THE DYNAMIC RELATIONSHIP BETWEEN UK HOUSING FINANCE, HOUSE PRICES AND THEIR INTERPLAY WITH MACROECONOMIC INDICATORS

A thesis submitted to the Faculty of Computing, Engineering and the Built Environment (CEBE), Birmingham City University, in partial fulfilment of the requirements for the degree of

Doctor of Philosophy

Bismark Aha

BSc (KNUST), MSc (LSE)

2022

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DECLARATION

I declare that this work or any part thereof has not previously been submitted in any form to the University or to any other body whether for the purpose of assessment, publication or for any other purpose.

I confirm that the thesis submitted is entirely my own work and based on my own research; that all sources used are appropriately acknowledged and that where the words of others are used these are clearly placed in quotation marks.

……..……..

AHA BISMARK

(Candidate)

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Thanks be to God almighty who always gives us victory through our Lord Jesus Christ!

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ABSTRACT

A strong, stable and vibrant residential housing market occupies a pivotal position in any mature economy. In the United Kingdom, due to the high owner-occupation rate and the large stock of residential mortgage debt, house price trends attract considerable interest from economists, politicians, lenders and the general public. Over the last five decades, there have been noticeable increases in UK house prices. In particular, house price growth from the late 1990s to 2007 was both substantial and volatile, outpacing inflation and income growth. House price-to-income (PTI) ratios more than doubled between 1995 and 2006 and affordability worsened. At the same time, the UK mortgage market witnessed significant transition and expansion aided by the deregulation and liberalisation of the financial and mortgage markets in the 1980s.

This study contributes to and extends current knowledge on the linkages between house prices and housing finance. The study empirically examines the role of housing finance in the cyclicality within the UK housing market over a fifty-year period:1968 to 2018. In addition to establishing the macroeconomic indicators associated with house price growth, the key drivers of the mortgage credit expansion and how they interact with macroeconomic variables and regulatory policy in shaping house prices are examined.

Key long-run drivers of UK house price growth were identified as macroeconomic drivers (government expenditure, money supply, disposable incomes, unemployment), demographic drivers (size of the working population), financial drivers (mortgage credit supply, mortgage interest rates, term structure of interest rates) and housing market factors (housing supply and construction cost). Using vector error correction modelling (VCM) and cointegration analysis, the existence of both long- and short-term relationships were observed. The study identified an important role for interest rates, mortgage flow and money supply in the short-run dynamics of UK house prices.

The determinants of UK residential mortgage debt growth were further examined in a vector autoregression (VAR) framework. The study identified property market factors (house price growth, homeownership preferences, housing supply) and macroeconomic indicators (GDP growth, changes in base rate, money supply, employment, and inflation) as the key driving factors. The results highlight an important role of liquidity and housing credit in shaping UK house prices from the late 1980s to the 2000s.

It was further observed that the UK housing market has experienced structural changes in recent years, implying that conventional fundamental relationships no longer hold. Evidence from spline regression analysis suggests that the determinants of UK house prices have changed in structure, magnitude and direction over time, varying with the prevailing macroeconomic indicators.

The study represents a systematic empirical examination of the role and impact of macroeconomic and financial drivers on the UK housing market performance and housing finance. The findings suggest that the UK government's macro-prudential tightening of the mortgage lending market through the implementation of the Mortgage Market Review (MMR) could have suppressive impact on mortgage lending and prevent the credit-fuelled boom seen in the 1990s and early 2000s. It is important that the highlighted house price determinants and relationships are monitored carefully. Long-term house price modelling should take into account the changing nature of house price drivers, ensuring that selected models and determinants incorporate post-evaluation analysis and use structured market research to identify relevant factors influencing price dynamics under the prevailing macroeconomic and regulatory regime.

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LIST OF ABBREVIATIONS AND ACRONYMS

ADF	-	AUGMENTED DICKEY-FULLER TESTS
AIC	-	AKAIKE INFORMATION CRITERION
ANOVA	-	ANALYSIS OF VARIANCE
ARM	-	ADJUSTABLE-RATE MORTGAGE
BIC	-	BAYESIAN INFORMATION CRITERION
BOE	-	BANK OF ENGLAND
BTL	-	BUY-TO-LET
CML	-	COUNCIL OF MORTGAGE LENDERS
CMO	-	COLLATERALIZED MORTGAGE OBLIGATIONS
CPI	-	CONSUMER PRICE INDEX
DCLG	-	DEPARTMENT FOR COMMUNITIES AND LOCAL GOVERNMENT
ECB	-	EUROPEAN CENTRAL BANK
EMF	-	EUROPEAN MORTGAGE FEDERATION
FCA	-	FINANCIAL CONDUCT AUTHORITY
FHLMC	-	FEDERAL HOME LOAN MORTGAGE CORPORATION
FLS	-	FUNDING FOR LENDING SCHEME
FPC	-	FINANCIAL POLICY COMMITTEE
FRM	-	FIXED-RATE MORTGAGE
FSA	-	FINANCIAL SERVICES AUTHORITY
FTB	-	FIRST TIME BUYER
GFC	-	GLOBAL FINANCIAL CRISIS
GPM	-	GRADUATED PAYMENT MORTGAGE
HQIC	-	HANNAN AND QUINN'S INFORMATION CRITERION
HTB	-	HELP-TO-BUY
LPI	-	LAND PRICE INDEX
LTI	-	LOAN TO INCOME RATIO
LTV	-	LOAN TO VALUE RATIO
M4	-	BROAD MONEY SUPPLY
MBB	-	MORTGAGE-BACKED BOND
MBS	-	MORTGAGE-BACKED SECURITIES
MFIS	-	MONETARY AND FINANCIAL INSTITUTIONS
MMR	-	MORTGAGE MARKET REVIEW
MPS	-	MORTGAGE PAY-THROUGH SECURITIES
MPTS	-	MORTGAGE PASS-THROUGH SECURITIES
OECD	-	ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT

