DETERMINANTS OF REAL ESTATE PRICES IN NAIROBI METROPOLITAN: AN EMPIRICAL APPROACH.

BY

VICTOR MAVUTI

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF DEGREE IN MASTERS OF SCIENCE-COMMERCE IN THE SCHOOL OF BUSINESS AND PUBLIC MANAGEMENT AT KCA UNIVERSITY

SEPTEMBER 2017

DECLARATION.

I declare that this disseration is my original work and has not been previously published or submitted elsewhere for award of a degree. I also declare that this contains no materials written or published by other people except where due references is made and author duly acknowledged.

Student name……...Reg. No……

Sign…….Date……....

I do hereby confirm that I have examined the master's dissertation of

Victor Mavuti

And have approved it for examination.

Sign……Date……

DR CHRISTINE NANJALA

Dissertation supervisor.

DETERMINANTS OF REAL ESTATE PRICES IN NAIROBI METROPOLITAN

ABSTRACT

Real estate is a basic need and forms the significant component of human wealth. Therefore, a change in real estate prices has a significant impact on individuals' welfare and investment decisions. In Kenya, and particularly Nairobi and its environs, real estate prices continuously increased since 2004. This has raised concerns and fears that the sector may become unsustainable and cause financial crisis in the economy. This study focused on the determinants of the prices of residential houses in Nairobi City County, Kenya. Quarterly data for the period 2004 Q1-2017Q2 sourced from private real estate firm (Hass consult), mortgage lending institutions, the Central Bank of Kenya, and the Kenya National Bureau of statistics was analysed. The study used correlation analysis to determine relationships that exist between the prices and selected independent variables. The residential real estate price increase can be explained by non-macroeconomic fundamental changes in the country, among them building and construction costs, and population growth and house trading volumes(sales). The study was highly constrained of enough data. The study lays the ground for further research into the rampant increase of real estate prices in the Kenyan urban market.

Table of Contents

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENT

I sincerely extend my sincere gratitude to my supervisor Dr Christine Nanjala for her time, guidance and working tirelessly in ensuring that this dissertation was successful.

I deeply appreciate my course mates, family and friends for standing and believing in me through this process

I also sincerely thank my Almighty God for granting me good health and opportunity throughout this process.

DEDICATION

I dedicate this work to my entire family for the great support they showed to me throughout the entire process. May God bless you all.

CHAPTER 1: INTRODUCTION

1.1Background of the study

According to Brueggeman & Fisher (2005), real estate refers to things that are not movable such as land and improvements permanently attached to land such as residential property, and non residential property which includes but not limited to agricultural land, industrial land, office buildings and retail centres. For purposes of this study, real estate refers to housing. Real estate is recognized as a basic need whereby every person should be able to afford or be provided with; hence governments should ensure that the determinants of house prices are sustainable and commensurate with income levels (Jensen, 2003). Real estate is also used as collateral for loans; hence price fluctuations make it a security risk to the financial intermediaries.

A Proquest search since 1740 and a Lexis-Nexis search since 1970s for the term *housing bubble* or *home price* in English-language newspapers globally shows that these terms were rarely used at all until just after the 1987 stock market crash (a time when people were already talking about bubbles and many countries were showing very rapid upward price changes), but those terms disappeared soon after 1987. The terms reappeared in the late 1990s, and their use took off dramatically after 2000.Life was simpler once; one saved, and bought a home when the time was right. One expected to buy a home as part of normal living, and didn't think to worry about what would happen to the price of homes. The increasingly large role of speculative markets for homes, as well as of other markets, has fundamentally changed our lives. The price activity that was once very local and confined to such events as the building of highways, canals, and railroads has become national and even international, and it is now connected to popular stories of new economic eras. The changing behaviour of home prices is a sign of changing public impressions of the

value of property, a heightening of attention to speculative price movements (Schiller, 2005).

Over the years, the movement of house prices has been a huge concern within the housing market and had been widely researched according to the literatures. Movement of house prices is fundamentally related to the dynamics of supply and demand of housing stocks in the market. According to Mankiw& Weil (1989), the fluctuations in demand have a significant impact on the price of house. They suggest that the demand of house is affected by the demographic changes. However, Swan (1995) argues that Mankiw-Weil predictions of house prices are misinterpreted. According to Swan (1995), the prediction of future movements in house prices should also take into consideration, information on the supply factors in addition to relevant demand variables. House prices are usually described by fluctuations around a function of fundamental variables in the economy (Bjork, 2013). It has been a normal phenomenon that house prices fluctuate recurrently in a time-series. However, large fluctuations of house prices are likely to cause problems in the property market. Declines in house prices will result in capital losses for the homeowners (Feinstein &McFadden, 1989; Mankiw& Weil, 1989). However, if households are able to anticipate house price changes, potential losses may be mitigated.

The period of home price increase starting in 1998 in the United States has been concentrated in some states and metropolitan areas, and where it has been concentrated, there have been many stories about the psychological correlates of the boom. Stories have abounded since 2000 of aggressive, even desperate, bidding on homes, of homes selling the first day on the market for well above the asking price, of people buying homes in a rush to beat the market—homes that they have sometimes hardly even had a chance to look at. People have been afraid that the price of housing would soon rise beyond their means and that they might never be able to afford a house, and so have rushed to bid on homes. But, in

other cities, where there is not a history of home price volatility, there are few such stories, and investors are not very reactive to home price changes(Shiller, 2005).

The same forces of human psychology that have driven the stock market over the years have the potential to affect other markets. The market for real estate, particularly individual homes, would seem likely to display speculative upward price changes from time to time, since the psychological salience of the price of the places we see every day and the homes we live in must be very high, and because home prices are such a popular topic of conversation. Yet the market for real estate is different from the stock market in a unique ways (Shiller 2005).

We have no shortage of recent incidents of real estate booms to research on. There were sharp home price increases after 2000 in cities in Australia, Canada, China, France, Hong Kong, Ireland, Italy, New Zealand, Norway, Russia, South Africa, Nairobi, Spain, the United Kingdom, and the United States. There has been a breath taking real estate construction boom in China. These real estate booms have not taken place everywhere, but they have occurred in a variety of places. Considering these most recent booms is important because they are fresh in our memory and allow us to think strategically about the psychology that underlies them, (Shiller, 2005).Housing is the biggest marketable asset in a household portfolio for most people. For example, in the United States, equity in housing is a major component of the household wealth. Home owners generated household wealth through capital gains over house prices. Most of the households in the United States, anticipate using their equity in housing to finance the second half of their life. Banks et al, (2010).

The performance of housing market in Kenya is mainly based on the residential property market. Since residential property is the strong backbone in the Kenyan property market, any change in house prices will greatly impact the property market and hence the

Kenyan economy. Kenya is experiencing significant movements in the property market, particularly in the residential property sector, which has caused various determinants to also evolve. These factors which are specific to real estate include; age of property, location, availability of infrastructure among others. In an emerging economy like Kenya, several demand and supply side factors determine housing prices. These factors could be quantitative as well as qualitative in nature and include among others the size of population, its composition, urbanization, and economic prosperity, role of speculative investors, government policy intervention and monetary policy that play a dynamic role in the housing markets. It is difficult to capture all of these factors in the fundamental and non-fundamental modelling of housing prices(Kibunyi,2015). For instance in 2015 Real estate contributed to 7.6% to the Kenya's 5.6% economic growth and consumed 10.1% of the total commercial Banks credit facilities, this translates that real estate is among the top exposed sectors to the banking sector even more than Agricultural sector which contributed to 30% of the economic growth (KNBS,economic survey,2016). Real estate has therefore become a centre of focus for many investors, both local and foreign.

The housing supply factors consisting of land price, construction cost and the housing stock are also factors influencing house prices (Malpezzi, 1999).Modelling the housing market is significant since the volatility of residential Properties, especially house prices, directly influences the levels of investment in other related sectors, such as the construction, raw material markets, labour markets and consumption (Ball et al.,1996).The real estate sector has been a key productive sector of the economy as it contributes several types of input to different sectors (O'Flaherty, 1994).

The real estate market is described as inefficient and imperfect compared with other financial markets due to its characteristics of real estate features such as fewer transactions,fewer participants,less liquidity and supply rigidities (Kang and

Gardner,1989). These characteristics are believed to chip in to the deflection of the real estate market's price from its elemental values and therefore to the creation of the price bubble in the real estate segment(Xiao and Tan,2007)

When demand is high, prices of a product goes up. Higher prices on the other hand decreases the demand of the particular commodity (Baumol & Bondr, 2011). House prices are driven by the demand in the market. Demand on the other hand is determined by a number of macro & micro economic variables in the economy. The market for homes has produced a situation in which median home prices are sometimes ten times buyers' per capita income or more (Shiller 2005). There is convincing evidence that home prices are over-valued in many countries thus deviating relationship between house prices and rents. The ratio of prices to rents is a sort of price/earnings ratio for the housing market. Just as the price of a share should equal the discounted present value of future dividends, so the price of a house should reflect the future benefits of ownership, either as rental income for an investor or the rent saved by an owner-occupier (Economist, 2005).

According to Edward L. Glaeser, in his study "*A Nation Of Gamblers:Real Estate Speculation And American History*" Kenya has become a nation of real estate speculators and Nation of gamblers as far as Real estate is concerned. A Kenyan case as it stands depicts a scenario that has wide information asymmetry. There lacks a clear legal framework and guideline to regulate the real estate sector in Kenya which is more privately controlled and lacks comprehensive information to help fully understand it despite being a key economic driver. Studies of this recent housing cycle, including Chinco and Mayer (2012), Li and Gao (2013), and Haughwout, Lee, Tracy, andvan der Klaauw (2011), argue that speculative investment home purchases contributed to the the dramatic price run-ups in certain areas like Las Vegas and Phoenix. These findings suggest that studying the

determinants of investment home or speculative purchases might be important for understanding real estate price cycles.

1.2 Real Estate Market in Nairobi Metropolitan

1.2.1 Background Information

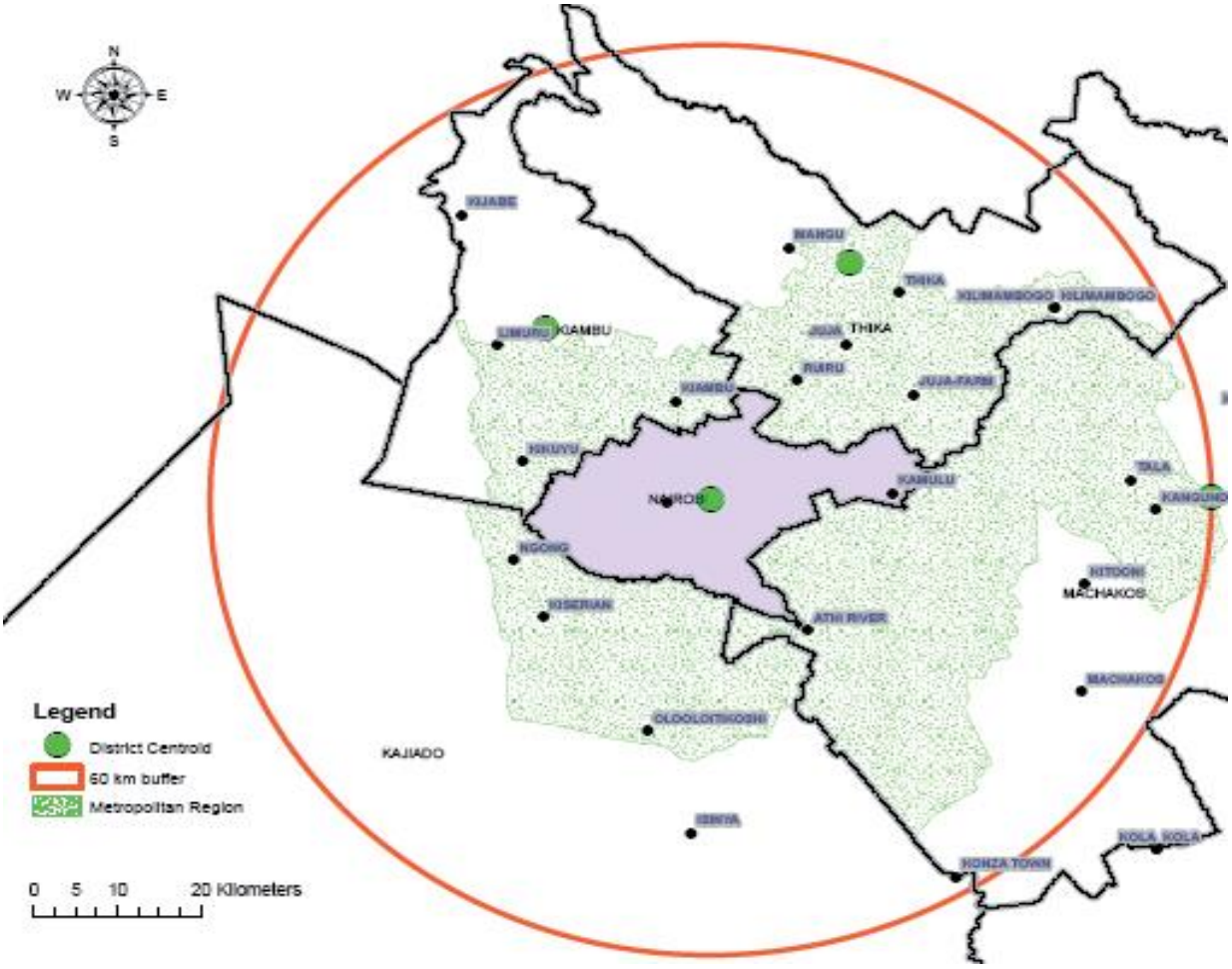
Nairobi the capital city of Kenya owes its birth to the Kenya- Uganda railway. The moving of the railway headquarters from Mombasa to Nairobi in 1899 resulted in the subsequent growth of Nairobi as a commercial and business hub (Olima, 2001). By 1900, Nairobi settlement consisted of railway buildings and separate areas for Europeans and Indians. The boundary of Nairobi as an urban centre was defined in 1900 (Mitullah, 2003). In 1927, the boundary of the city was extended to cover 30 square miles (77km²) as a result of growth of the urban centre both in terms of population and infrastructure. From 1928-1963, the boundary remained the same, with only minor additions and excisions taking place. In 1963, the boundary was extended to cover an approximately 266 square miles (686 km²).

According to the Government of Kenya (2008), the city has expanded further to the neighbouring satellite towns to cover over 3,000 km²

In 30-40 years, Nairobi has experienced tremendous population growth at an average of 4.8 per cent per annum. This population growth is quite high compared to Kenya's average national growth rate of 3.4 per cent per annum (Omwenga, 2008). Nairobi's population increased from about 0.8 million in 1989 to 2.1 million in 1999, and for 2011

are 3.36milion.

Figure 1: Nairobi boundary changes: 2008



Source: Government of Kenya (2008)

1.3 Problem Statement

Real estate prices in the major developed markets have been increasing, sometimes dramatically, over the last decade in both nominal and real terms. This has raised concern among many investors about the right level of prices in the real estate sector and about whether prices might not be already too high, while some see the recent price behaviour as support for a continuing trend (Sabal, 2005). Housing is the biggest marketable asset in a household portfolio for most people. For example, in the United States, equity in housing is a major component of the household wealth. Home owners generated household wealth through capital gains over house prices. Most of the households in the United States,

anticipate using their equity in housing to finance the second half of their life, Banks et al. (2010).

Modelling the housing market is important since the volatility of residential Properties, especially house prices, directly influences the levels of investment in other related sectors, such as the construction, raw material markets, labour markets and consumption (Ball et al.,1996).The real estate sector has been a key productive sector of the economy as it contributes several types of input to different sectors (O'Flaherty, 1994).For instance in 2015 real estate contributed to 7.6% to the Kenya's 5.6% economic growth and consumed 10.1% of the total commercial Banks credit facilities,this translates that real estate is among the top exposed sectors to the banking sector even more than Agricultural sector which contibuted to 30% of the economic growth (KNBS,economic survey,2016).

