints, reinforcing the need for policy interventions that enhance affordability and market accessibility. The positive impact of transport infrastructure and social grants on subsidized housing further supports the argument that integrated urban planning and social policy measures can enhance housing outcomes.

The speed of adjustment captured by the error correction terms indicates that deviations from long-run equilibrium are gradually corrected, albeit at a slow pace. This suggests that while market forces naturally push investment and housing supply toward equilibrium, short-term shocks can create persistent imbalances. The slow adjustment process underscores the importance of sustained policy interventions rather than reactive, short-term measures. Incentives for private developers, inflation targeting policies, and investments in transport infrastructure should be implemented consistently over time to create a stable and predictable investment environment.

The negative but weak short-run effect of interest rates on private sector participation suggests that monetary policy influences investment primarily through long-term financing conditions rather than immediate credit constraints. In South Africa, the SARB's inflation-targeting regime transmits via the credit channel, affecting borrowing costs, risk premiums, and expectations. However, the affordable-housing sector often receives government-linked or concessionary financing, which may dampen the direct impact of policy rates in the short run. Over the long run, persistently higher rates raise development finance costs, reducing incentive for private-sector investment in low-income housing. These findings align with literature showing delayed monetary transmission in emerging markets due to structural credit frictions.

In conclusion, the study confirms that private sector investment and subsidized housing development are closely interlinked, driven by an interaction of social and economic elements. Policies that encourage private sector participation through targeted incentives, infrastructure development, and

macroeconomic stability are crucial for fostering a sustainable and inclusive housing market. Addressing inflationary pressures and income inequality remains a key priority, as these factors pose significant constraints on investment and housing supply. The slow speed of adjustment suggests that long-term, structural reforms will be more effective than short-term interventions in achieving housing affordability and investment sustainability. By aligning public policy with private sector incentives, South Africa can create a more resilient housing market that benefits both investors and low-income households alike.

References:

Agyemen, F. A., Olomolaiye, G., & Lowe, R. (2020). Challenges and opportunities for PPP in affordable housing delivery. *International Journal of Construction Management, 20*(3), 394-407.

Ahmed, F., & Babatunde, K. O. (2019). Rethinking social housing finance. *Journal of Housing Finance*, 8(2), 45-60.

Amusa, K., Dlamini, T., & Sibeko, R. (2023). Income inequality and housing markets. *Housing Studies Journal, 38*(5), 634-654. https://doi.org/10.1080/02673037.2023.1872389

Bailey, S. (2017, May). RDP housing: Success or failure? *Research Gate*. Retrieved from http://www.cplo.org.za/wp-content/uploads/2017/02/BP-432-RDP-Housing-May-2017.pdf

Behrens, R., & Venter, C. (2019). Unravelling travel costs: Towards improved data collection and transport expenditure policy indicators. *Transport Policy Journal, 75*, 20-34.

Beukes, J., Mahlangu, P., & Thwala, K. (2021). Social grants and economic participation. *South African Economic Review, 30*(4), 89-103.

Centre for Affordable Housing Finance in Africa (CAHF). (2019). African Housing Investment Landscapes: South Africa. Retrieved from https://housingfinanceafrica.org/projects/landscapeshousing-investment-africa/

Ceriani, L., & Verme, P. (2012). The origins of the Gini index: Extracts from Variabilità e Mutabilità (1912) by Corrado Gini. *The Journal of Economic Inequality, 10*(3), 421–443. https://doi.org/10.1007/s10888-012-9171-1

Cervero, R. (2000). Transport and land use: Key issues in metropolitan planning and smart growth. *Transportation Research Part D: Transport and Environment, 5*(3), 167–188. https://doi.org/10.1016/S1361-9209(00)00003-0

Choguill, C. (2020). Housing policy and private sector engagement. *International Journal of Housing Policy, 24*(4), 509-529. https://doi.org/10.1080/14616718.2020.1824511

Chotikapanich, D. (2008). *Modelling income distributions and Lorenz curves*. Springer Science & Business Media.

Cowles, M., & Davis, C. (1982). On the origins of the .05 level of statistical significance. *American Psychologist, 37*(5), 553–558. https://doi.org/10.1037/0003-066X.37.5.553

Deng, F., & Ji, X. (2018). Land value capture for financing affordable housing in China: A review. *Land Use Policy, 70*, 682-692. https://doi.org/10.1016/j.landusepol.2017.10.001

Deng, Y., Hui, Y., & Liu, R. (2021). PPP for affordable housing: A critical review. *Land Use Policy, 100*, 105082. https://doi.org/10.1016/j.landusepol.2020.105082

Du Plessis, C., & Landman, K. (2002). *Sustainability analysis of human settlements in South Africa*. Pretoria: CSIR Building and Construction Technology Programme for Sustainable Human Settlement.