OLS	-	ORDINARY LEAST SQUARE
ONS	-	OFFICE OF NATION STATISTICS
QE	-	QUANTITATIVE EASING
QUAL	-	QUALITATIVE RESEARCH
QUANT	-	QUANTITATIVE RESEARCH
REIT	-	REAL ESTATE INVESTMENT TRUST
RESET	-	RAMSEY REGRESSION SPECIFICATION ERROR TEST
RMBS		RESIDENTIAL MORTGAGE-BACKED SECURITY
RPI	-	RETAIL PRICE INDEX
RTB	-	RIGHT-TO-BUY
SBIC	-	SCHWARZ'S BAYESIAN INFORMATION CRITERION
SPSS	-	STATISTICAL PACKAGE FOR SOCIAL SCIENCES
VAR	-	VECTOR AUTOREGRESSION
VECM	-	VECTOR ERROR CORRECTION MODEL
VIF	-	VARIANCE INFLATION FACTOR
VRM	-	VARIABLE RATE MORTGAGE

CHAPTER ONE

INTRODUCTION

1.1. Background to the Study

Housing issues permeate debates in developed economies because shelter is fundamental to the safety and wellbeing of the population and housing acquisition is typically the most significant form of fixed capital investment most households would ever undertake. The housing sector is, moreover, an integral and sensitive part of national and global macroeconomies and represents a significant component of wealth (Case et al., 2003). Thus, the activity and performance of the housing market is a key barometer for assessing the level of overall economic and financial stability.

Following the house price boom in the late 1990s and early 2000s which subsequently resulted in the Global Financial Crisis (GFC) of 2007/2008, rising house prices receive significant attention in academic and political discussions. This has kindled much interest in studies seeking to understand the fundamental drivers underlying the trends in residential house prices (Berry & Dalton, 2004). Although the crisis led to a significant downturn and correction in house prices from the peak values in 2007, prices began to stabilize in 2011 and by 2014 the upward trend had regained momentum. Figure 1.1 depicts the trends in UK house price trends between 1968 and 2018.

Figure 1.1: Trends in real house prices & real incomes in the UK, 1968-2018

Source: Office of National Statistics (ONS), 2019: Nationwide, 2019

From the late 1980s till about 2007/8, house prices assumed a trend of high and volatile growth, outstripping inflation and disposable incomes (White 2016). The often-pointed drivers of this trend are the widespread availability of finance (Tsatsaronis & Zhu, 2007), income growth and demographic trends (Brown et al., 1997), supply rigidities (Ball, 2011) and consumer expectations in the housing market (Meen, 2012).

In the UK, house purchase and mortgage finance are inextricably linked. For most individuals and families, residential housing purchase is an expensive undertaking, involving significant capital commitment over a long investment horizon (Ball, 2011). As a result, homebuyers must simultaneously take a long-term credit that enables them to purchase their preferred properties and spread repayment to match the longevity of the housing asset. The mortgage and housing markets are thus interlaced and have historically developed in tandem (Pugh,1994).

A well-functioning housing finance system not only provides access to affordable long-term funding and stimulates growth in owner-occupation but also favours the development of rental housing as it allows landlords to leverage debt finance to purchase investment housing against the future rental stream (Scanlon et al., 2015).

Around the globe, housing finance markets saw unparalleled expansion and transition starting from the late 1980s (Johnson *et al.*, 2016; Jorda *et al.*, 2016). Whereas housing finance in many countries, historically, relied on funds provided by few regulated local depository institutions (Green & Wachter, 2010), the present situation is very different as funding for housing now comes from a much wider array of private sources, including domestic and international investors (Scanlon et al., 2015; Lunde & Whitehead, 2016). This has been enabled, *inter alia*, by the deregulation and liberalisation of financial markets; the development and subsequent integration of capital markets with housing finance markets through securitisation; technological change; and innovations in mortgage contract design (Coles & Hardt, 2000; Fisher & Jaffe, 2003; Stephens, 2007; Green & Watcher, 2010).

From the late 1980s till 2007, the UK housing finance market and those of many other developed economies appeared to work very well as deregulation and liberalisation led to a significant boom in mortgage finance and increased access to housing. The homeownership rate in the UK increased consistently from 57% in 1981 until it peaked at 71% in 2003 (Office of National Statistics, 2016). In the opinion of Baddeley (2005), housing finance was a particularly successful part of the governments' deregulation and privatisation story as lower borrowing costs and greater mortgage choices for households led to higher owner-occupation. At the same time, Miles (2011) notes that increased use of leverage made housing perform more favourably as an investment in comparison to other asset classes and the residential real estate sector attracted a significant portion of private investment through the buy-to-let (BTL) mortgage market.