It is raising a concern to researchers, property investors, mortgage lenders and policy makers involved in real estate and financial market that the current real estate price are on upward movement trend which may not be sustainable as evidenced from the various quarterly reports carried out by Hass consult, the real estate consultants from 2004 up to date. Garino and Sarno in their 2004 study, they provide some indicative evidence in support of the view that non fundamental economic forces are an important factor that drive change in property prices. A Study by Ouma (2011) suggested that residential house prices are not supported by economic fundamentals other than population growth; rate of inflation and level of money supply in Nairobi Metropolitan.GDP and rate of interest were found to have no significance in their relationship with the residential house prices and so does building costs. Ouma's conclusion seems to be out of sync with others since the expansion of real estate sector is contributing to GDP growth and therefore a positive correlation is

expected. Moreover, the basic pricing model involves cost of production plus mark-up, such cost being affected by changes in inflation.

This study proposes to test the possibility of other non-fundamental variables determining house prices as opposed to the key macro-economic variables which may have not been majorly researched on determining house prices that would lead to sustainable real estate market prices in urban Kenya conducive to both investors and economy at large.

1.4 Objectives of the Study

1.4.1 General Objective

To study the determinants of real estate prices in Nairobi metropolitan region.

1.4.2 Specific Objectives

1. To examine the impact of House trading volumes on real estate prices in Nairobi Metropolitan.
2. To determine how the urban building cost index affect the real estate prices in Nairobi metropolitan.
3. To investigate the impact of urban population on real estate prices in Nairobi metropolitan.

1.5 Research Questions

The following research questions respond to the problems outlined above and seek to address existing research gaps.

1. Do the house trading volumes (sales) affect the price changes of real estate sector?
2. Can the real estate price changes in Nairobi be explained by the building cost index?
3. Is the house price index affected by urban migration?

1.6 Significance of the Study

The value of most investments depends on expectations for the near to distant future, something that cannot be seen clearly today, and so a public focusing of attention on investments creates an opportunity for deception and misrepresentation When we have the equivalent of professional magicians running some of our companies or acting as some of our real estate brokers, we have to expect that what we see is not reality (Kindle Berger, 1989).

This study will benefit investors and policy makers; investors would be able to estimate the condition of the housing market in respect to the house price volatility before they make an investment decision by analysing how the house prices in Nairobi metropolitan are affected by non fundamentals of economics such as urban migration,building cost and house trading volumes, and how they individually interact within the Kenyan's unique and complex housing market and establish their possible long run equilibrium relationships in explaining the house pricing puzzle in Kenya.Besides, policy makers should also take into account the importance of house price volatility in formulating the house policy.. It will also add to the body of knowlegde of real estate research in Kenya which has heavily focused on fundamental macro economic forces.

1.7 Scope Of The Study

The study will focus the housing segment of the real estate sector in Kenya. Main focus will be on residential housing which have being developed in and around Nairobi metropolitan. For this reason, Nairobi metropolitan has been chosen as it is the political and administrative centre with over four million people.

1.8 Limitation Of The Study

The study focused on real estate sector which is largely controlled by private sector and the data depended was secondary mainly from private firms which is not adequate for proper time series analysis significantly. The study restricts itself to the period within which such data was available. The demand for housing for urban households, majority of whom are middle income earners, is dependent on their disposable incomes (Hui & Yue, 2006). The data for the disposable incomes for this group in Nairobi was not readily available.

CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

This chapter review and analyses previous study done on the real estate pricing and other relevant literature. It will discuss some major theories applied in study of the real estate sector. Empirical literature review will then follow after which the variables used are then discussed building conceptual framework.

2.1 Theoretical Literature Review

There are several theories of property values based on the works of Von Thunnen, Richardo, Alonso and Muth dating back in 1964, and draws on concepts from microeconomics. The demand by firms and households for a particular location depends upon the expected net revenue yield or utility, referred to as value. The rent is what has to be paid by a particular firm or household to prevent the site from going to another use. Since different locations have different uses and capacities, a pattern of differential value emerges. Thus, land values and land uses are determined simultaneously by the location of the site. The greatest demand will be for those sites or a location having the greatest relative advantage though in agreement with Alonso (1964), adds that there are other factors in play when determining the value of land or housing. He argues that choices of locations and land prices are influenced by social values, tastes, symbols, and social choices that will frequently vary among various social and ethnic groups of a particular society. Rational determinants of land use are contingent upon a particular culture bound value system, and the cultural component is key to location processes (Kibunyi, 2015).

However, Harvey (1996) noted that though most writers emphasized on location, transport and culture as determinants of property values, the determination of urban

property prices must incorporate consideration for multiple factors associated with the parcel of land, such as transportation mode, compatibility of land uses (planned environment), historical development of a location, topographic features, government policy, and globalization. He concludes that changes in local land uses and prices in a city are influenced by the location of the land unit relative to other landscape elements, and will be reflective of its uses such as commercial and residential land within the larger establishment of a geographic area.

Recent studies like the one done by Clapp and Giaccotto, (1992) have also suggested that models should include variables representing both the productive and consumptive values of property, by using hedonic models. These models estimate the value of real estate by decomposing it into its constituent characteristics and estimates of the contributory value of each characteristic. This information can be used to construct a price index that can be used to compare the price of real estate in different urban areas, or do time series analysis. According to Kalra et al (2000), some of the important features of the property market include: limited land supply, difficult terrain, location preferences of the population and businesses, immigration, rising wealth and a strong performing economy. Therefore, there will be movement of property prices in terms of fundamentals such as user and supplier cost factors, demographics and general economic conditions. The effect of nature conservation designation on land values will vary not only in relation to the impact on property rights, investment and income flows, but also the type of purchaser and the relative weight they place on the consumptive components of land value.

2.3 Theoretical Approaches

2.3.1 The Agency Theory

The agency theory explains the relationship that exists between the principal and the agent. It is an agreement under which one or more persons engage another person to perform some service on their behalf, the former being the principal and the latter the agent. This relationship also involves delegating some decision making authority to the agent (Jensen &Meckling, 1976).

Real estate agents are licensed experts specializing in real estate transactions. They sell this knowledge about local real estate markets and provide services associated with the purchase and sale of properties on a commission basis. For home sellers, agents are typically involved in advertising the house, suggesting listing prices, conducting open houses and negotiating with buyers. For home buyers, agents search for houses that match their clients' preferences, arrange visits to the listings and negotiate with sellers. In addition they frequently provide suggestions on a host of issues related to changes in property ownership, such as home inspections, obtaining mortgage loans and finding real estate lawyers (Barwik&Pathak, 2011).

Therefore, this theory is ideal in helping the stakeholders of the real estate sector understand and analyse the crucial details about their agents due to the fact that most of agents' compensation is based on the sale value as a percentage, there is the strong temptation to keep the prices high to increase their earnings. It is in the Agents benefit for the prices to continue rising. Agents can therefore keep the property prices rising. The introduction of aggressive lending instruments like sub-prime lending advances the Operationalization of this theory as agents seek to create more mortgages and subsequently pass over the risk. The supply of aggressive lending instruments temporarily increases the asset prices in the underlying market because agents find it more attractive to own or

because their borrowing constraints is relaxed or both. This result implies that the availability of aggressive mortgage lending instruments magnifies the real estate cycle and the effects of fundamental demand shocks (Pavlov&Wachte, 2011).

2.3.2 The Economic Theory of Demand and Supply

Several studies like the ones by (Tsatsaronis &Zhu, 2004);(Girouard, Kennedy, Noord&Andre, 2006) and (Hou, 2010), have been carried out based on the premise that in an uncontrolled economy the interaction of the market forces of demand and supply determines the price at which properties Should be exchanged On one hand of the housing price divide are the demand factors which include population growth, house-hold formations, employments, household income, interest rates, income tax policy and the cost of renting housing(Brueggeman&Fisher,2005). On the other hand are the supply factors mainly construction costs which include availability and cost of land, labour, materials and investment in the improvement of the existing housing stock (Tsatsaronis&Zhu, 2004).

According to Tsatsaronis&Zhu (2004), the demand and supply factors that drive real housing prices either have a longer term or a shorter term influence. Factors that influence the demand for housing over long horizons include growth in household disposable income, gradual shifts in demographics, permanent features of the tax system that might encourage home ownership as opposed to other forms of wealth accumulation and the average level of interest rates. The growth of the housing stock can be constrained in the short-run as a result of a number of factors that include the length of planning and construction phases and the inertia of existing land planning schemes.

House prices can also be affected by restrictions on the availability of land for residential housing development that can constrain the responsiveness of supply. These would include tough zoning rules, cumbersome building regulations, slow administrative procedures, all of which would restrict the amount of developable land (Girouard et al.,

2006). This affects the speed of delivery of the housing units thus affecting the supply side. Moreover, an unexpected rise in real interest rates that raises housing costs, or a negative shock to a local economy, would lower housing demand, slowing the growth of house prices and possibly even leading to house price decline (Himmelberg, Mayer &Sinai, 2005) .The interplay between these fundamental factors of demand and supply settle at an equilibrium price.

This theory will be very important in this study as it will address the theoretical explanations of population variable on the demand side and construction costs variable on the supply side.

2.3.3 Malthusian Theory of population

This theory by Thomas Robert Malthus proposes that the principle that human populations grow exponentially (i.e., doubling with each cycle) while food production grows at an arithmetic rate (i.e. by the repeated addition of a uniform increment in each uniform interval of time). Thus, while food output was likely to increase in a series of twenty-five year intervals in the arithmetic progression 1, 2, 3, 4, 5, 6, 7, 8, 9, and so on, population was capable of increasing in the geometric progression 1, 2, 4, 8, 16, 32, 64, 128, 256, and so forth. This scenario of arithmetic food growth with simultaneous geometric human population growth predicts a future when humans would have no resources to survive on (Weil and Wilde, 2010).

In view of the above this theoretical explanation gives evidence that when population grows exponentially especially in the urban setup, there is a likelihood that demand of housing will outgrow the supply and this will obvious push the house prices.

2.4 Empirical Review

2.4.1 House Prices

A study by Kalra et al (2000) has attempted to test empirically for the real estate prices by examining the determinants of residential property prices and speculative bubbles in Hong Kong SAR during 1980-1998. Two models for property prices were applied: Univariate time series models (ARIMA models) to model the trend behaviour of the property price changes and to assess deviation of actual changes from trend values; and models motivated by the efficient markets hypothesis (EMH) (Discounted present value model) where property price changes are assumed to be determined by economic fundamentals. The latter model permit an examination of the hypothesis that property prices may be subject to speculative bubbles and allows comparison to other models of housing markets in addition to providing a measure of the deviation of actual price changes from trend values. The variables used included residential property prices indices, rental price indices, bank lending rates (as proxy for mortgage lending rate), real interest rate, real construction index, real effective exchange rate, real GDP, real wage and population. They found that Hong Kong had speculative bubbles as those experienced in the US at the time.

Smith and Smith (2006), and Krainer and Wei (2004) found that housing price to rent ratio deviates over time and one should not expect the fundamental value of a home to be a constant multiple of rent. Among the many factors that affect the price-rent ratio are interest rates, growth rates, and tax laws (including property, income, and capital gain taxes). Thus, price-rent ratios in the housing market can rise without signalling a bubble if, for example, interest rates fall or the anticipated rate of growth of rent rises.

Kanoh and Murase (1999) investigated the theory of land price formation in Japan, taking into consideration the fact that an ‘option’ is implicitly attached to land. ‘Option’ refers to the land use that can produce optimal utilization of land. Thus, they tested various

land uses on each land to get the optimal land use. They concluded that even if bubbles do not exist according to the conventional definition, there is a possibility that actual land prices exceed theoretical land prices by a large amount. This is because land owners will always be considering potential alternative uses of land. The degrees of uncertainty in their expectations play an important role in determining the option premium.

A rich history exists of studies that have been carried out in various parts of the world to understand the relationships between real estate prices and the economic fundamentals. Such studies extend to make tabulations suggesting the way in which long wings in construction and price development were synchronized with long swings in aggregate economic activity(Gottlieb,1976). although such studies have generally tended to conclude that economic fundamentals play a somewhat major role in influencing the house prices, other factors specific to the particular geographies come into play. This is because housing markets are intrinsically local in character as such; the growth of the housing stock can be constrained in the short run as a result of a number of factors which suggests that idiosyncratic, national factors can lead to significant differences in the dynamics of prices across countries. One set of such factors relate to the prevailing conditions in the provision of financing for the purchase of housing. Another factor affecting the liquidity of the housing market is the specific transaction cost framework such as the level of VAT, stamp and registration duties and inheritance taxes. Additionally, the uncertainty about future prospects that follows periods of heightened volatility in housing prices tends to lead to a more cautious response of housing construction to shifts in demand because of the inherent irreversibility of this type of investment (Tsatsaronis & Zhu, 2004). Glindro, Subhanji, Szeto, & Zhu (2008) carried out a study of nine Asia-Pacific Economies to investigate the characteristics of house

price dynamics and the role of institutional features during the period 1993 to 2006. The study concluded that the current run-up in house prices reflects mainly an adjustment to more buoyant fundamentals than speculative housing bubbles. On average, house prices tend to be more volatile in markets with lower supply elasticity and a more flexible business environment.

In a study of the Swiss economy, Borowiecki (2009) found that house prices and construction activity appears to be most sensitive to changes in population and building costs. Contrary to recent empirical findings from other countries, real GDP turns out to have only limited explanatory variable. Although the research warns that the real estate sector is a very local issue and each empirical approach with national perspective may be skewed because of the notably heterogeneous nature of real estate.

In a study of the determinants of house prices in eastern and central Europe, Egert & Mihaljek (2007) found that the fundamentals have played an important role in explaining house prices in both OECD and CEE countries. Also the study found a strong positive relationship between per capita GDP and house prices. In addition; robust relationships were found between real interest rates and house prices, as well as between housing credit and house prices.

These findings were challenged by Ouma (2011) who suggested that residential house prices are not supported by economic fundamentals other than population growth, rate of inflation and level of money supply in Nairobi Metropolitan.GDP and rate of interest were found to have no significance in their relationship with the residential house prices and so does building costs. Ouma's conclusion seems to be out of sync with others since the expansion of real estate sector is contributing to GDP growth and therefore a positive correlation is expected. Moreover, the basic pricing model involves cost of production plus mark-up, such cost being affected by changes in inflation. It is therefore expected that if

inflation and house prices have a positive relationship, so should costs and house prices. The conclusion that building costs do not affect housing price is contrary to empirical research and therefore needs further investigation.

In his study to further understand the forces affecting the property values in Nairobi, Kariuki (2012) earmarked some factors as political stability which attracts foreign investment, Diaspora remittances, increased credit, infrastructure developments and new land laws. However; her study did not employ any statistical methods to quantify the extent of the effect of these factors on the development of residential property prices.

2.4.2 Urban population

In making a contribution to the determinants of house prices, Gabriel et al. (1999) looked at role of migration in explaining differences in house prices and house price dynamics across Los Angeles and San Francisco metro areas within California. They find that net migration is a major factor in the performance of California's metropolitan housing markets during the 1980s and 1990s. Gabriel et al. (1992) examined the effects of regional house price dispersion on migration decisions, identifying the importance of relative wages and demonstrating empirically that relatively high house prices in destination cities are an impediment to inter-regional migration. Capozza et al. (2004) recognized the importance of relative economic performance, finding that faster growth in both population and real income is associated with more serial correlation in house price appreciation. Finally, Potepan (1994) identifies the potential for simultaneity between house prices and population and estimates a simultaneous equation model, but finds rather mixed results and considers only absolute measures, as opposed to relative, measures of economic opportunity. This study also hypothesizes that cities with growing migrant populations should experience rising real estate prices. During recent decades, Kenya has experienced

significant internal migration due to industrialization, marketization and urbanization (Tunon, 2006).

Domestic migration is deemed as an influential factor of housing price in cities through its influence on urban population growth (Chen and Guo, 2010). The study also hypothesizes that there should be a positive relationship between population and housing prices. According to Zheng and Kahn (2010), population has a positive effect on housing price among cities. A larger population should generate a higher housing demand which will increase housing price. Other factors such as social interaction, better infrastructure, and better educational opportunities and entertainment in big cities have also attracted migrants. The specific destinations of rural migrants also have changed. Instead of mainly migrating from rural areas to towns, rural-city migration has also been increasing.