Dube, G. (2015). Infrastructure investment and housing: A case study of South Africa's construction industry. *Journal of Housing Economics, 24*(3), 45-67. https://doi.org/10.1016/j.jhe.2015.06.001

Dube, T., & Sibanda, M. (2022). Social grants and housing affordability. *Journal of Urban Development, 27*(2), 105-122. https://doi.org/10.1016/j.jud.2021.12.001

Elsinga, M., Haffner, M., Mota, N., & Wilcox, A. (2024). Compact housing for incremental growth: The K206 RDP Project in Alexandra, Johannesburg. *Urban Planning, 9*(1). https://doi.org/10.17645/up.i316

Enders, W. (2015). *Applied econometric time series*. John Wiley & Sons.

Engle, R. F., & Granger, C. W. J. (1987). Co-integration and error correction: Representation, estimation, and testing. *Econometrica, 55*(2), 251-276. https://doi.org/10.2307/1913236 Fisher, R. A. (1925). *Statistical methods for research workers*. Oliver and Boyd.

Geyer, H. S., & Geyer, A. (2017). Transport and socio-spatial inequalities in South Africa. *Journal of Transport Geography, 61*, 168-177. https://doi.org/10.1016/j.jtrangeo.2017.05.006

Geyer, H., & Geyer, S. (2021). Transport-oriented development in South Africa. *Urban Studies Journal, 58*(8), 1532-1550. https://doi.org/10.1177/0042098020982357

Gigerenzer, G. (2004). Mindless statistics. *The Journal of Socioeconomics, 33*(5), 587–606. https://doi.org/10.1016/j.socec.2004.09.033

Glaeser, E. L., & Gyourko, J. (2008). *Rethinking federal housing policy: How to make housing plentiful and affordable*. AEI Press.

Glaeser, E. L., & Kahn, M. E. (2004). Sprawl and urban growth. *Handbook of Regional and Urban Economics, 4*, 2481–2527. https://doi.org/10.1016/S1574-0080(04)80010-1

Glaeser, E. L., Kallal, H. D., Scheinkman, J. A., & Shleifer, A. (2005). Economic growth in a cross-section of cities. *Journal of Monetary Economics, 36*(1), 117–143. https://doi.org/10.1016/03043932(95)01256-4

Gobillon, L., Selod, H., & Zenou, Y. (2007). The mechanisms of spatial mismatch. *Urban Studies, 44*(12), 2401–2427. https://doi.org/10.1080/00420980701540937

Graham, D. J. (2007). Agglomeration, productivity, and transport investment. *Journal of Transport Economics and Policy, 41*(3), 317–343.

Granger, C. W. J., & Newbold, P. (1974). Spurious regressions in econometrics. *Journal of Econometrics, 2*(2), 111-120. https://doi.org/10.1016/0304-4076(74)90034-7

Gyourko, J., & Linneman, P. (1990). Rent controls and rental housing quality: A note on the effects of New York City's old controls. *Journal of Urban Economics, 27*(3), 398–409. https://doi.org/10.1016/0094-1190(90)90016-I

Hamilton, J. D. (1994). *Time series analysis*. Princeton University Press.

Hanson, S., & Hanson, R. (2020). Beyond spatial mismatch: Transportation disadvantage and the quest for urban opportunity. *Journal of the American Planning Association, 86*(3), 290-307. https://doi.org/10.1080/01944363.2020.1797857

Harris, C. D., & Ullman, E. L. (1945). The nature of cities. *Annals of the American Academy of Political and Social Science, 242*(1), 7–17. https://doi.org/10.1177/000271624524200102

Hussien, A. (2000). Factors determining private investment in Ethiopia. *School of Public and Management*.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control, 12*(2-3), 231-254. https://doi.org/10.1016/0165-1889(88)90041-3

Johansen, S. (1991). Estimation and hypothesis testing of cointegration vectors in Gaussian vector autoregressive models. *Econometrica, 59*(6), 1551-1580. https://doi.org/10.2307/2938266

Johansen, S. (1995). *Likelihood-based inference in cointegrated vector autoregressive models*. Oxford University Press.