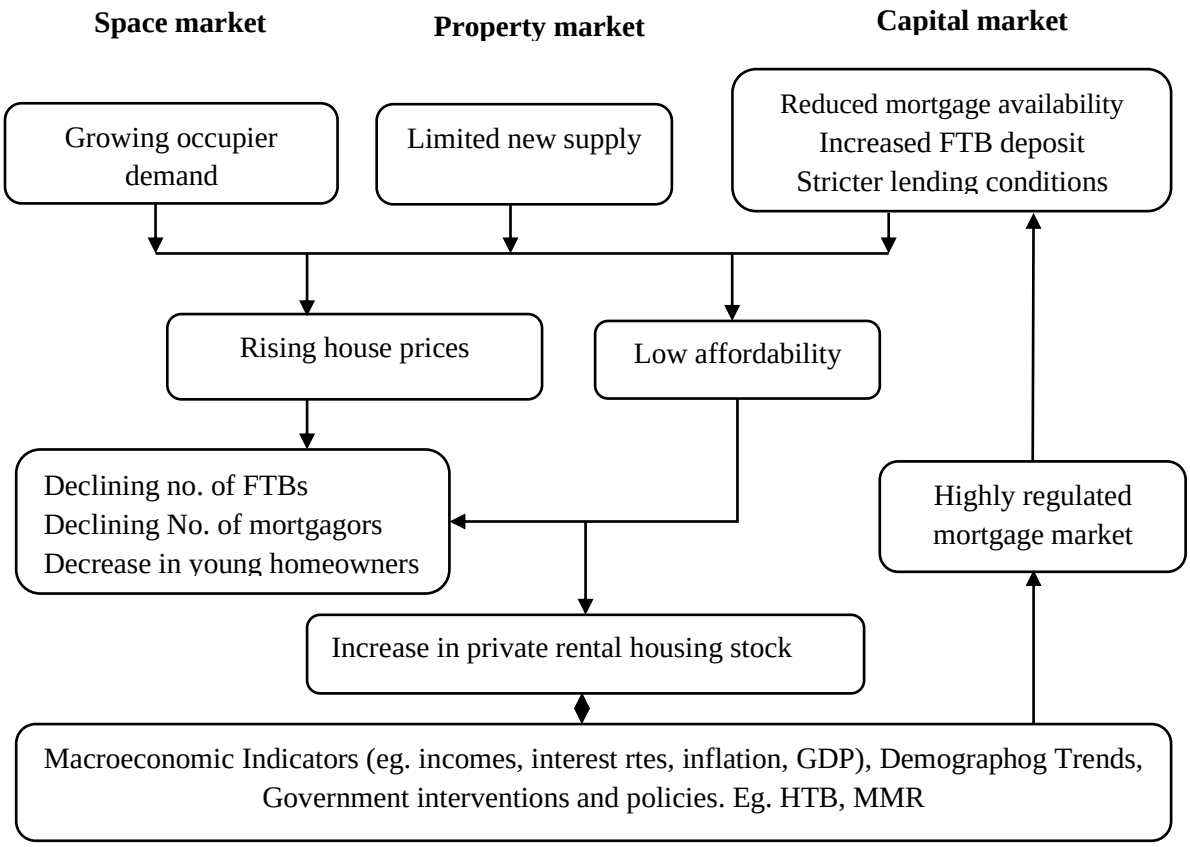
Moreover, favourable macroeconomic indicators, monetary policy and regulatory changes also played an important role in the rise of credit-financed homeownership in the United Kingdom (Whitehead & Williams, 2011; Sivitanides, 2018). From the early 1980s, government involvement in the direct provision of housing declined considerably giving way to private sources of housing finance and development (Stephens, 2011; Poon & Garratt, 2012). Stable and low interest rates and sustained economic growth were among the key factors associated with the mortgage market expansion (Green & Wachter, 2010). Additionally, Lunde & Whitehead (2016), state that reducing interest rates became an important part of global monetary policy after the September 11 attack in 2001.

Following the Global Financial Crisis of 2007/2008, concerns arose regarding the regulation and operation of housing finance markets. The subprime mortgage market was blamed by commentators for the depth of the crisis, its persistence and the subsequent recession and stagnation that followed in many countries (Turner, 2008; Armstrong & Davis, 2014). Among the arguments levelled against the mortgage market concerning the crisis were that deregulation and expansion of housing finance paved the way for unhealthy competition in the mortgage market, led to the introduction of risky and poorly underwritten mortgage-backed securities and made households over-indebted, allowing house prices to increase in an unsustainable way (Scanlon et al., 2011; Davis & Van Nieuwerburgh, 2015).

The period following the GFC has thus seen a resurgence of regulation of the housing finance market with the introduction of new macro-prudential rules (UK Finance, 2019). In the UK, these culminated in the coming into force of the Mortgage Market Review (MMR) in 2014 which introduced rigorous affordability assessment criteria, curtailing lenders' ability to offer some conventional mortgage products such as interest-only mortgages (Edmonds, 2014). Access to housing finance has therefore become more difficult especially for first-time buyers and home buyers with small deposits, thus, limiting homeownership (UK Finance, 2019).

Cognizant of this, other government policies such as the Funding for Lending Scheme (FLS) and the Help to Buy (HTB) schemes were introduced to ameliorate conditions in the housing market and help homebuyers overcome the constraints in accessing mortgages. Why the government found it prudent to guarantee high LTV loans through the HTB programmes while at the same time cautioning in the MMR that high LTVs were a stronger indicator of risk has puzzled some observers and critics who contend that the HTB might have led to increased house prices instead of incentivising supply (Edmonds, 2014; Scanlon & Adamczuk, 2016). Figure 1.2. gives a summary of the current developments in the UK housing market.

Figure 1.2: Current developments in the UK housing markets



Office of National Statistics (ONS), 2016; Council of Mortgage Lenders (CML), 2015

While housing finance and house prices have grown in parallel over the last three decades, the drivers of housing finance and how they interacted with macroeconomic and monetary variables in shaping house prices is still far from being well understood. Several studies have examined the sources of price growth and cyclicality within the UK housing market and found a link between house prices and mortgage debt growth (Andrew & Meen, 2003; Iacoviello & Minetti, 2003; Muellbauer, 2007; Demary, 2010; Hinch, 2012). Still, not much success has been chalked in terms of providing an adequate analytical and empirical framework within which the complex interlinkages between house price movements and housing finance can be explained. It has been argued that much of the prior "studies of UK house prices have been poor in terms of robustness and ex-post forecasting ability" (Brown *et al.*, 1997, p. 531). Similarly, Ball *et al*, (2006) observe that significant gaps exist in the literature regarding the need for formal theoretical links between the property market, the macroeconomy and the capital market.

As Scanlon & Adamczuk (2016) rightly point out, understanding the drivers of housing finance must, however, be of first-order concern for policymakers if the housing finance market is to be properly regulated to ensure a sound and sustainable residential housing delivery. More than a decade after the GFC, uncertainties still linger with regards to the future direction of house prices, interest rate expectations, mortgage accessibility, new housing supply and, more critically, the market response to the deluge of policies and regulations introduced.

1.2. Aim and Objectives of the study

The aim of the study was to assess empirically the relationship between the performance of the UK housing market and mortgage credit growth between 1968 and 2018 and identify the key drivers.

To achieve this, the following specific research objectives were pursued.

i. To examine the performance of the UK housing market between 1968 and 2018 and establish the key drivers.
ii. To assess how the drivers of UK house prices have evolved in the light of the changing economic, financial and regulatory landscape.
iii. To assess the interlinkages between house price growth and developments in housing finance and the extent to which mortgage credit expansion has contributed to the performance of the UK housing market.
iv. To analyse and identify the key macroeconomic variables associated with the growth of the UK mortgage market.
v. To evaluate the major policy and regulatory changes in UK housing finance and their impacts on present and future trends in the housing market.