2.4.3 Building cost index

The evidence by Shiller (1996) indicates that house buyers' manifests very positive expectations on house prices increase in the long run and that this increase has predominantly been a post WW II aspect. The change in real construction costs and real land prices can shed light on the historical movement in house prices. Considering real land prices over a century for four countries Mundlak et al. (1997) conclude that real land prices have hardly increased during the past century. Consumer price deflated construction costs also appear to have been constant before WWII and increased thereafter for the countries considered in that study. The increase was particularly concentrated over the period from the mid-1940s to the end of the 1960s. Thereafter, the real construction cost index stabilized for most countries. If the productivity advances in the building industry continue to follow the productivity advances in the rest of the economy into the future, the post-WWII increase in real house prices may have come to a halt.

2.5 Operationalization of the Variables

2.5.1 House Trading Volumes

House trading volumes refers to the number of houses sold.

2.5.2 Building Cost Index

Construction costs are the portion of hard costs usually associated with the construction contract, including the cost of materials, the labour and equipment costs necessary to put those elements in place. Overhead costs, which include both job site management and the contractors' standard cost of doing business, are added to this. Theoretical underpinning and constructs of the notable drivers of cost of construction work in this research are based to the conclusions of past studies by Odediran and Windapo (2014); American Institute of Architects (2013); Olatunji (2010); Skitmore et al. (2006); Lowe et al. (2006); Sawhney et al. (2004); Ng et al. (2000); Akintoye et al. (1998); Fitzgerald and Akintoye (1995); Chau (1990); Eastman (1986); and Snyman (n.d).

Aligned on literature review , the drivers of construction costs are grouped into – Resource factors (labour, material and plant); Project factors (competition intensity, profit, overhead cost, space available for construction, management skills provided, type of structure/design and construction methods used); Macroeconomic forces (demand and supply of construction work, finance or mortgage cost, inflation, transportation costs ,foreign exchange rates and fuel price); construction work elements (excavation, concrete work, formwork, reinforcement work, mechanical, electrical and plumbing installation etc.); and stakeholder requirements (professional fees and transaction costs).

2.5.3 Urban Population

Urban population refers to the number of people living in the Nairobi Metropolitan region. In 30-40 years, Nairobi has experienced tremendous population growth at an average of 4.8

per cent per annum. This population growth is quite high compared to Kenya's average national growth rate of 3.4 per cent per annum (Omwenga, 2008). Nairobi's population increased from about 0.8 million in 1989 to 2.1 million in 1999, and estimates for 2010 are 3.4milion.

2.5.4 House Price Index

The house price index is constructed using the regression, moving average or repeated sales regression to ascertain the price changes of residential housing. It is used to provide investors, home owners, financial sector and other consumers with the right information about house price inflation thus allowing them to make informed decisions in the housing market with the aim of enjoying the best possible returns. The construction of the house price index must take into account all the possible influences on price based on certain weights. These dynamics include but not limited to location, road, development, number of beds, number of bedrooms, number of bathrooms, swimming pool, gym, Jacuzzi, elevator, gated community, garage parking, balcony, backyard, floors, age, type of house, social amenities, zoning etc. This study will adopt the Hass Price Index which is developed using the repeated sales regression method. According to Hass Consult Real Estate, the majority of the house price information is derived from sold data as at transaction date, properties sold at true prices. The data is usually cleaned to remove items that may cause distortion for example properties where prices contain a development potential premium especially where the properties are sold with land of more than half an acre (Kibunyi 2015).

2.6 The Conceptual Framework

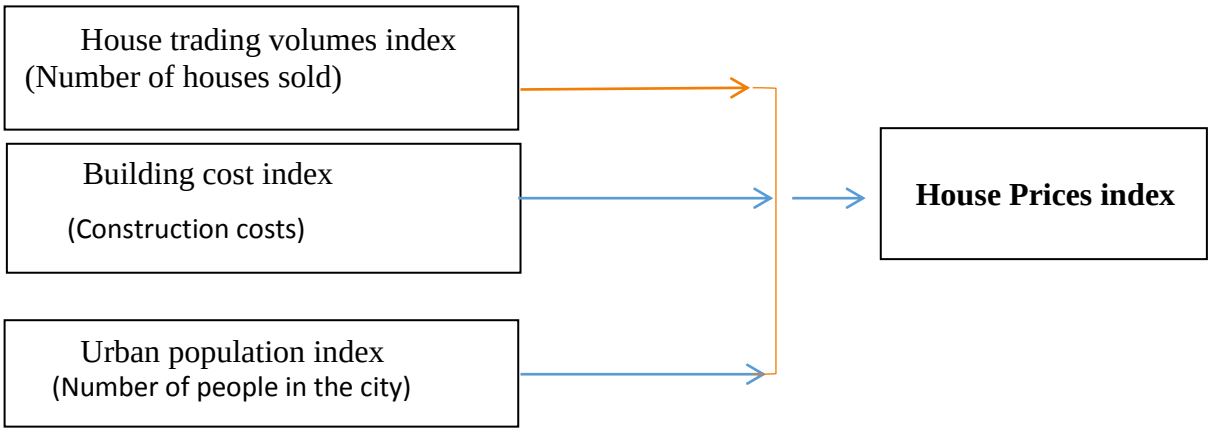


Table 1: Operational Framework

Variable	Abbreviation	Description	Measure
HOUSE TRADING VOLUMES INDEX	HTVOLINDEX	The number of houses sold	Unit Sales
BUILDING COST INDEX	BCINDEX	All cost per square meter involved in putting up the house	Cost
URBAN POPULATION INDEX	URBPOPINDEX	The number of people living in the Nairobi metropolitan region.	Number
HOUSE PRICES INDEX	HPINDEX	House prices for the houses sold at true prices	Shillings

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discussed the overall design and methodology used to address the research questions in this study. It explains the study design, data sources, study area, sample size and methods of data analysis and presentation of results.

3.2Research Design

The design for this study was be descriptive, which was used to explain the relationship existing between the prices of real estate (houses) and the various variables examined. The study applied the statistical technique of correlation to establish the relationship between the dependent and independent variables.

3.3Data and data Collection

The study used secondary data collected at quarterly intervals over a period of 54 successive quarters from January2004 to March 2017 because this is when first valid secondary data for property market is available as provided by Hass consult. The data for Building cost index and population was collected from Kenya National Bureau of Statistics (KNBS) and house price index and house trading volumes from the Hass Consult Limited.

3.4Data Analysis procedure

Borrowing from Hui & Yue (2006) the quantitative data collected are analysed using a number of statistical tests and procedures to test for Stationarity of the data, suitable lag length and appropriate model specification.

3.4.1Stationarity test

This study used Philips and Perron Tests (PP) to test for the Stationarity of the variables

H_0 There is a unit root (data is non-stationary); Reject if test statistic will be greater than the critical value.

H_1 There is no unit root (data is stationary)

If on first differencing does not make the data to be stationary, then the test will be carried out to the next differencing until the data becomes stationary.

3.4.2Lag Length Selection

If the variable(s) under testing is persistent--that is, values in the far past are still affecting today's values-more lags will be necessary. In order to determine how many lags to use, this study will use Information Criteria to determine the optimum lag. The two most common are the Akaike Information Criterion (AIC) and the Schwarz' Bayesian Information Criterion (SIC/BIC/SBIC).

3.4.3Model specification

This study used Autoregressive-Distributed Lag model, in the sense that

εt is "explained (in part) by lagged values of itself. It also has a "distributed lag" component, in the form of successive lags of the "x" explanatory variable.

The model looks like this,

$Y_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 X_{1t-1} + \beta_2 X_{2t-1} + \beta_3 X_{3t-1} + \varepsilon_t$

This study will use Box and Jenkins model in identification, estimation, and validation of the variables. Ljung and Box test is capable of testing the significance of the autocorrelations (partial autocorrelations) up to a finite number of lags.

3.4.4 Diagnostic test

Normality tests will be used to check for the model adequacy and residuals distribution, variables omissions and variance.

CHAPTER FOUR: RESEARCH FINDINGS

4.1 Introduction

This chapter presents the analytical procedures and findings from the data collected. Trend plots are presented first to establish if the series for the study variables are stationary. Secondly the stationarity tests are carried out to determine if the series need differencing. Finally the descriptive statistics,model specifications and diagnostic tests are carried out and presented.

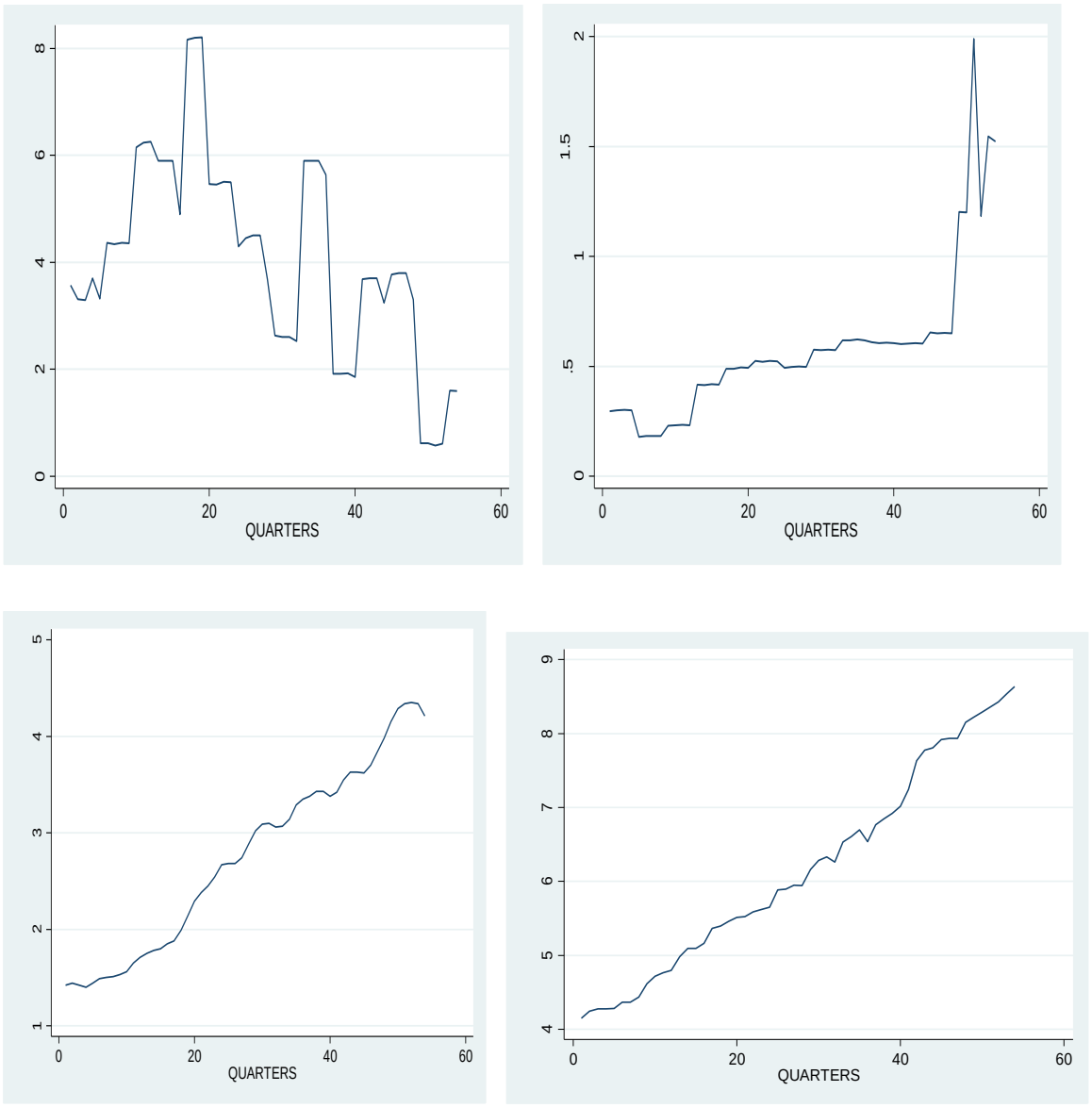
4.2 Data

The data comprises of quarterly time series collected from various institutions. The beginning of the sample period is influenced by the fact that quality real estate price series is available since 2004.

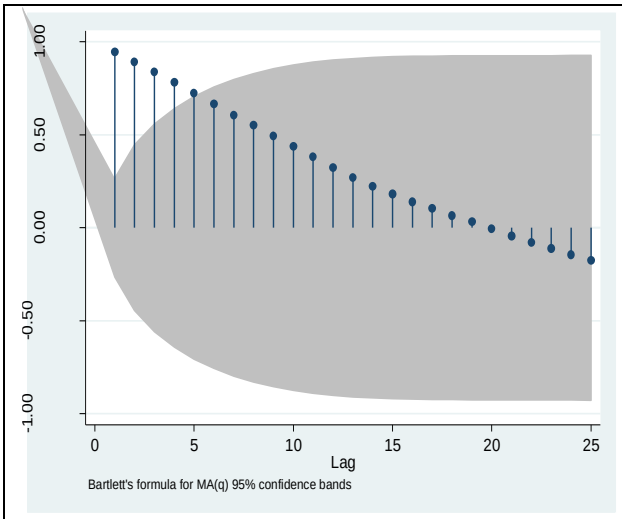
4.2.1 Trend Analysis

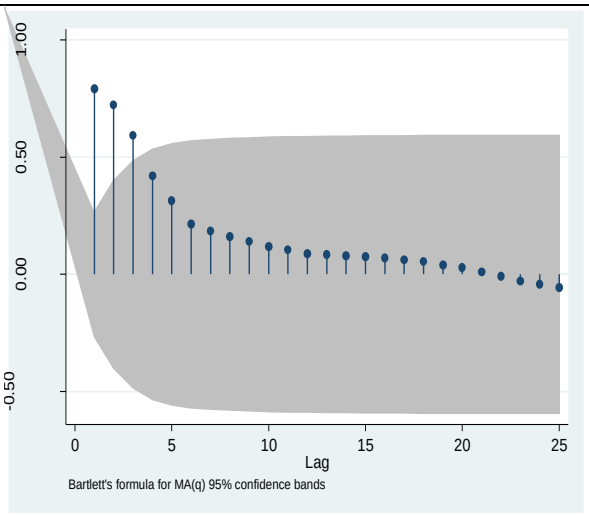
The trend analyses for the four time series show that the house prices and the building cost Index exhibit deterministic trend. The house sales and population series reveals a erratic trends with no apparent pattern.the series further suugests that all are non stationary since their corresponding correlograms dies away slowly.

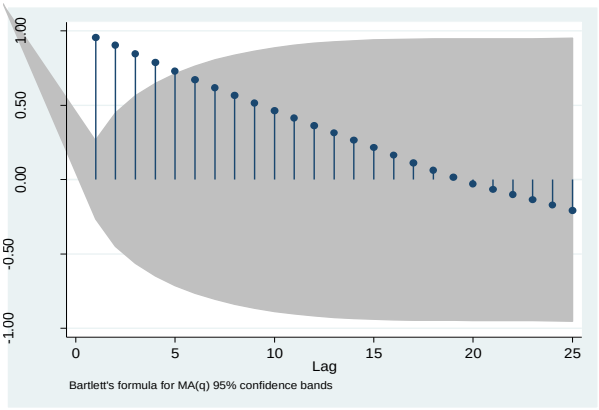
Figure 2:Trend plots for study variables.

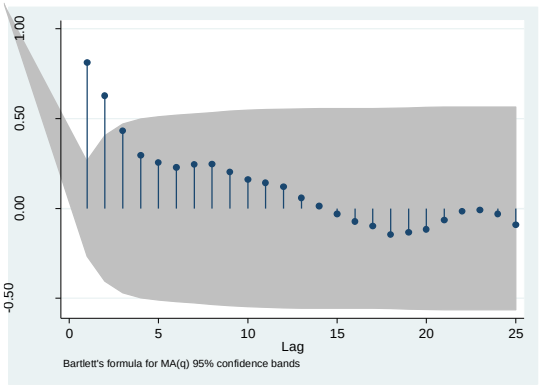


Source :study data







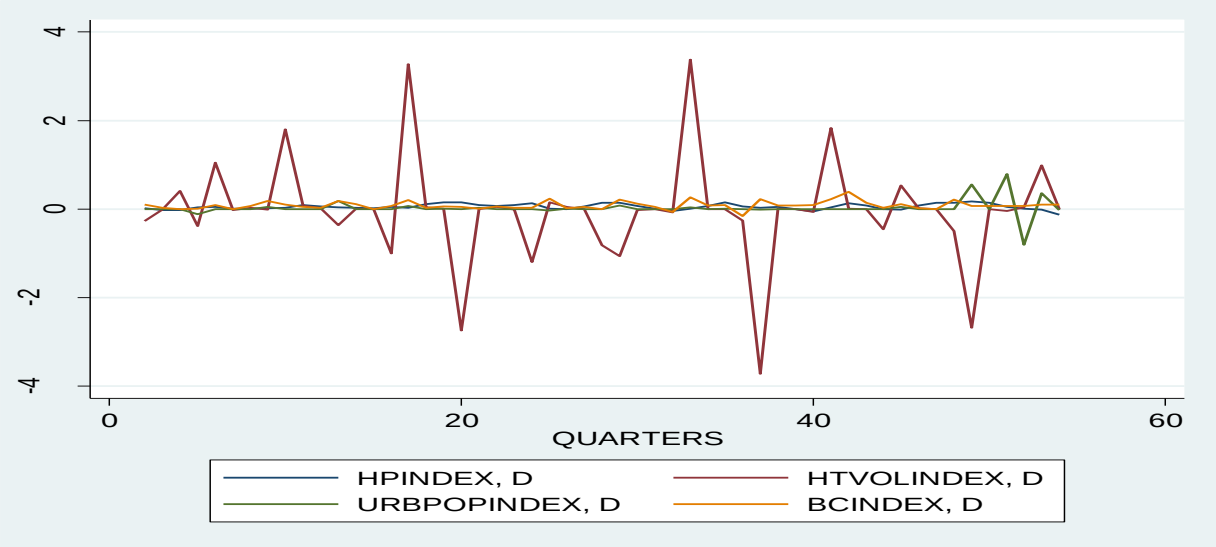


: Trend plots.

Source :study data

Figure 3 Correlograms

Figure 4: Trend plots for first difference of variables



Source: study data

Table 2: descriptive statistics for study variables

variable	obs	mean	Std. dev	min	max
HPINDEX	54	2.7474	0.9581	1.4	4.35
D1	53	0.05264	0.0617	-0.13	0.17
HTVOLINDEX	54	4.0687	1.8868	0.576	8.204
D1	53	-0.03726	1.1167	-3.724	3.372
URBNPOPINDEX	54	0.5818	0.3528	0.179	1.99
	53	0.02315	0.1835	-0.806	0.789
BCINDEX	54	6.1709	1.3726	4.146	8.638
	53	0.08475	0.0905	-0.157	0.385

Source :study data

After ascertaining that variables are stationary at first difference,the descriptive statitics for the study variables are shown in table 4.3 above. The results indicates that the minimum house price

index was 1.4 recorded in December 2004 with the highest of 4.35 recorded in December 2016 with the average reported to be 2.74 % per quarter over the study period,house trading volumes index had a minimum of 0.576 recorded in September 2016 with the maximum index of 8.204 recorded in September 2007 reporting an average of 4.068 per quarter throught out the period, urban population index had a minimum of 0.179 recorded in march 2005 with a maximum of 1.99 recoreded in December 2016 with an average of 0.5818 % over the entire period and that of building cost index stood at minimum of 4.146 recorded in January 2004 with maximum of 8.638 in July 2017 which was the last date the data was collected reporting an average of 6.17 during the study period.

The models were fitted with the first difference of all the study variables.

4.2.3 Correlation matrix

Table 3: Correlation matrix

variable	HPINDEX	HTVOLINDEX	URBNPOP	BCINDEX
HPINDEX	1.0000	-	-	-
HTVOLINDEX	-0.6069 0.0000	1.0000	-	-
URBNPOP	0.8080 0.0000	-0.5781 0.0000	1.0000	-
BCINDEX	0.9825 0.0000	-0.5576 0.0000	0.8069 0.0000	-

Source:study data

The interactions between housing prices and non market fundamentals have been examined through Pearson's correlation test which provides; House price index and house trading volumes are negatively correlated with coefficient of 0.609 at 5% significance level. House price index and urban population have a high positive correlation of 0.8080 which is significant at 5% level.

House price index and Building cost index are very highly positively correlated at 0.9825 and it's significant at 5% level. Urban population and house trading volumes have a negative correlation with coefficient of 0.5781 which is significant at 5% level. Building cost index and house trading volumes have a negative correlation of 0.5576 but significant at 5% level. Building cost index and urban population have a very strong significant correlation of 0.8069 which is significant at 5% level.

4.2.4 Unit Root Test

A unit root analysis of each of the series of the chosen variables was carried out to establish the order of integration. The order of integration for all the variables must be known prior to co integration analysis, to make sure that variables are not integrated of order greater than one (Engle and Granger, 1987). Philips and Perron (PP) Unit root test was employed and the results analysis indicated that all variables are non-stationary in levels, but they become stationary in first difference. The series are integrated of order 1(d=1) as in the table 4.2.3

Table 4: the stationarity test

variable	Phillips-perrons test				
	Test statistic	1% critical vaalue	5% critical value	10% critical value	p-value
HPINDEX ..	0.044	-3.576	-2.928	-2.599	0.9620
D.HPINDEX	-2.934	-3.577	-2.928	-2.599	0.0415
D.D.HPINDEx	-5.152	-3.579	-2.599	-2.600	0.000
HTVOLINDEX …	-2.125	-3.576	-2.928	-2.599	0.2346
D.HTVOLINDEX	-7.218	-3.577	-2.928	-2.599	0.0000
D.D.DHTVOLINDEX	-14.538	-3.579	-2.929	-2.600	0.0000
URBNPOPINDEX ..	-0.421	-3.576	-2.928	-2.599	0.9066
D. URBNPOPINDEX	-12.701	-3.577	-2.928	-2.599	0.0000
D.D.URBNPOPINDEX	-7.503	-3.577	-2.928	-2.599	0.0000
BCINDEX ..	1.224	-3.576	-2.928	-2.599	0.9961
D.BCINDEX	-33.331	-3.579	-2.929	-2.600	0.0000
D.D.BCINDEX	-17.823	-3.579	-2.929	-2.600	0.0000

Source: study data

4.2.5 Autoregressive Distributed Lag selection

Table 5 Autoregressive Distributed Lag using

variable	Coef.	Std. Err.	t-stat.	p-value
HPINDEX				
L1.	1.549207	0.2698	12.20	0.000
L2.	-1.073658	0.2119	-5.07	0.000
L3.	0.49453	0.1300	3.80	0.001
HTVOLINDEX				
L1.	0.021481	0.00576	3.73	0.001
URBPOPINDEX				
L3	-0.2542	0.07428	-3.42	0.002
BCIINDEX				
L4	0.14287	0.06575	2.17	0.037
CONS	-.15005	0.06255	-2.40	0.022
R-Squared	0.9989			
Observations	50			

Source :study data

The results above show that there are significant effects of the lags of independent variables on house prices. The house price is affected by first, second and third lags of itself with a cummulative effect of 0.97008 .The house price is determined by house sales volume up to first lag with a coefficient of 0.021481, Lag three of the urban population index determines the house price negatively with coefficient of 0.254223 and fourth lag of the Building cost index have the

significant effects on the house price.This implies that current house sales volume would still affect the house price in the coming quarter.

4.2.5 Auto regressive distributed lagged regression test for cointegration and error correction model

The Long run coefficients show that in the long run, none of the independent variables has a significant impact on the house prices. The speed of long run adjustment is not significant

The results further indicates that the short run coefficients of house trading volumes has a significant impact on house price (sig. =0.001) at lag one, indicating that one percentage increase in house sales leads to a 0.0215% decrease in house price, the short run coefficients of urban population at lag 1 has a significant impact on house price (sig. = 0.049) and 1% increase in population will lead to increase of 0.125% in house price at second quarter. On Building cost index coefficients, at lags 2 and 3 have a significant impact on house price (sig. =0.029 and 0.037 respectively) . this implies that 1% increase in building cost index will lead to 0.14% and 0.142% decrease in house price respectively.

Table 6

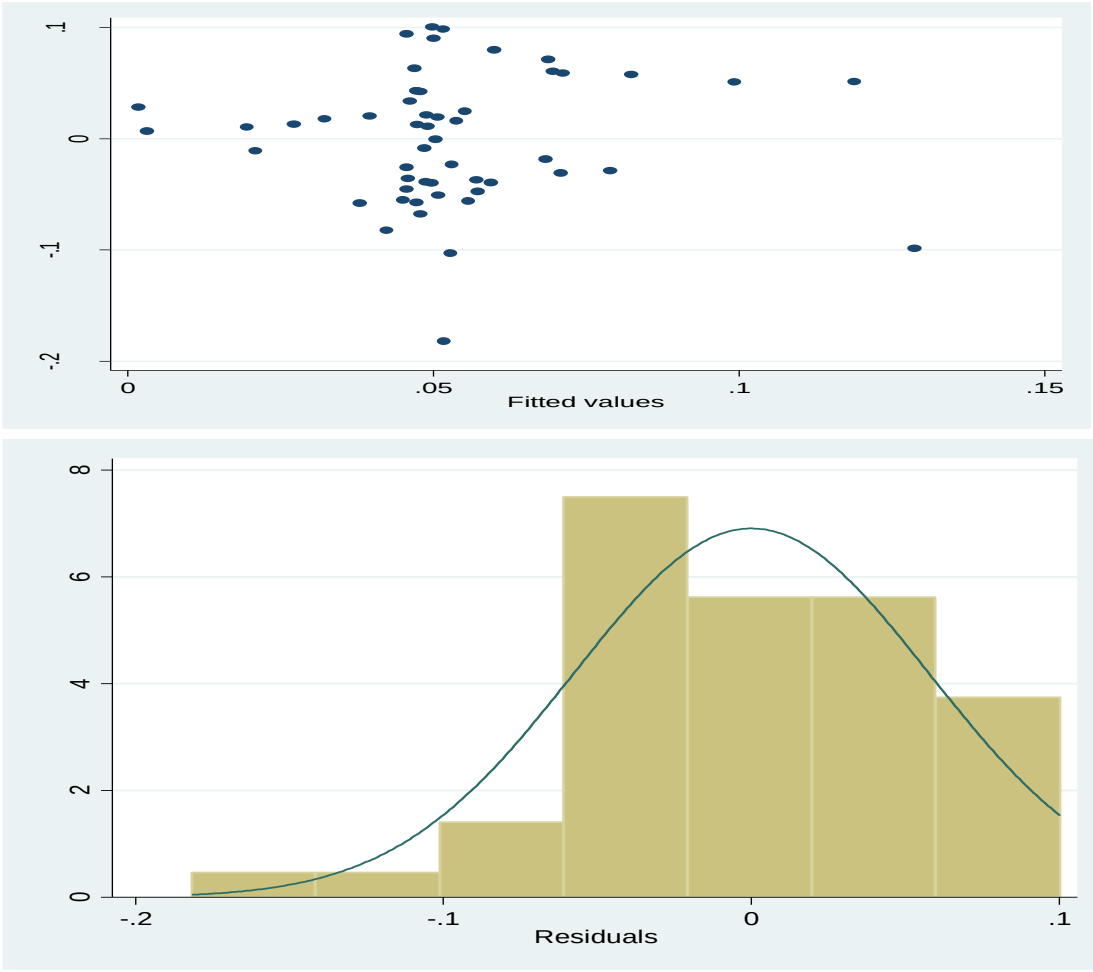
Number of obs = 50
Log likelihood = 106.0084
R-squared = .77328539
Adj R-squared = .67326425
Root MSE = .03521527

D.HPINDEX	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
ADJ						
HPINDEX						
L1.	-.02992	.0418239	-0.72	0.479	-.1149165	.0550764
LR						
HTVOLINDEX	.4401109	.705521	0.62	0.537	-.9936803	1.873902
URBPOPINDEX	-.7426485	3.421911	-0.22	0.829	-7.696808	6.211511
BCINDEX	1.46487	1.375627	1.06	0.294	-1.33074	4.260481
SR						
HPINDEX						
LD.	.5791269	.1243642	4.66	0.000	.3263884	.8318655
L2D.	-.4945314	.1300205	-3.80	0.001	-.7587648	-.2302979
HTVOLINDEX						
D1.	-.021481	.0057609	-3.73	0.001	-.0331886	-.0097734
URBPOPINDEX						
D1.	.0160448	.0914539	0.18	0.862	-.169812	.2019016
LD.	.1249604	.0611891	2.04	0.049	.0006091	.2493116
L2D.	.0978891	.0803235	1.22	0.231	-.0653479	.2611261
L3D.	-.1563339	.132131	-1.18	0.245	-.4248563	.1121886
BCINDEX						
D1.	-.0349175	.0653162	-0.53	0.596	-.1676561	.097821
LD.	-.0837372	.0621305	-1.35	0.187	-.2100016	.0425272
L2D.	-.1405113	.0615158	-2.28	0.029	-.2655266	-.0154961
L3D.	-.1428665	.0657574	-2.17	0.037	-.2765016	-.0092314
_cons	-.1500465	.0625503	-2.40	0.022	-.277164	-.022929

4.2.6Diagnostic tests.

The findings show that the residuals are normally and independently distributed with constant variance and no omitted variables. The findings indicate that the model is well specified and adequate for the analysis of the variables.

Figure 5: The scatter plot



Source: study data

Table 7: Normality Tests for Residuals

Skewness/Kurtosis tests for Normality					
	Obs	Pr(Skewness)	Pr(Kurtosis)	Adj Chi 2(2)	Prob>Chi2
Residuals	53	0.1513	0.3269	3.19	0.2032
Shapiro-Wilk W test for normal data					
	Obs	W	V	Z	Prob>z
Residuals	53	0.97214	1.372	0.677	0.24918

Table 8:Heteroskedasticity and omitted variables tests

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of D.HPINDEX
chi2(1) = 1.75
Prob > chi2 = 0.1861

Ramsey RESET test using powers of the fitted values of D.HPINDEX
Ho: model has no omitted variables
F(3, 46) = 1.84
Prob > F = 0.1540

CHAPTER FIVE: DISCUSSION AND CONCLUSION

5.1 Introduction

This chapter discusses the findings of the research in relation to the objectives of study and the linkages with other empirical findings in the literature. The objectives of the study included; to examine the impact of House trading volumes on real estate prices in Nairobi, to determine how the urban building cost index affect the real estate prices in Nairobi metropolitan and to investigate the impact of urban population on real estate prices in Nairobi metropolitan.

The main objective was to find out the determinants of real estate prices in Nairobi.

5.2 The relationship between house price index and non macroeconomic variables

5.2.1 The correlation between house price index and house sales(trading Volumes)

The correlation coefficient of negative 0.6069 between house sales index (trading volumes) and house price index seems to suggest that as number of houses sold decreases as the house prices increases. The results of the regression show a coefficient of -0.21481 with a p-value of 0.001which are consistent with the correlation results.

5.2.2 The correlation between house prices and the urban population.

The correlation coefficient of 0.8080 between urban population and house price index wich is significance at 5% level suggests that as the urban population increases the house price also increase significantly. The results of the regression show a coefficient of 0.0160 with a p-value of 0.862 which is not significant but at lag one it becomes significant with coefficient of 0.1249 with p value of 0.049 now becoming consistent with the correlation results. Borowiecki, (2009) found that house prices appears to be most sensitive to changes in population and building costs.the findings in this study are in agreement to the study by Chen and Guo, (2010) which

found that domestic migration is deemed as an influential factor of housing price in cities through its influence on urban population growth. The study also hypothesizes that there should be a positive relationship between population and housing prices.

5.2.3 The correlation between house prices and the building cost index

The correlation coefficient of 0.9825 between building cost index and house price index suggests that as the building cost increases, the house price also increase significantly. However the results of the regression show a coefficient of -0.3492 with a p-value of 0.596 which is not significant but at lag 2 and 3 it becomes significant with coefficient of -0.141 and -0.143 respectively with significance levels at 5% suggesting that as the building cost increases it causes the house price to increase until it reaches a point at lag 2 whereby as the building cost increases, and the same cost is passed to the buyer which pushes the house price to shoot in the short run but due to high house prices the demand declines which automatically corrects the prices downwards to affordable levels.This is evidenced in Shiller's study,(1996) which found that house buyers' manifests very positive expectations on house prices increase as building costs increases. This was also found out in the empirical study by Borowiecki, (2009) which found that house prices and construction activity appears to be most sensitive to changes in population and building costs.