1.3. Research Questions

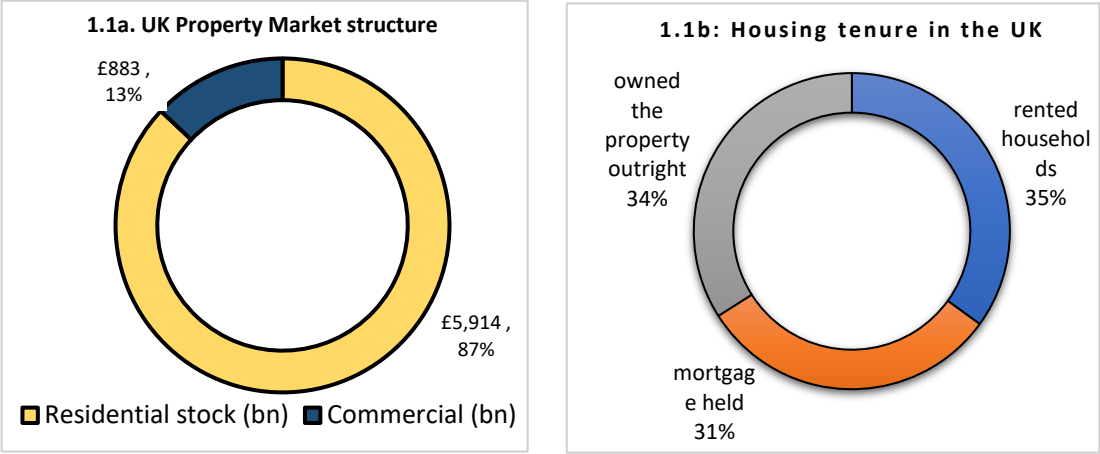
The study thus sought to address the following research questions:

i. How did the UK housing market perform between 1968 and 2018 and what were the key drivers?
ii. How have the fundamental drivers of UK house prices evolved in the light of the changing economic, financial and regulatory landscape?
iii. To what extent are changes in UK house prices linked to developments in housing finance and how did the expansion of mortgage credit contribute to the performance of the UK housing market?
iv. What are the key macroeconomic variables associated with the growth of the UK mortgage market?
v. How did the major policy and regulatory changes in UK housing finance impact trends in the housing market?

1.4. Significance of the study

The housing market is a significant component of the UK economy due to a high owner-occupation rate and a dramatic expansion of the private rented sector in recent years. As an asset, housing is an important motivation for household savings and significantly influences wealth and consumption (World Bank, 1993). The value of the UK's residential stock overshadows commercial property, being almost 6 times larger (see Figure 1.3). The residential property stock of £5.9 trillion compares favourably with the London Stock Exchange valued at £2.2 trillion and UK government bonds worth £1.8 trillion (Property Industry Alliance, 2016). Figure 1.3 depicts the current size of the residential market viz-a-vis commercial property (a) and tenure structure within the housing market (b).

Figure 1.3: The state of the UK housing market



Source: Office of National Statistics (ONS), (2019): Property Industry Alliance, (2016)

The current housing tenure structure is roughly evenly split between outright ownership, mortgaged and rented households. But outright owners include both cash investors and homeowners who have paid off their mortgages while a greater proportion of current mortgaged households are first-time buyers. Besides, with the rise of mortgaged buy-to-let sales which currently accounts for some 10% of the rented stock, the mortgage market also provides an important stimulus for the rental sector (UK Finance, 2019). Mortgage finance is thus key in the UK housing market supporting both the owner-occupation and rental housing markets. According to UK Finance (2019), mortgage lending supports about 70 per cent of all housing transactions in the UK, and, despite limited mortgage product innovation since the onset of the GFC, gross annual lending doubled to £268 billion in 2019, supported by rising sales and house price growth.

Understanding the behaviour of the residential property market is also important because of the impact that house price volatility has on the lending portfolios of banks (Nneji *et al.*, 2013). Large declines in house prices have been shown to cause increases in mortgage defaults with adverse implications for lenders and a subsequent slowdown in economic activity (Wheelock, 2006). Due to its sheer size, shocks within the housing market can easily pose significant macroeconomic threats like what was seen in the last Global Financial Crisis which ostensibly originated from the US housing market (Grimes & Hyland, 2015). The bursting of the housing bubble quickly brought the entire global economy and banking system to the brink of collapsing (Case, 2008; Schwartz,

2012a; Bernanke *et al.*, 2013). In the UK, it was the run-on Northern Rock Bank, which at the time was one of the country's top five mortgage lenders, that signalled the dawn of the imminent doom (Malpass & Rowlands, 2009; Scanlon & Adamczuk, 2016).

As noted by Adams & Füss (2010), important links exist amongst the housing market, capital markets and regulatory policy that ought to be accounted for in the modelling of the housing market. OECD (2016) similarly noted that given the interlinkages between house prices and aggregate demand, policymakers and regulators will find it beneficial to observe developments within the housing market in their design and implementation of macroeconomic and monetary interventions.

UK Finance (2019) cautioned in a recent report that current macro-prudential regulations in the UK housing market are limiting the availability of mortgage finance particularly to first-time buyers and home buyers with small deposits and thus limiting homeownership. It was advised that "policymakers need to be clearer on the role and impact of mortgage lending in supporting the overall size and efficiency of the UK housing market, access to homeownership and the delivery of new homes" (UK Finance, 2019, p. 4). In a similar spirit, Zhu (2005) submits that monetary authorities should ascertain the drivers and subtleties of house price volatilities, recognize their implications for macroeconomic stability and formulate appropriate policy responses. Leamer (2007) and Ghent & Owyang (2010) have all provided empirical evidence that house price changes are linked to the business cycle.

The foregoing discussion indicates how imperative it is that we pursue a deeper understanding of the drivers of the residential housing market. Advancing research in this area can make an important contribution to developing an early warning system of overheating in the housing market in addition to helping policymakers develop appropriate policy interventions to positively influence developments within the housing finance market with minimum distortion.