5.2.4 The correlation between urban population index and house trading volumes

Urban population and house trading volumes have a negative correlation with coefficient of 0.5781 which is significant at 5% level. This implies that as the urban pupolation increases the house sales decrease a clear indication that the increasing population group either resides in slums or rent the houses. These findings go against the theoretical argument put across by Weil

and Wilde, (2010) which suggested that increase in population was likely to increase the number of houses sold in reference to Malthusian theory of population.

5.2.5 The correlation between Building cost index and house trading volumes

Building cost index and house trading volumes have a negative correlation of 0.5576 which is significant at 5% level.This implies that as the Building cost index increased,the number of houses sold decreases.

5.2.6 The correlation between Building cost index and urban population

Building cost index and urban population have a very strong positive correlation of 0.8069 which is significant at 5% level. This implies that the two variables are positively correlated as the one increases causes the other to increase. This was found out in the empirical study by Borowiecki, (2009) which found that house prices and construction activity appears to be most sensitive to changes in population and building costs.

5.3Conclusion

Using both descriptive and econometric models, this study tested for real estate price in Nairobi Metropolitan region. The sample period (2004Q1-2017Q2) was dictated by the fact that quality real estate price series data was not available for a longer period. First the house prices in Nairobi have a very strong relationship to the variables. More specifically there is a strong positive correlation which was observed between house price and urban population and building cost index. ECM confirmed that there is no stable long-run relationship and points to a short-run cointegration relationship between variables.The results further found that the short run coefficients of house sales (trading volumes) has a significant impact on house price (sig. =0.001), and one percentage increase in house sales leads to a 0.0215% decrease in house price,

the short run coefficients of urban population at lag 1 has a significant impact on house price (sig. = 0.049) and 1% increase in population will lead to increase of 0.125% in house price at second quarter. On Building cost index coefficients, at lags 2 and 3 have a significant impact on house price (sig. =0.029 and 0.037 respectively) and 1% increase in building cost index will lead to 0.14% and 0.142% decrease in house price respectively.

This is explained by the regression result which indicates that more than 67.33% of the variables affecting house prices can be explained by the independent variables considered in this study.

5.4 Recommendations

This study was carried out to find out the determinants of real estate prices in Nairobi Metropolitan with an aim of establishing the effects of non-macroeconomic fundamentals on real estate prices. From the findings this research cautions that the real estate sector is a very local issue and each empirical approach with national perspective may be skewed because of the notably heterogeneous nature of real estate hence need for further regular studies.

References

Ball, M., Morrison, T., & Wood, A. (1996). Structures Investment and Economic Growth: A Long-Term International Comparison. Urban Studies, 33(9), 1687-1706.

Banks, J., Smith, J. P., & Blundell, R., 2010. House Price Volatility and the Housing Ladder House Price Volatility and the Housing Ladder. Germany.

Baum-Snow, Nathaniel. 2007. "Did highways cause suburbanization? "*The Quarterly Journal of Economics 122, no. 2: 775-805.*

Björk, H., 2013. A New Approach in the Behaviour of House Prices.

Capozza, D., P. Hendershott and C. Mack (2004). An anatomy of price dynamics in illiquid markets: Analysis and evidence from local housing markets, Real Estate Economics, 32, 1-32.

Casty Gatakaa Mbae/Njoroge: Is There a Real Estate MarketBoom or Bubble in Urban Kenya? A Case Study of Residential Real-estate in Nairobi Metropolitan Region.

Charles P. Kindle Berger, *Manias, Panics and Crashes,* 2nd ed. (London: Macmillan, 1989), p. 90.

Chen, J. , Guo, F. and Wu, Y. (2011) One decade of urban housing reform in China: *Urban housing price dynamics and the role of migration and urbanization, 1995– 2005. Habitat International, Vol. 35, pg 1-8.*

Chinco, A. M., and C. J. Mayer, 2012, Distant Speculators and Asset Bubbles.

David N. Weil and Joshua Wilde,2010, How Relevant is Malthus for Economic Development Today?

Edward L. Glaeser,Housing Market," NBER Working Paper, pp. 1{52.*a nation of gamblers:real estate speculation and american history,feb 2013.*

Engle, R. F., and C. W. J. Granger (1987), “Co-integration and Error: Representation, Estimation and Testing”, Econometrica, Vol.55: 251-276.

Ely, Richard Theodore. 1920. "Land Speculation." *Journal of Farm Economics 2, no. 3: 121 135.*

Feinstein, J., &McFadden, D., 1989. The Dynamics of Housing Demand by the Elderly:Wealth, Cash Flow, and Demographic Effects (pp. 55–92).

Gabriel, S., J. P. Mattey, and W. Wascher (1999). House price differentials anddynamics: Evidence from the Los Angeles and San Francisco metropolitan areas.FRBSF Economic Review, 3, 22.

Garino, G. and L. Sarno (2004), “Speculative Bubbles in UK House Prices: Some New Evidence”, *Southern Economic Journal*, Vol.70: 777-795.

Grant, Charles S. 1955. "Land Speculation and the Settlement of Kent, 1738-1760." The New England Quarterly 28, no. 1: 51-71.

Haughwout, A., D. Lee, J. Tracy, and W. van der Klaauw, 2011, Real Estate Investor, theLeverage Cycle, and the Housing Market Crisis," Federal Reserve Bank of New York Station.

Himmelberg, C., C. Mayer and T. Sinai (2005), “Assessing High HousePrices: Bubbles, Fundamentals and Misperceptions”, *Journalof Economic Perspectives, Vol. 19: 67-92.*

Kwiatkowski, D., Phillips, P. C., Schmidt, P. & Shin, Y., 1992. Testing the null hypothesis of Stationarity against the alternative of a unit root - How sure are we that economic time series have a unit root*? Journal of Econometrics, Volume 54, pp. 159-178.*

KNBS,economic survey,2016)

Li, W., and Z. Gao, 2013, \Real Estate Investors and the Boom and Bust of the US Housing

Malpezzi, S., 1999. Economic Analysis of Housing Markets in Developing and Transition Economies.Market," SSRN Working Paper, pp. 1{38.Reports 514.

MacKinnon, J.G. (1991), Critical Values for Cointegration Tests, InEngle, R.F. and Granger, C.W.J. (eds), Long-run Economic Relationships in Cointegration. Oxford: Oxford University Press. O'Flaherty, B. (1994). *Land assembly and urban renewal, Regional Science and Urban Economics 24, 287-300.*

Mankiw, N. G., & Weil, D. N., 1989. The Baby Boom, the Baby Bust, and the Housing Market. Science, Regional Economics, Urban, 19, 235–258.

Mundlak, Yair, Donald F Larson and Al Crego, 1997, "Agricultural Development: Issues, Evidence, and Consequences," Policy Research Working Paper, The World Bank Development Research Group.

Olima, W.H.O. (2001), *The Dynamics and Implications of Sustaining Urban Spatial Segregation in Kenya-Experiences from Nairobi Metropolis*,

Omwenga, M. (2008), Urban Growth and Sprawl: Case Study of Nairobi.
Paper presented at the World Urban Forum 4, 3-9 November,2008, Nanjing, China.

Potepan, M. (1994). Intermetropolitan migration and housing prices: Simultaneously determined? *Journal of Housing Economics, 3, 77-91.*

Robert J. Shiller 2005 "Irrational Exuberance, Second Edition"

Shiller, Robert, 1996, "Speculative Booms and Crashes," in F Capie and G E Wood (Eds), Monetary Economics in the 1990s, London: Macmillan.

Swan, C., 1995. Demography and the demand for housing, a reinterpretation of the Mankiw-Weil demand variable. Regional Science and Urban Economics, 25(1), 41–58.

Tuñón, M. (2006). Internal Labour Migration in China: Features and Responses. ILO office, Beijing, China.

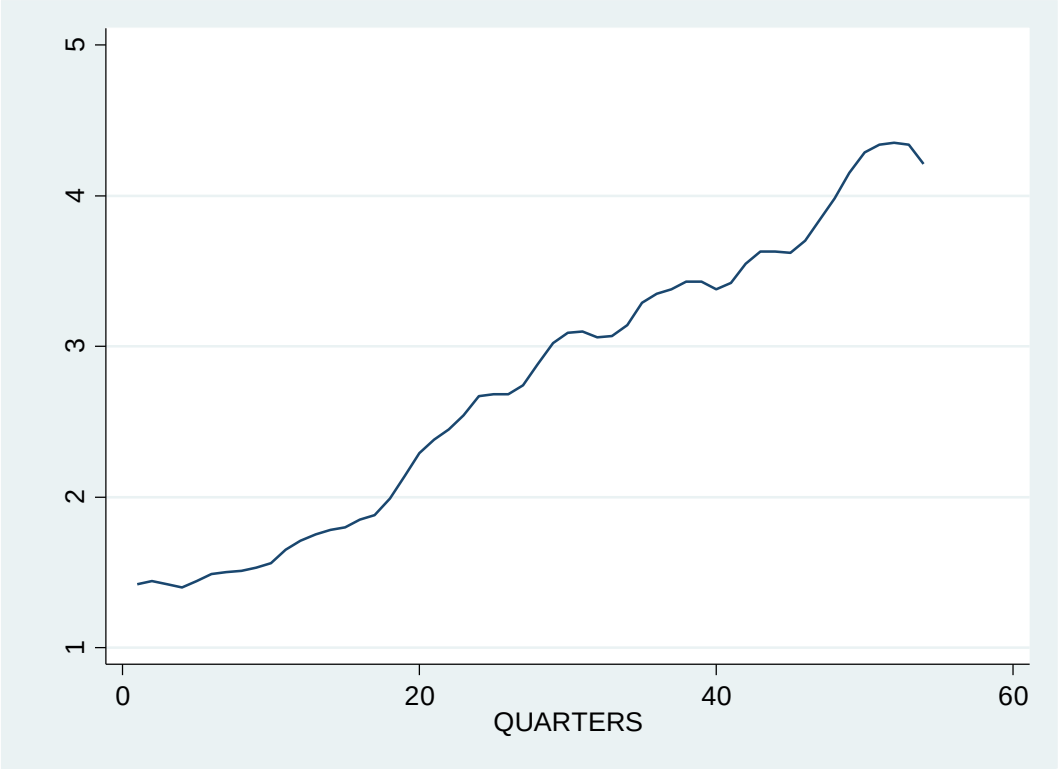
Xiao, Q., & Tan, G.K.R. (2007). Signal extraction with Kalman filter: A study of the Hong Kong property price bubbles. *Urban Studies, 44(4), 865-888.*

Zheng, S. , Kahn, M. and Liu, H. (2009) Towards a system of open cities in China: Home prices, FDI flows and air quality in 35 major cities. *Journal of Regional Science and Urban Economics, Vol. 40(1), pg 1-10.*

APPENDICES

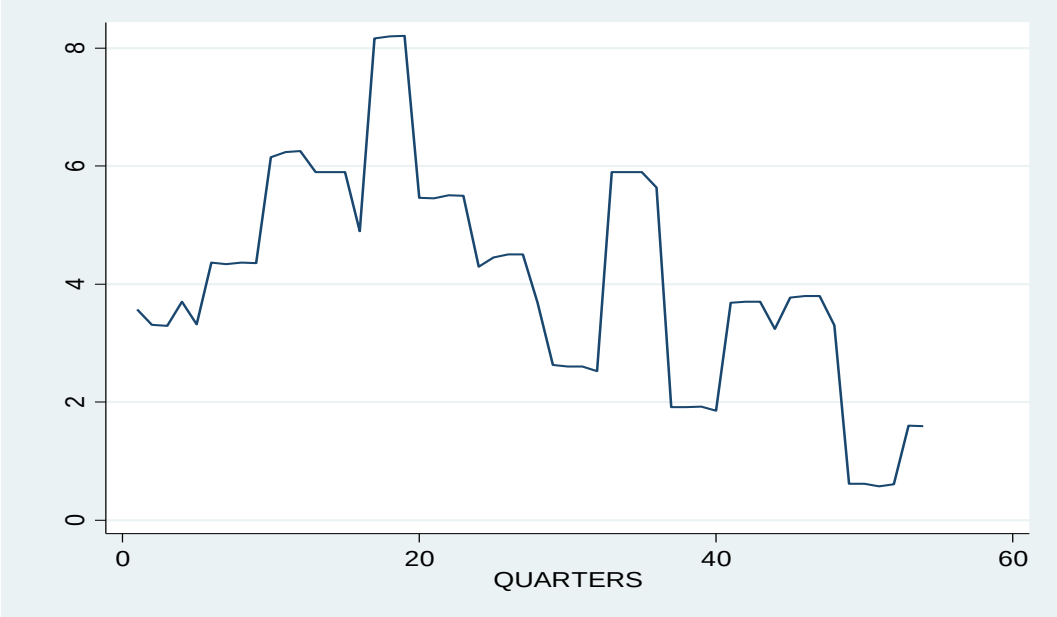
Appendix 1

Time series line HPINDEX.