1.5. Scope and limitations of the study

For consistency and comparison purposes, a clear content and time scope needed to be defined for the research. The study is concerned with price performance within the UK housing market over the 50 year period between 1968 and 2018. The study looked at the UK as a whole comprising England, Scotland, Wales and Northern Ireland. The UK was chosen due to the highly developed housing market and the availability of long historical series of housing market and macroeconomic datasets.

The chosen 50 year period allows all the major changes and developments within the UK housing and housing finance markets to be sufficiently covered. As highlighted in the seminal work by Knoll *et al.* (2014) which examined global house prices from the 1800s to 2012, UK house prices experienced particularly high rates of price appreciation in the late 1990s and 2000s. Moreover, Scanlon & Adamczuk (2016) noted that policy and regulatory changes in the 1970s and 1980s, particularly the abolishing of mortgage tax reliefs and financial deregulation, provided the needed impetus for the acceleration of the UK mortgage market. The chosen 50-year timeframe allows the study to capture the effects of all these factors in addition to more recent changes following the 2008 global financial crisis.

The emphasis of the thesis is on the financial, macroeconomic and regulatory drivers of the observed trends within the housing and housing finance markets. The scope of the analysis in the thesis is confined to the UK residential market at the national level. Aggregate national macroeconomic and housing market datasets were sourced and analysed to arrive at the conclusions in the study. These needed to be from reliable and reputed sources, hence the leading providers of housing data, finance and macroeconomic data, that are recognised by industry stakeholders and used in previous scholarly works were selected. The datasets used in the study and the sources from which they were obtained are discussed in detail in Chapters Three and Four.

Like any other research work, there were limitations associated with this study. These were primarily related to examining the UK housing market on a holistic platform without explicitly accounting for regional and local variations. In part, this was due to much of the available macroeconomic data of interest being supplied only at the

national level for the timeframe specified. Additionally, the use of the Nationwide house price index makes the analysis more skewed towards the mortgaged housing segment of the housing market. As outright purchases are effectively excluded, this may not paint a complete picture of the UK housing market. Nevertheless, the Nationwide house price dataset is highly recognised for its timeliness and length of coverage and has been used in several academic studies. Finally, time and resource constraints necessitated that the analysis is confined to the UK, although a cross-country perspective would have enhanced the usability and international comparability of the findings.

1.6. Structure of the thesis

The thesis is organised into six chapters (see Figure 1.4) all aimed at achieving the objectives of the research. Chapter One provides a general introduction to the research and sets the context for the study, specifying the aims, objectives, significance of the study and contributions. All five research objectives are addressed, at a conceptual level, in chapter Two. Objectives one, two and three are addressed empirically in Chapter Four whilst objectives four and five are addressed in Chapter Five.

Chapter Two constitutes the first phase of the research – the literature study – establishing the theoretical underpinnings of the work and relating the research to the larger treatises in academia. It presents a detailed literature review on important concepts in the residential property market and further explores the interlinkages between housing finance, macroeconomic variables and the housing market.

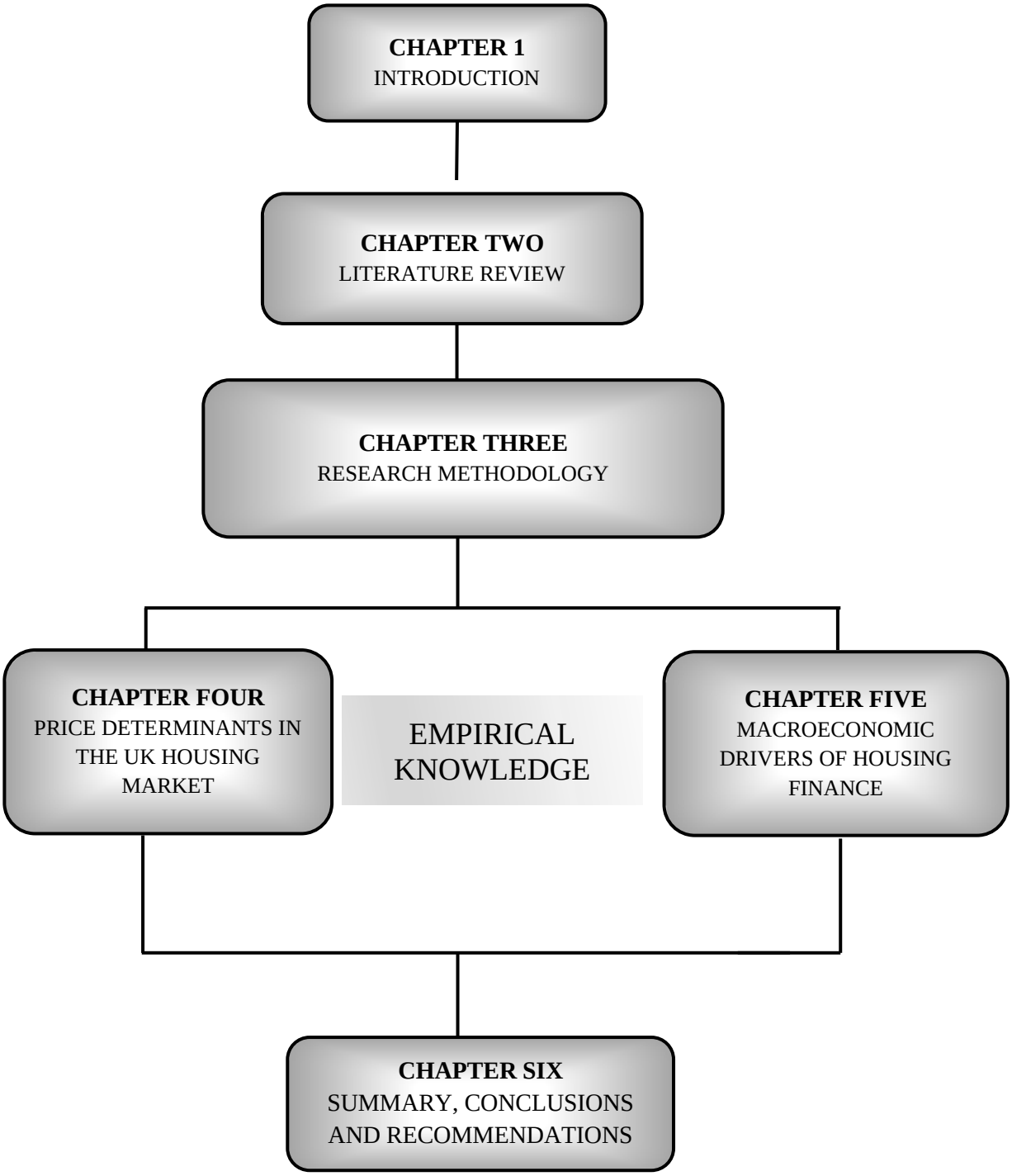
Chapter Three explains the methodology for the research. It first presents a review of emerging philosophical viewpoints and paradigms in social research and then moves on to justify the epistemological and ontological alignments of the study. The chapter also elaborates the research design, data collection strategies and analytical procedures.