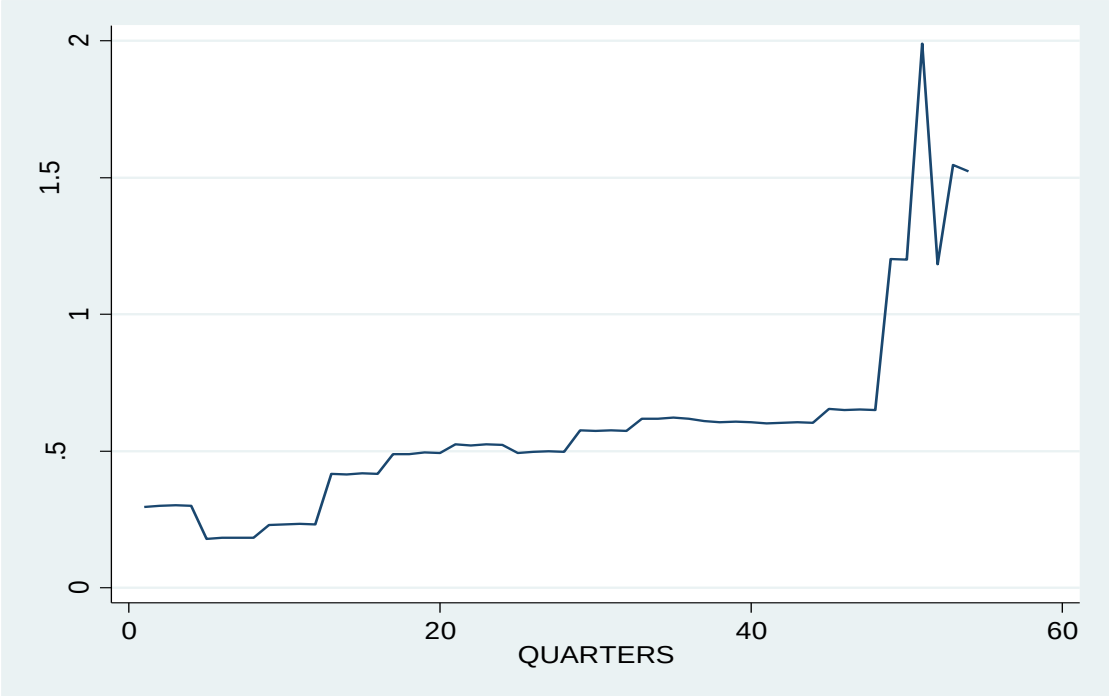
Appendix 2

Time series line HTVOL INDEX



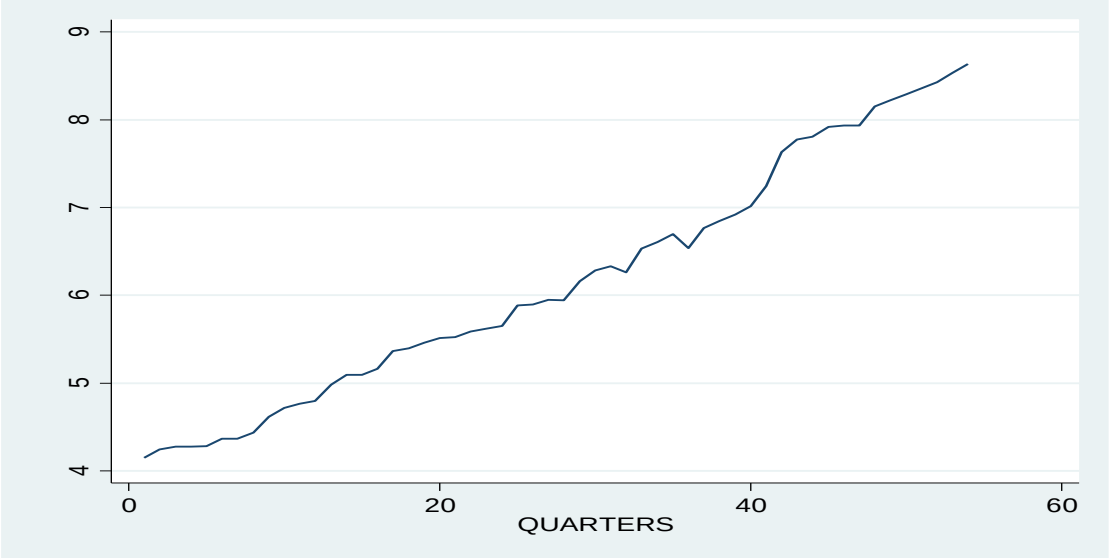
Appendix 3

Time series line URBPOPINDEX



Appendix 4

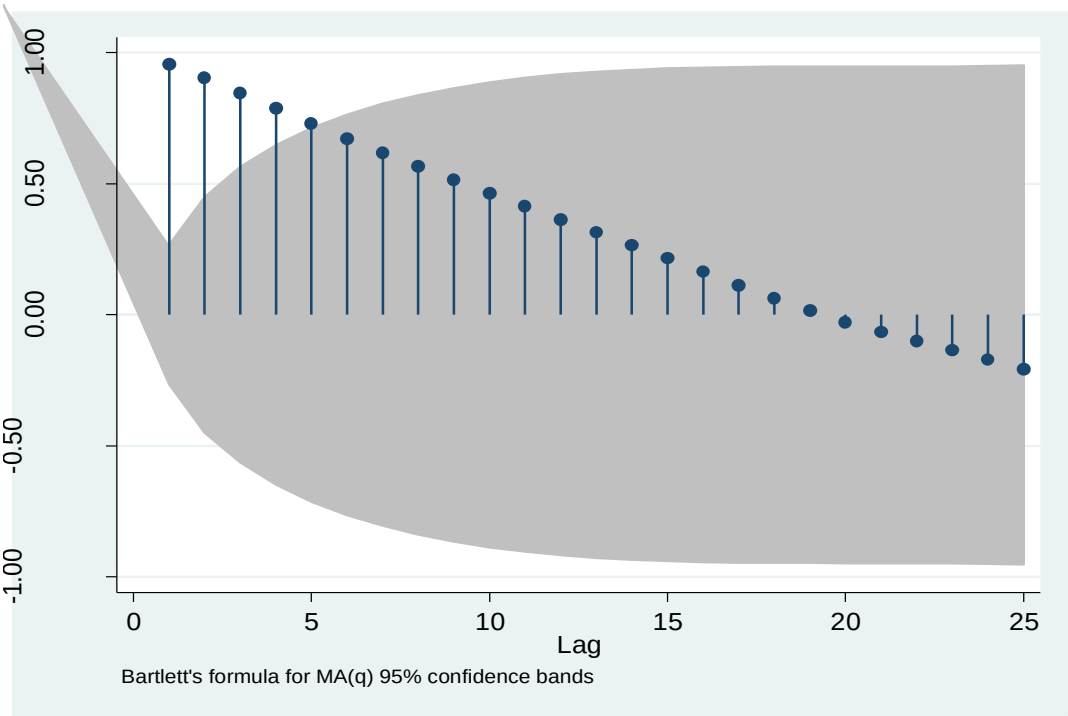
Time series line BCINDEX



Appendix 5

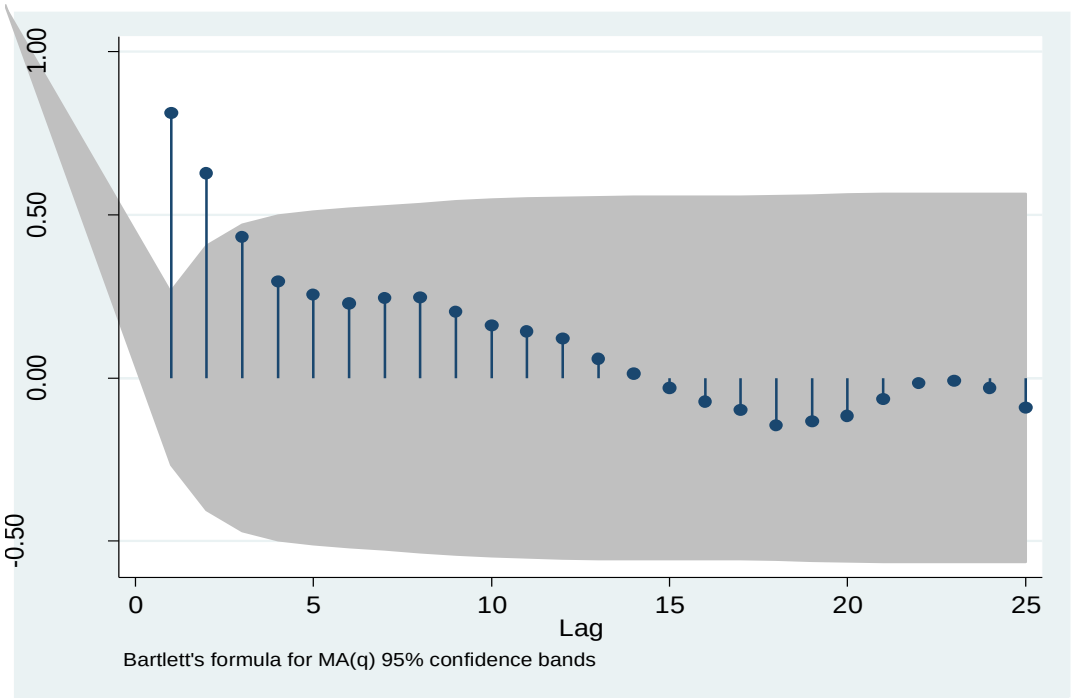
Collelograms

Ac HPINDEX



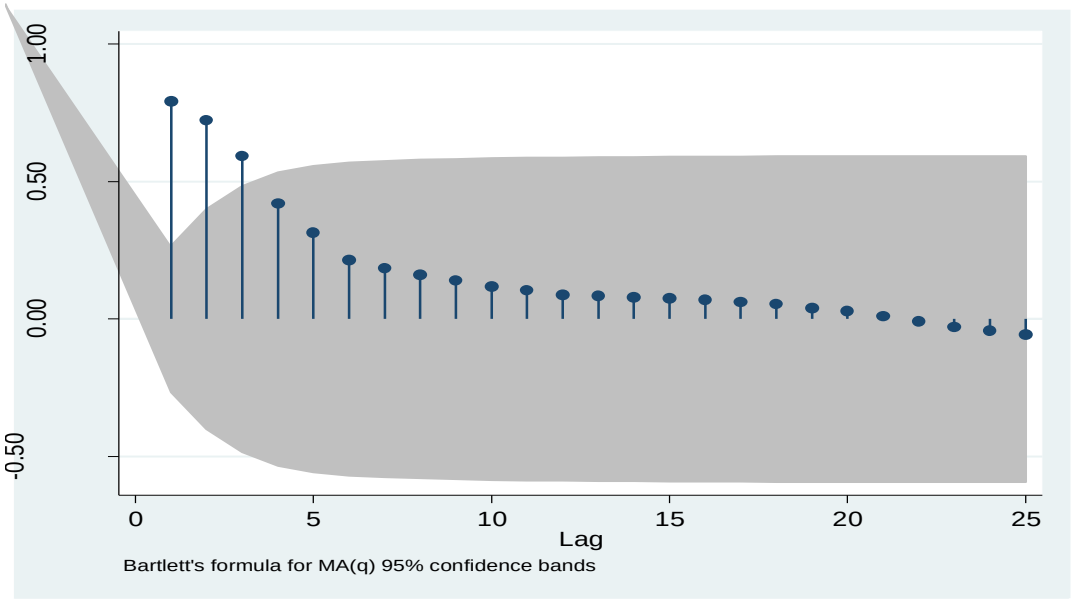
Appendix 6

Ac htvolindex



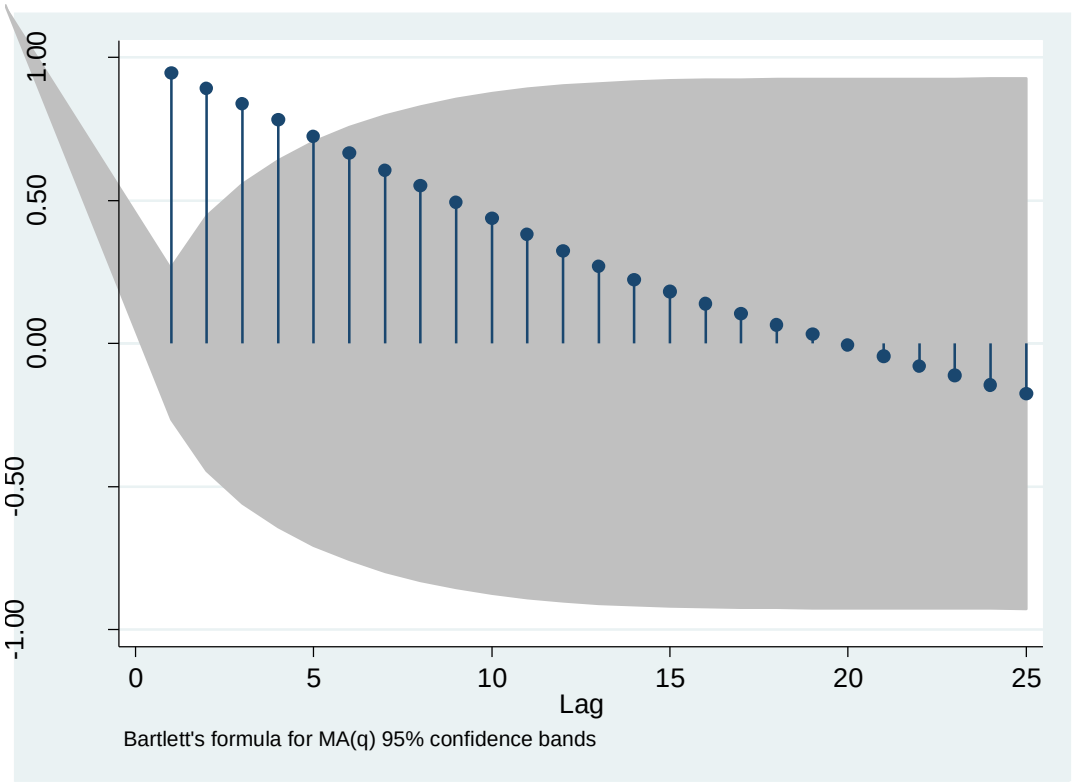
Appendix 7

Ac urbnpopindex



Appendix 8

Ac bcindex

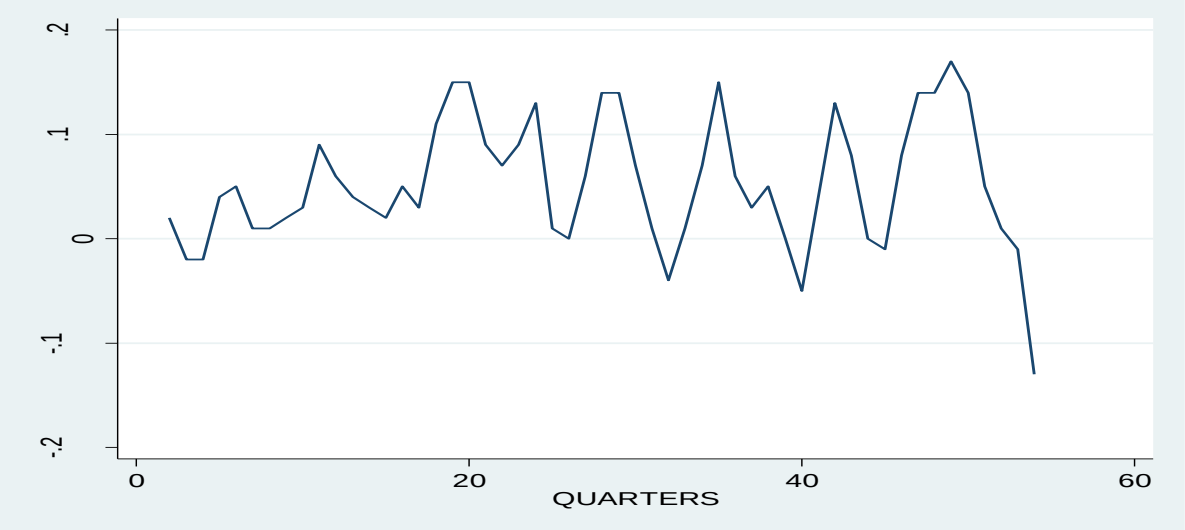


Appendix 9

```
. pperron D.HPINDEX

Phillips-Perron test for unit root                 Number of obs   =        52
                                                   Newey-West lags =         3

                         ---------- Interpolated Dickey-Fuller ----------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(rho)          -19.495          -18.936           -13.316          -10.712
 Z(t)             -2.934           -3.577            -2.928           -2.599
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0415

. pperron D.HTVOLINDEX

Phillips-Perron test for unit root                 Number of obs   =        52
                                                   Newey-West lags =         3

                         ---------- Interpolated Dickey-Fuller ----------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(rho)          -50.537          -18.936           -13.316          -10.712
 Z(t)             -7.218           -3.577            -2.928           -2.599
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

. pperron D.URBPOPINDEX

Phillips-Perron test for unit root                 Number of obs   =        52
                                                   Newey-West lags =         3

                         ---------- Interpolated Dickey-Fuller ----------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(rho)          -83.941          -18.936           -13.316          -10.712
 Z(t)            -12.701           -3.577            -2.928           -2.599
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

. pperron D.BCINDEX

Phillips-Perron test for unit root                 Number of obs   =        52
                                                   Newey-West lags =         3

                         ---------- Interpolated Dickey-Fuller ----------
                 Test         1% Critical       5% Critical      10% Critical
               Statistic           Value             Value            Value
------------------------------------------------------------------------------
 Z(rho)          -49.525          -18.936           -13.316          -10.712
 Z(t)             -7.503           -3.577            -2.928           -2.599
------------------------------------------------------------------------------
MacKinnon approximate p-value for Z(t) = 0.0000

.
```

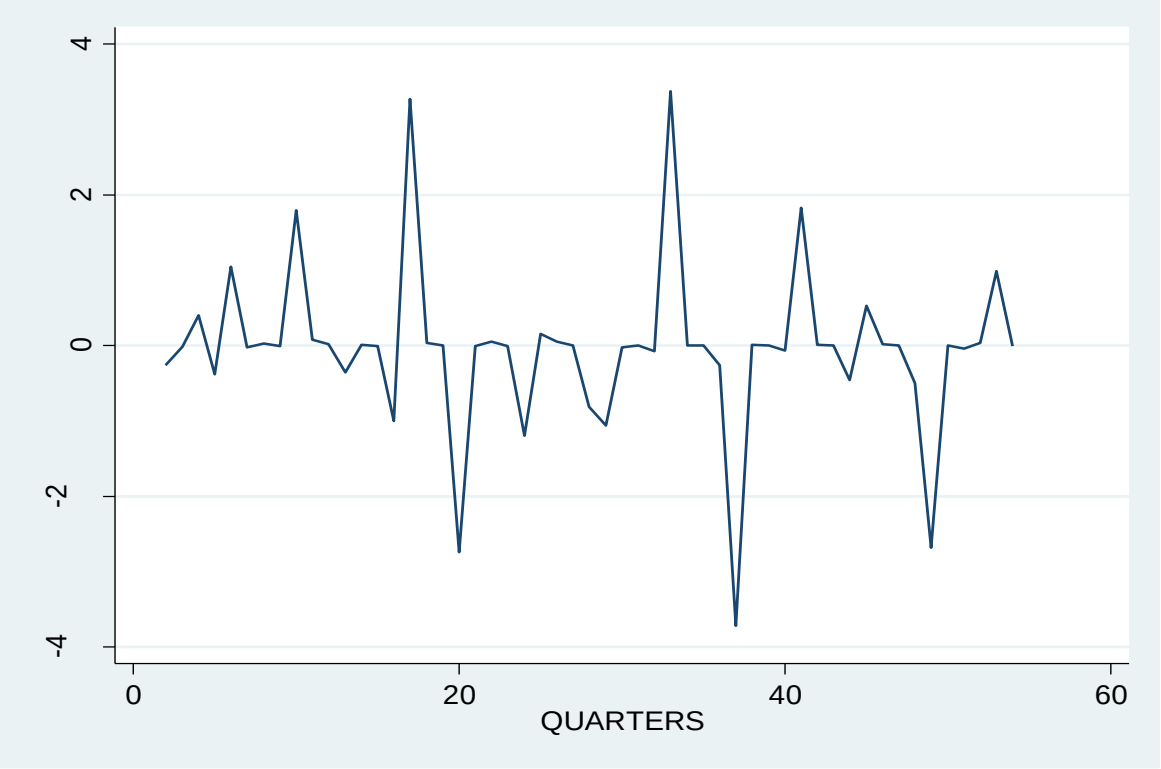
Appendix 10

Tsline D.HPINDEX



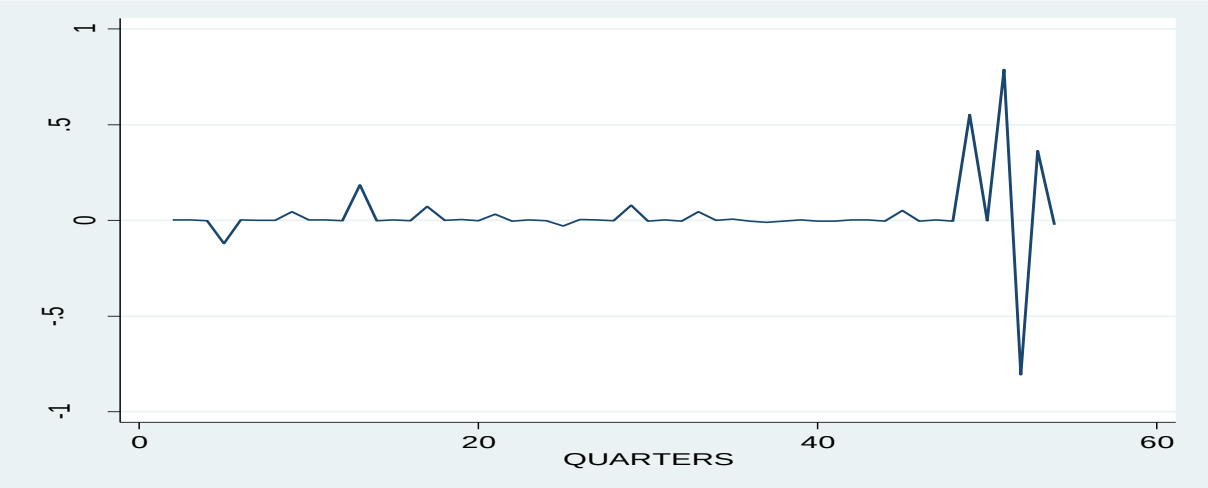
Appendix 11

Tsline htvolindex



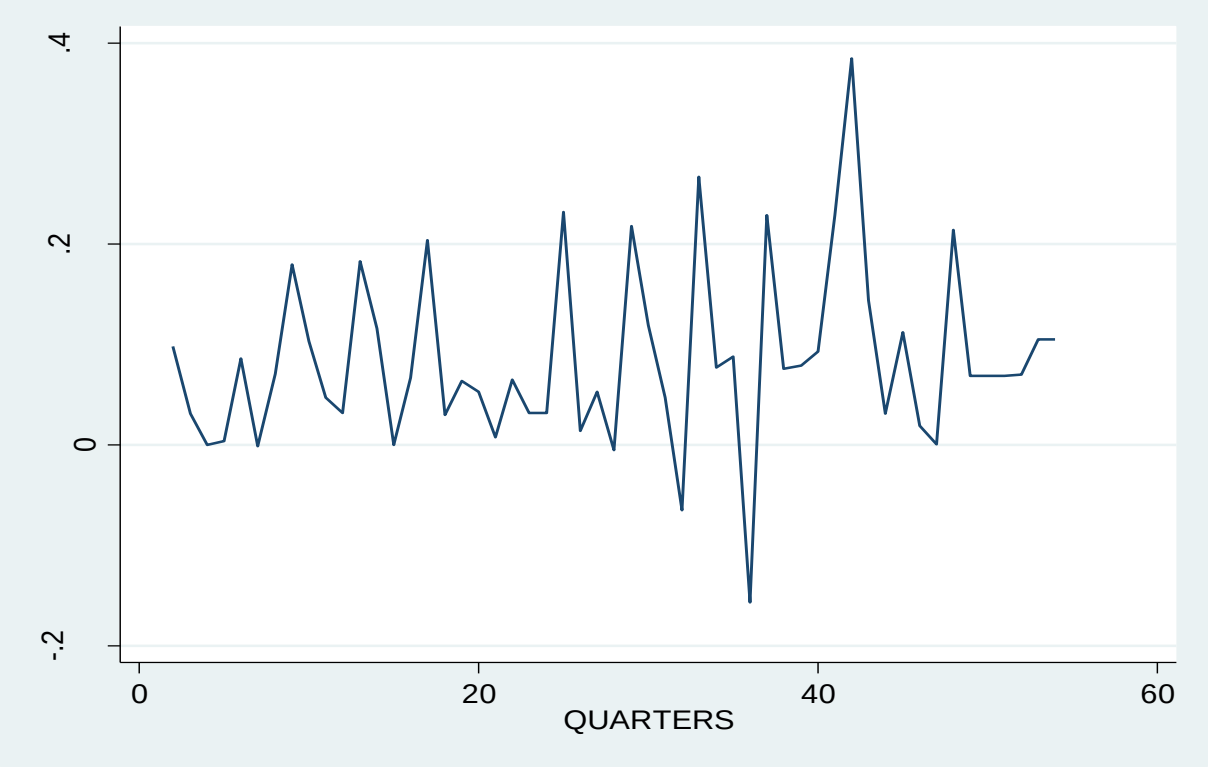
Appendix 12

Tsline urbnpopindex



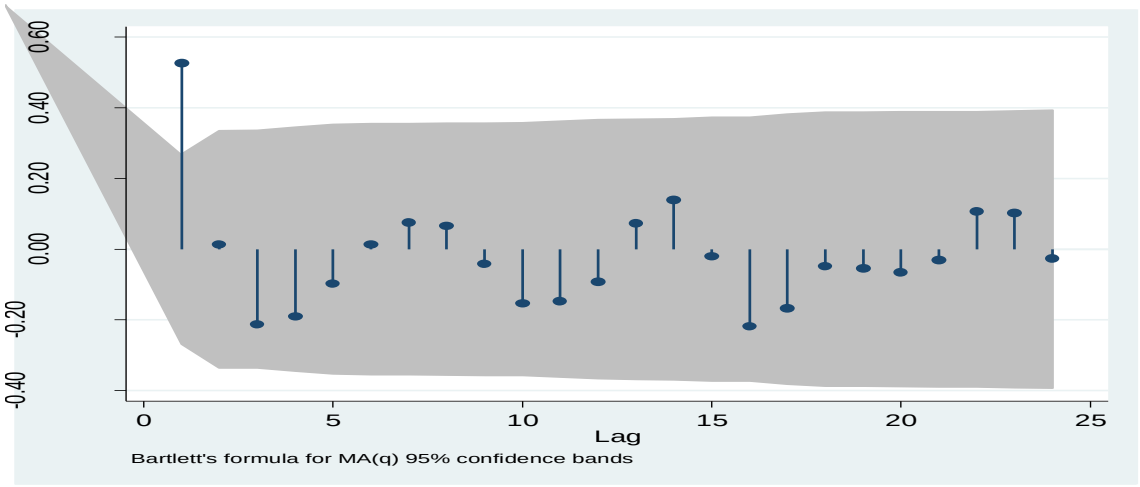
Appendix 13

Tsline D.BCINDEX



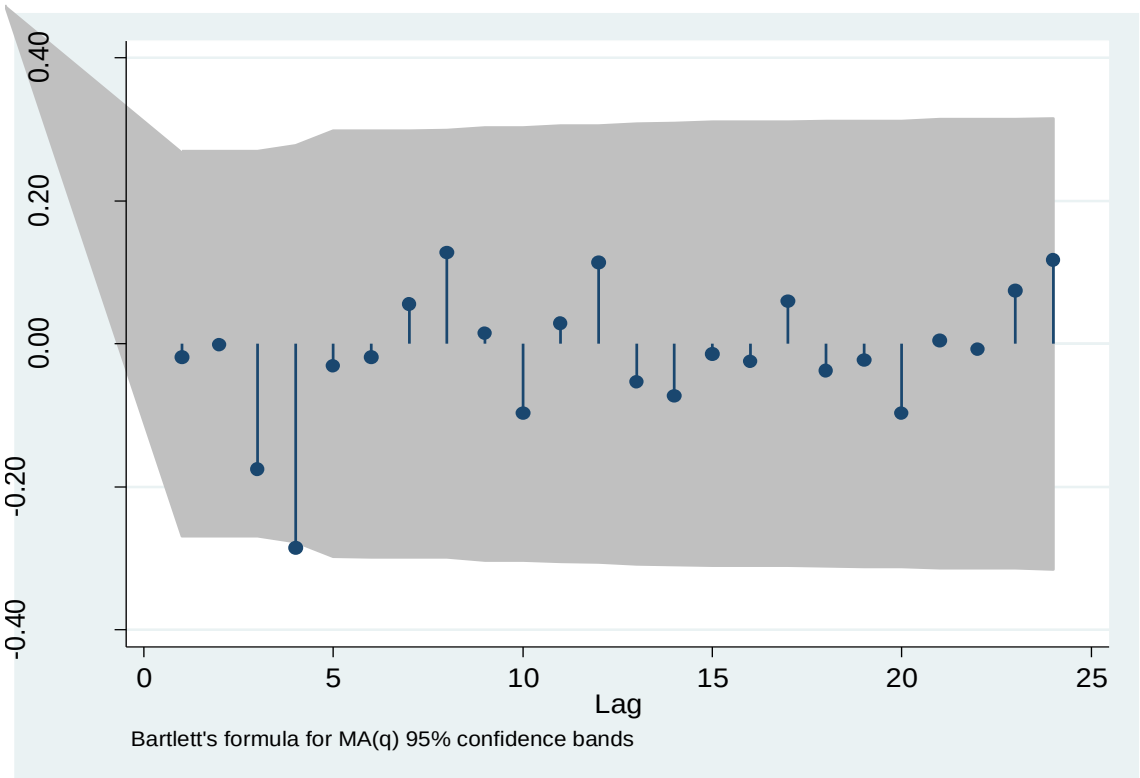
Appendix 14

Ac for D.HPINDEX



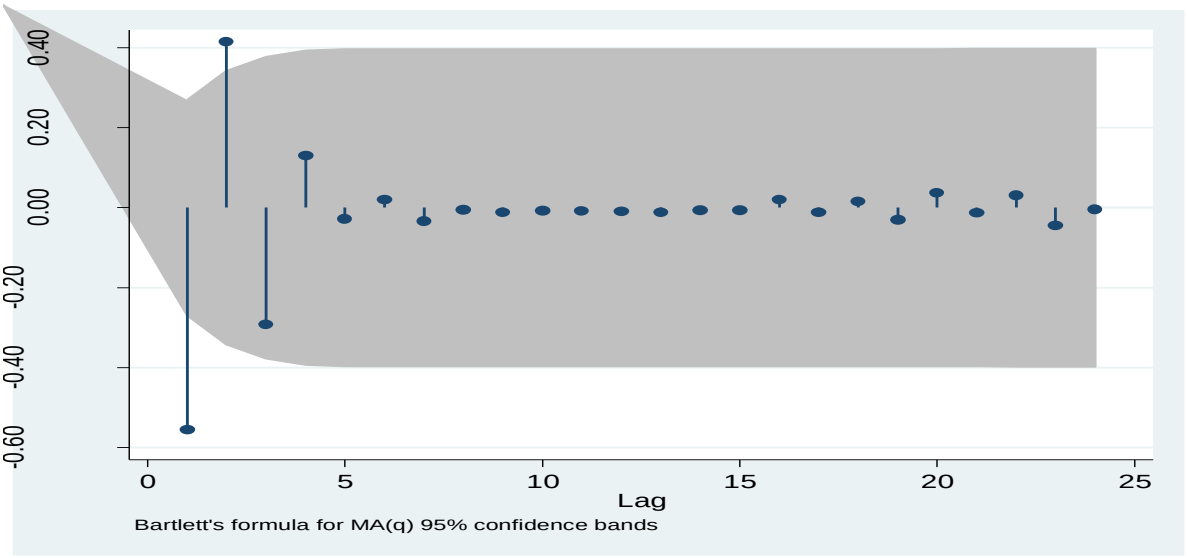
Appendix 15

Ac of D.HTVOLINDEX



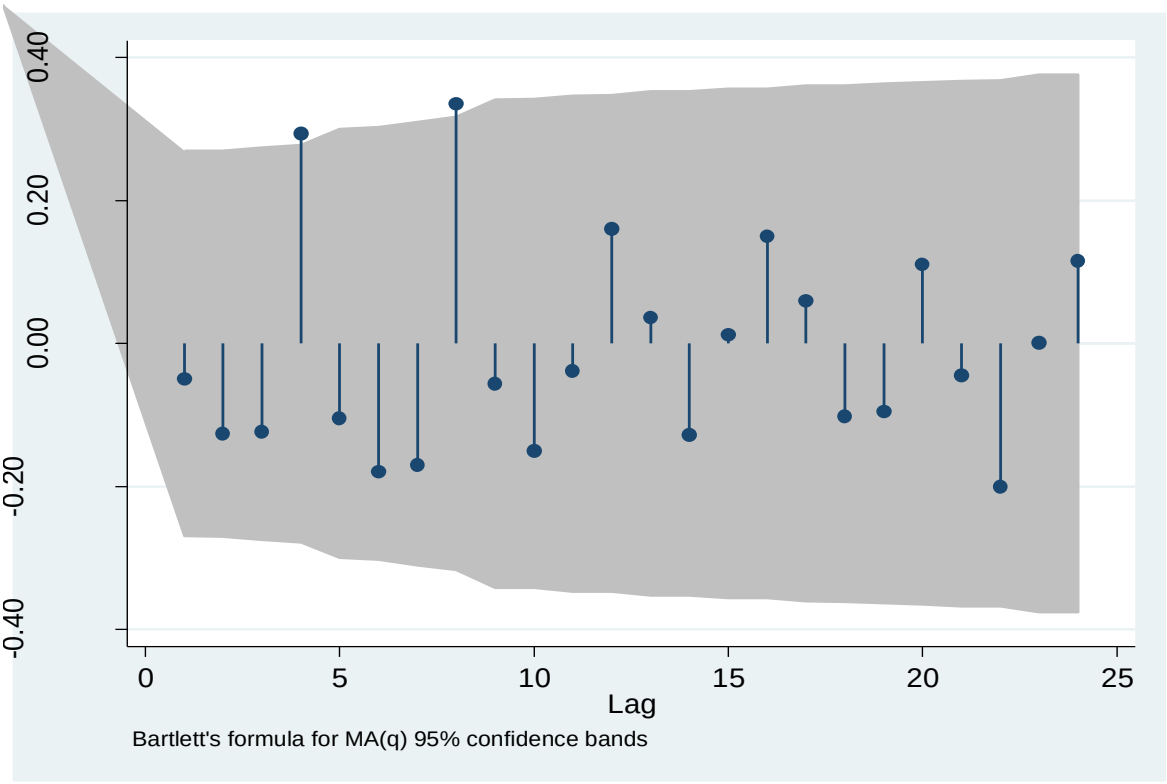
Appendix 16

Ac of D.URBANPOPINDEX



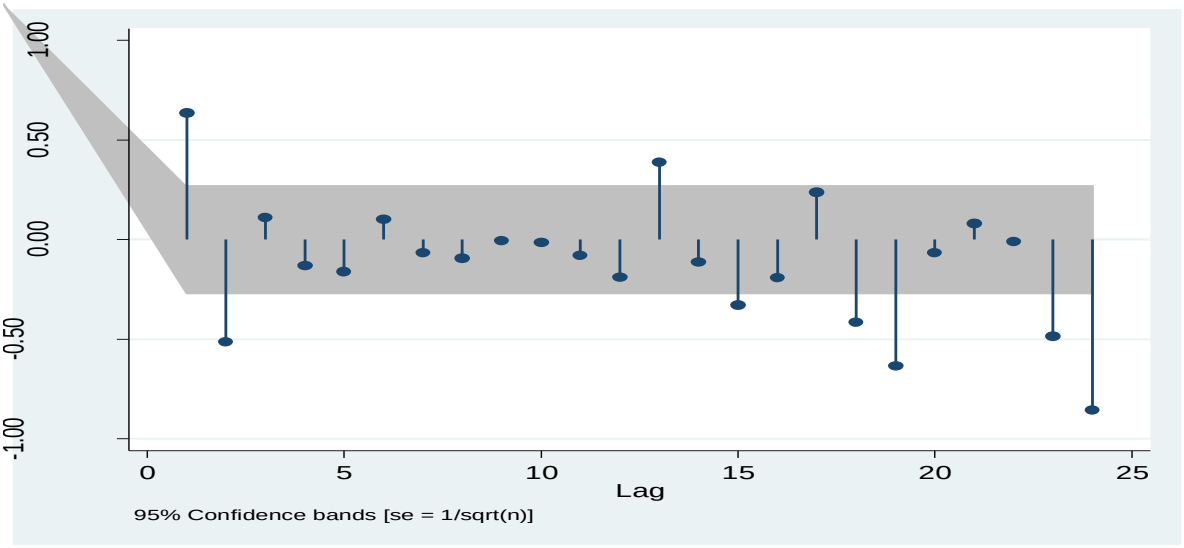
Appendix 17

Ac for BCINDEX

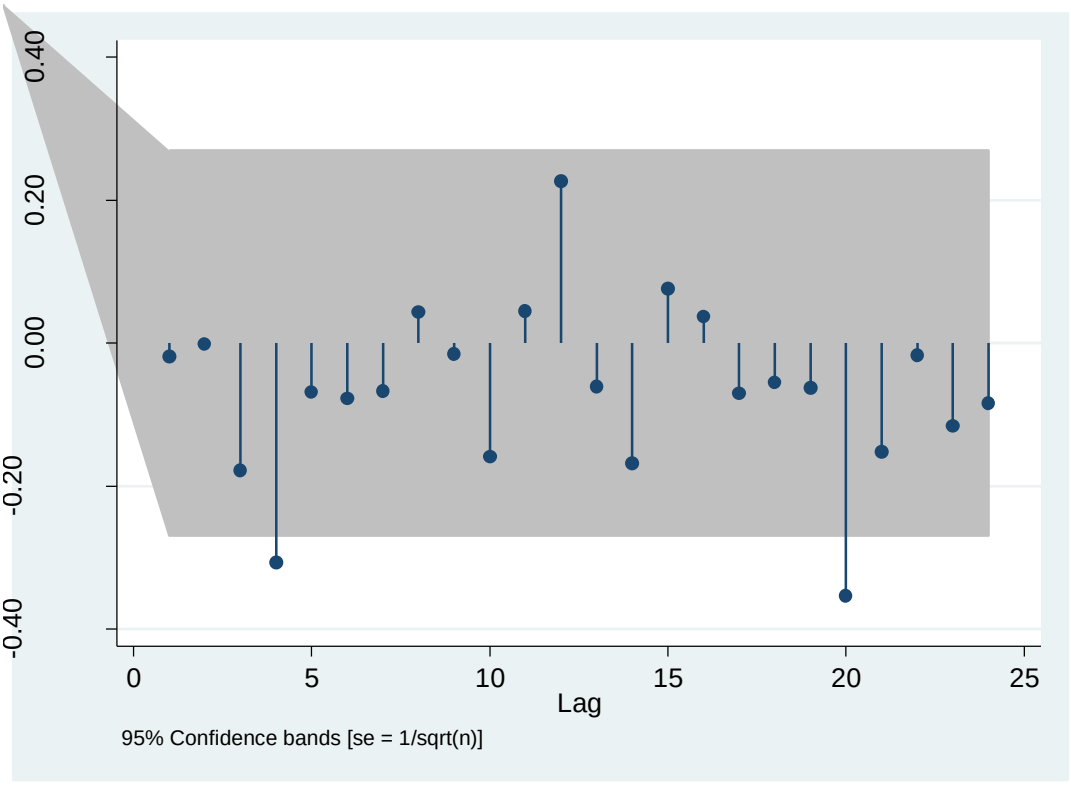


Appendix 18

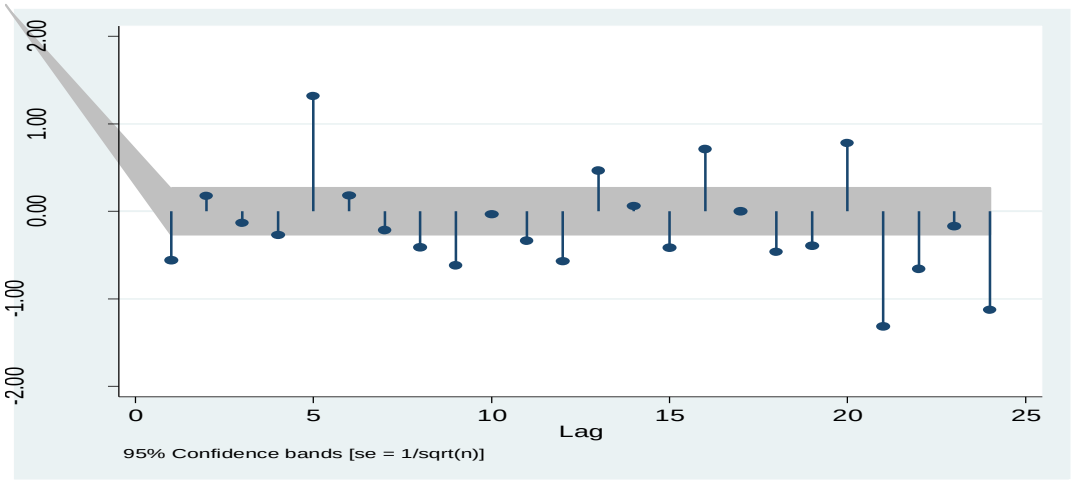
Partial autocorrelations



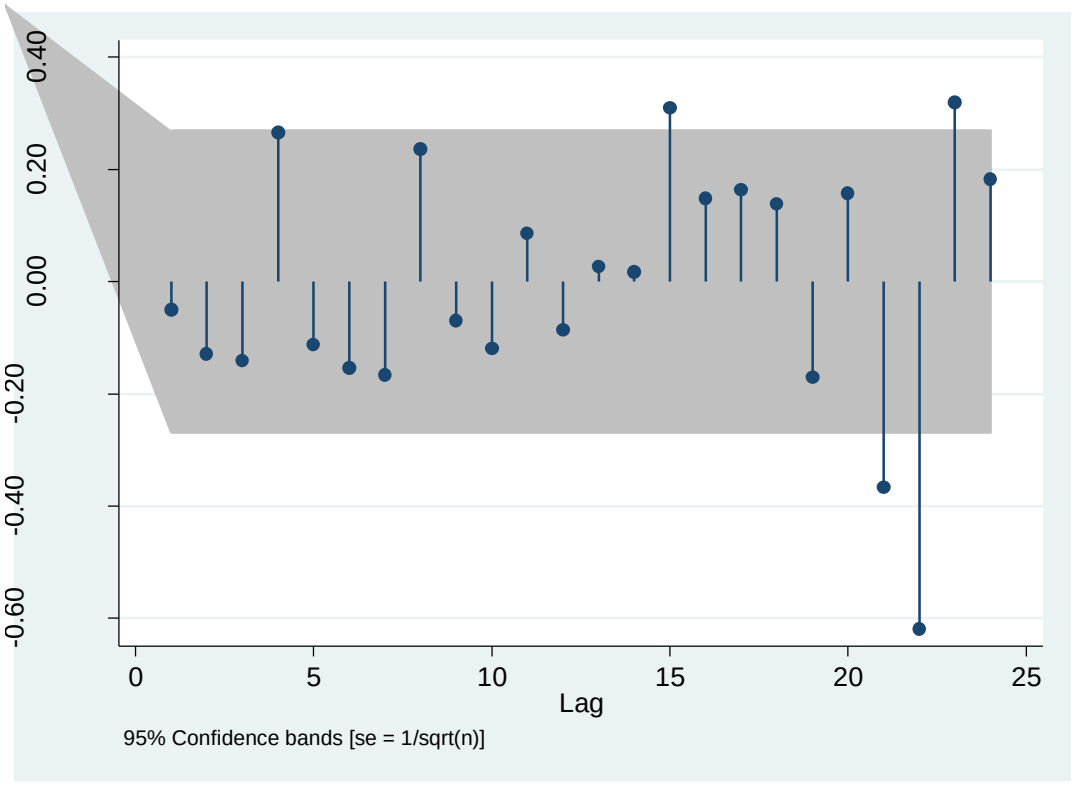
Appendix 19



Appendix 20

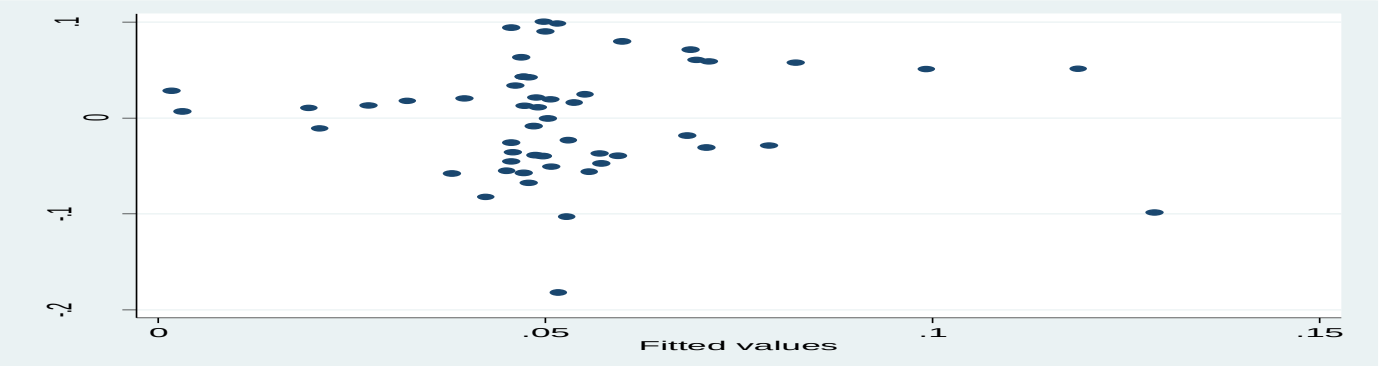


Appendix 21



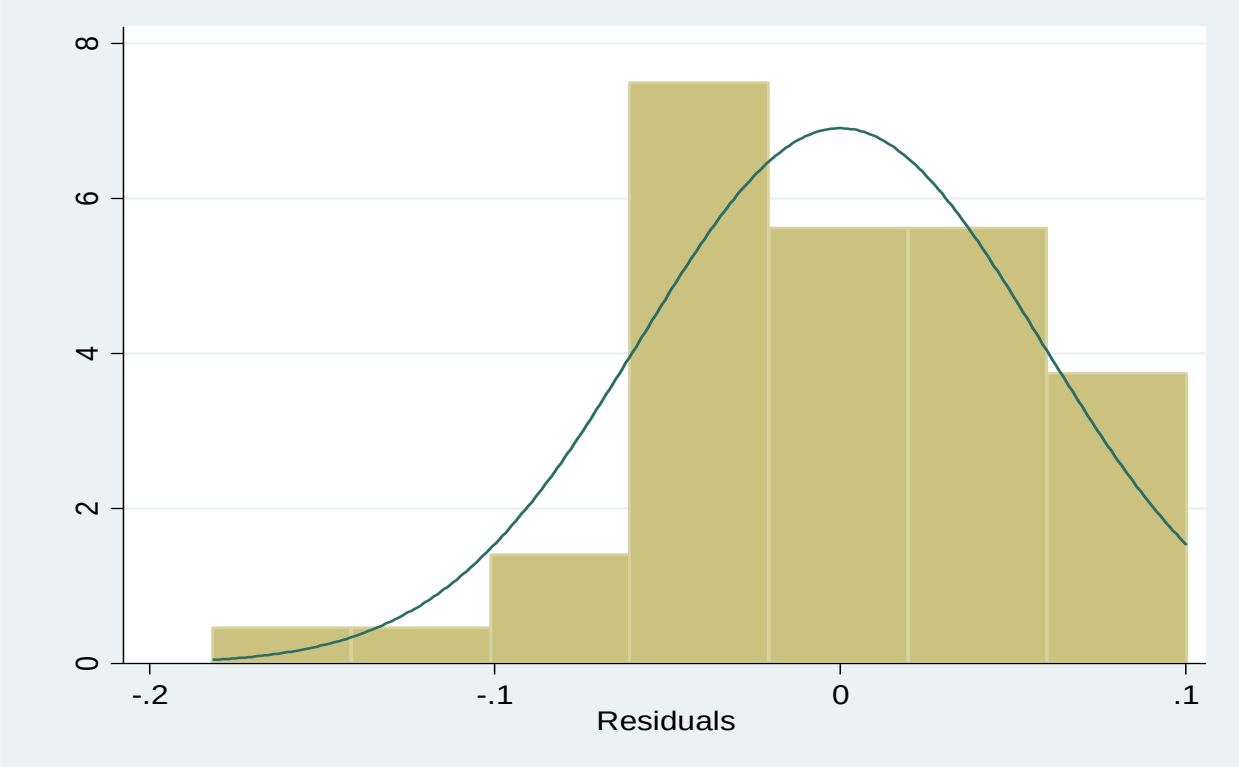
Appendix 22

Rvf plot



Appendix 23

Normality test



Appendix 24

QUARTERS	HPINDEX	HTVOLINDEX	URBPOPINDEX	BCINDEX
1	1.42	3.573	0.296	4.146
2	1.44	3.308	0.299	4.244
3	1.42	3.295	0.301	4.275
4	1.4	3.7	0.299	4.275
5	1.44	3.318	0.179	4.279
6	1.49	4.362	0.182	4.365
7	1.5	4.341	0.183	4.364
8	1.51	4.369	0.183	4.435