Chapters Four and Five constitute the quantitative empirical sections of the research using statistical and econometric models to explore trends and determinants of house price and housing finance growth. Chapter Four addresses the first two research objectives by exploiting alternative multivariate ordinally least square (OLS) regression and vector error correction models (VCM) to identify the drivers of change in house

prices in the short- and long-run, their behaviour over time and under defined economic periods. Chapter Five follows a similar pattern, using the vector autoregression (VAR) framework to examine the drivers of UK mortgage finance growth. In addition, the research examines how regulatory and policy changes have influenced developments within the UK housing finance and housing markets through key-informant interviews in Chapter Five.

Chapter Six summarises and synthesises the main findings of the study, highlighting the practical and conceptual implications. It concludes the study, provides answers to the research questions and proposes fitting recommendations and directions for future research.

Figure 1.4: Structure of the Thesis



CHAPTER TWO

LITERATURE REVIEW: DYNAMICS OF THE RESIDENTIAL PROPERTY MARKET, HOUSING FINANCE AND THE MACROECONOMY

2.1. Introduction

This chapter reviews present literature related to the study, develops the conceptual foundations for the research and explains foundational concepts which form the basis of the subsequent empirical work. The chapter begins with a discussion of market theory in general and how this may be applied is in the context of property markets. The structure of the property market is then elaborated with the aid of conceptual models depicting its complex interactions. Following this is a discussion of the residential housing market, its peculiar nature and characteristic features. The chapter further addresses the concept of housing finance and its position in the housing market. The structure and operation of the mortgage market and the drivers of the transformation in housing finance witnessed since the 1980s are discussed. The interconnectedness between housing finance, macroeconomic indicators and housing prices is also examined. The chapter concludes with a synopsis of the key policy and

regulatory changes in the UK housing and mortgage markets from the early 1960s to 2018.

2.2. Market theory and its application to property

The concept of a market is not something new in economic theory. Modern economies rely on the principles of division of labour and specialisation to increase both output and welfare, and inseparable from this is the necessity to exchange goods and services in markets (Krugman, 1993). In this regard, the fundamental position of markets in shaping almost all economic social phenomena has long been recognized. Smith (1976) was the first known scholar to formally theorise about markets in his seminal work: The Wealth of Nations, where he described the operations of the market mechanism as an "invisible hand" that guides the economy. Massey (2000:313) points out that, despite the long recognition, little attention was devoted to the issue of market definition historically by economists. This lack of systematic treatment of market theory is akin to the lack of a precise understanding of its operation. Horowitz expressed this when he stated that:

> *…because economists, from Adam Smith forward, have with confidence and enthusiasm, although not necessarily with shared views, written about markets, it is plausible to expect that they would have had quite a bit to contribute to the resolution of the market-definition issue. Plausible, but erroneous* (Horowitz (1981, p3).

It is difficult to find a convincing definition for the term "market" in the literature as different writers put forward different descriptions depending on the theoretical lenses through which they view the market. Watson & Getz (1993) posit that the term "market" has a flexible meaning. They define a market as a set of points of contact between buyers and sellers. Dunnett (1998) considers a market in terms of its participants and defines it as the totality of actual and potential buyers and sellers of a particular commodity or service. Aspers (2007) considers a market as a social organization for the exchange of rights which enable goods and services to be priced. This view is espoused by King (2009) who likewise sees the market as a set of relations between people and other organisations that exist to allocate goods and services and rights over them. In the opinion of Levine (1995) market is simply a standard way of

designating a transactional process by which goods and services are exchanged for money.

It is recognizable from the above definitions that a market can, but need, not be a defined geographical area. The principal notion is that, for a market to exist, there must be a social or institutional arrangement for producers and distributors who wish to sell a particular commodity to be able to do so with other agents who wish to buy. A market is thus, first of all, a social entity connoting a set of interactions for the matching of the needs and expectations between participants. Markets, therefore, do not necessarily need a physical place but rather institutional arrangements to underpin them.

The most important element in the study of markets is "price" which is fundamentally determined by the interaction between *demand* and *supply* (Denzau, 1992; Krugman & Wells, 2015). In the opinion of Warren (2007), market analysis is interchangeable with demand and supply analysis. Prices are important as they provide the organising mechanism within markets. Commenting on the role of prices in the market system, (Sowell, 2015, p. 4) stated that:

> *…each consumer, producer, retailer, landlord, or worker makes individual transactions with other individuals on whatever terms are mutually agreeable. Prices convey these terms, not just to the particular individuals immediately involved but throughout the whole economic system - and indeed, throughout the world* (Sowell, 2015, p. 4).

Prices are essential means by which information is conveyed to market participants about what is available in the market and whether it is affordable. Prices convey information about another important market concept: scarcity (Sowell, 2015). Therefore, what high prices mean is that there are not enough of the particular commodity in question and when many people bid for a relatively scarce commodity, that commodity becomes very expensive because of supply and demand.

On one side of the market price equation is "demand" defined as the amount of that commodity that consumers are prepared to buy at a given point in time (Dunnett, 1998). Effective demand connotes the kind of demand that results in actual transactions taking place because it is backed by purchasing power (Warren, 2007). For almost all products,

demand is greater at lower prices and vice versa and hence the demand curve slopes negatively from the left to the right (Krugman & Wells, 2015). The elasticity of demand implies the extra units of a product consumers will demand given a unit fall in its relative price: if a small change in price leads to more than proportionate change in quantity demanded, demand is said to be elastic and vice versa (Bain & Howells, 1988). On the other side of the price equation is "supply" - the amount of a commodity that sellers are willing to sell at a given price. In economic theory, supply is assumed to increase as price increases (Dunnett, 1998). Price is the single most important factor determining producers' willingness to supply a good or service on the market as higher prices imply high profits and encourages greater output. The supply curve, therefore, slopes positively from left to right (Warren, 2007). Like demand, the actual level of supply response to changes in prices will depend on the elasticity of supply.

A free-market economy is characterised by free trade without the imposition of any tariffs or subsidies by governments: the allocation of goods and services is done by the invisible hand of the market referred to as the price mechanism (Jowsey, 2011). The main advantage here is that it is able to determine both output levels and prices without the need for any expensive government intervention (Warren, 2007). Where demand falls short of supply for a commodity, the price will fall and when demand is inadequate to meet the supply for a commodity, the price will rise. The market-clearing price or equilibrium price is the price level at which demand and supply are equal (Bain & Howells, 1988). Fisher (1999, p27) describes the equilibrium price as *"... an elegant and powerful tool, providing a considerable illumination of the way in which real economies operate."* An important caveat, however, is suggested by Krugman & Wells (2015) who note that demand and supply models are only appropriate for describing market behaviour in competitive markets. Whether property markets are competitive and amenable to supply and demand analysis portrayed in economic theory will be deliberated in the later sections of this chapter.

A free-market economy is not completely free of government interventions and influences. Notwithstanding the significance of supply and demand forces in market price determination, government policy has an important role to play as it has both direct and indirect influences on demand and supply variables. This is particularly

important in the context of the property market where government interventions and contextual influences such as planning and zoning regulations, the strength of property rights and information availability are just as important as demand and supply in the price determination framework (Adams *et al.*, 2005). Government failure to provide enough land for urban expansion often leads to high housing prices resulting in slum creation and lower urban productivity (Bertaud, 2010). Moreover, in providing tools to manage the macroeconomy, government do exert direct and indirect influence on demand and supply variables and consequently on prices (Higgins & Reddy, 2010). There is therefore a considerable avenue for the government to influence the operation of the market altering the environment within which market transactions take place.

2.3. The property market

A useful starting point in comprehending the determination of prices in the property market is to analyse the structure of the property market. Brueggeman & Fisher (2011) define property, in a general sense, as anything capable of being owned or possessed. A distinction is often made between real (immovable) property and personal (movable) property. Real property is defined as "property in land and buildings" (Floyd & Allen, 2002 : 3). It specifically denotes land and all those things permanently attached to the land such as buildings, trees and structures, and the rights appurtenant (Brueggeman & Fisher, 2011; Jowsey, 2011). In law, the term real property is used in a more restricted sense to mean the legal interest associated with the ownership of real estate. In practice, however, these two terms are deemed interchangeable and are used in contrast to personal property which denotes things that are movable and not permanently affixed to the land or structure such as automobiles, shares and furniture.

Real property can either be viewed as a tangible asset (i.e. land and buildings) or as a bundle of intangible rights associated with the ownership of the land and the improvements thereon (Ling & Archer, 2012). The latter view of real estate considers property as not just bricks and mortar but in terms of the services it provides such as shelter, security, privacy and the right to receive rent. The quantum or extent to which these rights are held is referred to as estate and the two main forms are freehold and leasehold estates (Brueggeman & Fisher, 2011).

Property as an asset class exhibits unique characteristics that make the property market distinct from other markets. These include fixity of location, lumpiness, high unit value, heterogeneity, illiquidity and longevity (Baum, 2015; Hoesli & Macgregor, 2000).

The property market is the market for the allocation of real estate resources. While property has the distinguishing characteristic being physically immovable, title to property is ownable and exchange of titles do take place. The property market is a mechanism by which buyers and sellers of real estate are brought together to determine the price at which a particular property can be exchanged (Dunnett, 1998). This could be a formal marketplace such as an auction house or (mostly) informal arrangement such as when estate agents introduce buyers to sellers. Much real estate is also advertised in journals and online property portals and can therefore be said to be part of the property market. In the view of Jowsey (2011), therefore, that the property market is an abstract concept encompassing all levels of transactions in real property.