9	1.53	4.359	0.229	4.615
10	1.56	6.155	0.231	4.718
11	1.65	6.237	0.233	4.765
12	1.71	6.252	0.232	4.797
13	1.75	5.894	0.417	4.98
14	1.78	5.901	0.415	5.096
15	1.8	5.897	0.418	5.096
16	1.85	4.892	0.416	5.163
17	1.88	8.164	0.488	5.367
18	1.99	8.199	0.489	5.397
19	2.14	8.204	0.494	5.461
20	2.29	5.459	0.492	5.514
21	2.38	5.455	0.524	5.522
22	2.45	5.505	0.521	5.587
23	2.54	5.498	0.524	5.619
24	2.67	4.297	0.522	5.651
25	2.68	4.448	0.493	5.883
26	2.68	4.502	0.497	5.897
27	2.74	4.502	0.499	5.95
28	2.88	3.688	0.497	5.945
29	3.02	2.629	0.576	6.163
30	3.09	2.602	0.573	6.282
31	3.1	2.602	0.576	6.329
32	3.06	2.53	0.573	6.264
33	3.07	5.902	0.617	6.531
34	3.14	5.9	0.617	6.608
35	3.29	5.898	0.623	6.696

36	3.35	5.637	0.619	6.539
37	3.38	1.913	0.609	6.768
38	3.43	1.919	0.605	6.844
39	3.43	1.922	0.608	6.923
40	3.38	1.857	0.605	7.016
41	3.42	3.686	0.601	7.245
42	3.55	3.699	0.603	7.63
43	3.63	3.699	0.606	7.774
44	3.63	3.244	0.603	7.805
45	3.62	3.776	0.654	7.917
46	3.7	3.798	0.65	7.936
47	3.84	3.799	0.653	7.937
48	3.98	3.301	0.649	8.151
49	4.15	0.619	1.202	8.22
50	4.29	0.618	1.201	8.289
51	4.34	0.576	1.99	8.358
52	4.35	0.611	1.184	8.428
53	4.34	1.602	1.547	8.533
54	4.21	1.598	1.523	8.638