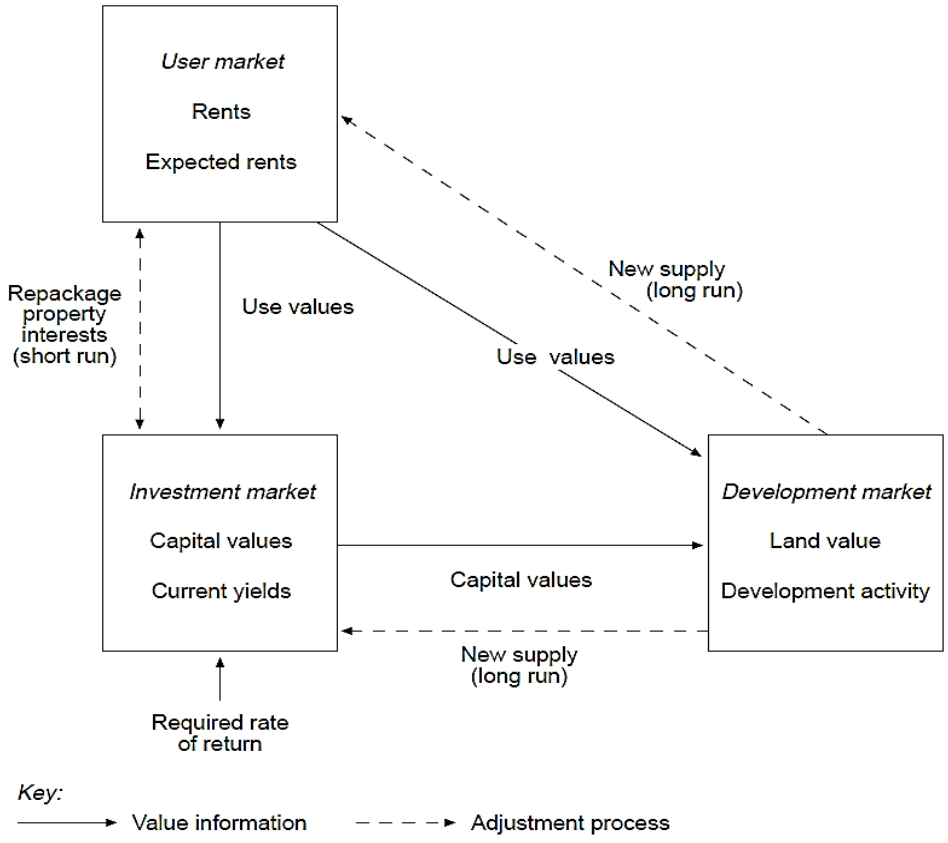
2.3.1. Economics of the property market

The market for real estate has not been the easiest for economists to theorise about because the property market is best conceived as comprising of several inter-linked markets. Property values, thus, derive from a complex interaction of different sectors or markets in the economy rather than just a unitary market. Dipasquale & Wheaton (1992) developed a two-market conceptual framework whereby the property sector is divided into two interlinked markets: the space market and the asset market. Their model develops and builds on an earlier work by Fisher (1992) who first discussed the importance of recognizing that distinct but interrelated markets exist for tenant space and investment capital.

Archer & Ling (1997) extended this into a three-market model, maintaining the space market component from the two-market model and separating specific property asset risk components from the general capital market. Keogh (1994) recognizes the importance of the *development market* in determining the balance between the user and investment markets. Ball, et al, (1998) similarly maintain the user and asset markets and argue for a separate development market where property assets are produced and a *land market* that underpins both the development and the user market.

Keogh (1994) suggests a simple model illustrating the interrelationships between the user, investment and development market as depicted in Figure 2.1. Distinguishing between these interlinked sub-markets of the property market helps to provide a clearer understanding of how exogenous forces such as changes in financial and macroeconomic variables or government policy affect the real estate sector. This is also crucial for understanding the possible response of the property market to regulatory and policy initiatives (Adams, 2008).

Figure 2.1: A Model of the property market structure



Source: Keogh, 1994

2.3.1.1. The space (user) market

The space or occupiers' market is the market for the right to use real estate. The supply side of the market is constituted by landlords who have rentable space to let whilst demand emanates from potential occupiers, comprising both owner-occupiers and renters (DiPasquale & Wheaton, 1992; Geltner et al., 2006). Ling & Archer (2012) note that demand for space in the property market stems from the needs of households, firms and corporate organizations for real estate services such as shelter, accommodation for

business and access to other locations and amenities. In the case of businesses, space is one of the many factors of production and its use depends on firm output levels relative to the cost of space whereas, for households, demand for space depend on income and the cost of occupying space relative to the cost of consuming other commodities (DiPasquale & Wheaton, 1992). For both firms and households, the cost of occupying space is the *rent* which, in the case of tenants, is specified in lease agreements. Owner-occupied real estate, on the other hand, has an implicit cost of use known as *imputed rent* and is which can be expressed in terms of the annualised cost incidental to the ownership of property (Ball *et al.*, 1998). The demand for space depends on rents and is further influenced by exogenous macroeconomic indicators including industry output levels, employment, incomes and demographic trends. The space market has a primary function of determining the rent levels that equate the demand for space with available supply.

2.3.1.2. The asset (investment) market

The asset market is the market for trading ownership of real property. Buildings may be bought, sold or exchanged just like any other financial asset. These transactions occur in the asset or investment market where asset prices, risks and returns are determined. In essence, every purchase of property can be regarded as an investment, even for owner-occupiers, who make capital commitments in exchange for future savings in rental payments. Investors will balance the risk-return trade-off associated with property ownership against that of holding alternative financial investments such as stocks and bonds. In this regard, property can be considered as part of the broader capital market. Property assets consist of claims to future cash flows (rents and capital appreciation) hence can be compared to, and do compete in the capital market with, other financial assets for scarce investment capital (Geltner et al, 2006). The asset market determines the property-specific investment returns, property values, capitalisation rates and construction feasibility and is part of the broader capital market (Ling & Archer, 2012).

2.3.1.3. The development market

The space market and the asset market are linked together in the long run by the development industry which organises and financial and physical factors of production to supply new buildings. The development industry converts financial capital into physical capital and thus determines the level of supply available in the space market (Geltner et al., 2006). As property is a long-lasting product, demand for newly built space deriving essentially from economic growth and structural changes is the main driver of activity within the development industry. The supply of new built space is determined by the price for which it can be sold vis-à-vis the replacement or construction cost. DiPasquale & Wheaton (1992, p186), suggest that "in the long run, the asset market will equate market prices with replacement costs in the development market". This is because developers will only produce new space when they can be sure that the final product can be sold at a price that, at least, is as much as the cost incurred in producing them, including reasonable compensation for risk borne (Graaskamp, 1992). Supply in the property market is generally inelastic. In the UK, for instance, new buildings add just about one per cent to the total housing stock per year and constitute only about 15 per cent of total owner-occupied house sales annually (Meen, 2001). Given these low output ratios, changes in aggregate demand for housing tend to cause significant distortions in the demand for newly built housing.

2.3.1.4. The capital market

Capital markets serve as the source of funding for the development and acquisition of property assets and allocate financial resources among end-users who require them (Archer & Ling, 1997). Capital market participants invest in a wide range of assets such as bonds, stocks, mortgages and property in anticipation of receiving financial returns for the risk associated with these investments. Modern portfolio theory dictates that rational investors examine the risk-return attributes of competing investment opportunities and select a combination that yields the highest returns with the least risks (Baum, 2015). Real estate, therefore, competes for scarce investment capital amongst a diverse menu of other investment opportunities in the capital market. Capital market investors can invest as equity or debt investors. In the property market, equity capital investors are the owners of real estate and expect to receive returns on their investment

by way of rental income and capital appreciation. Debt participants lend money to property investors and developers and receive their reward by way of interest on the borrowed funds (Geltner *et al.*, 2006).

2.3.2. Conceptual models of the property market

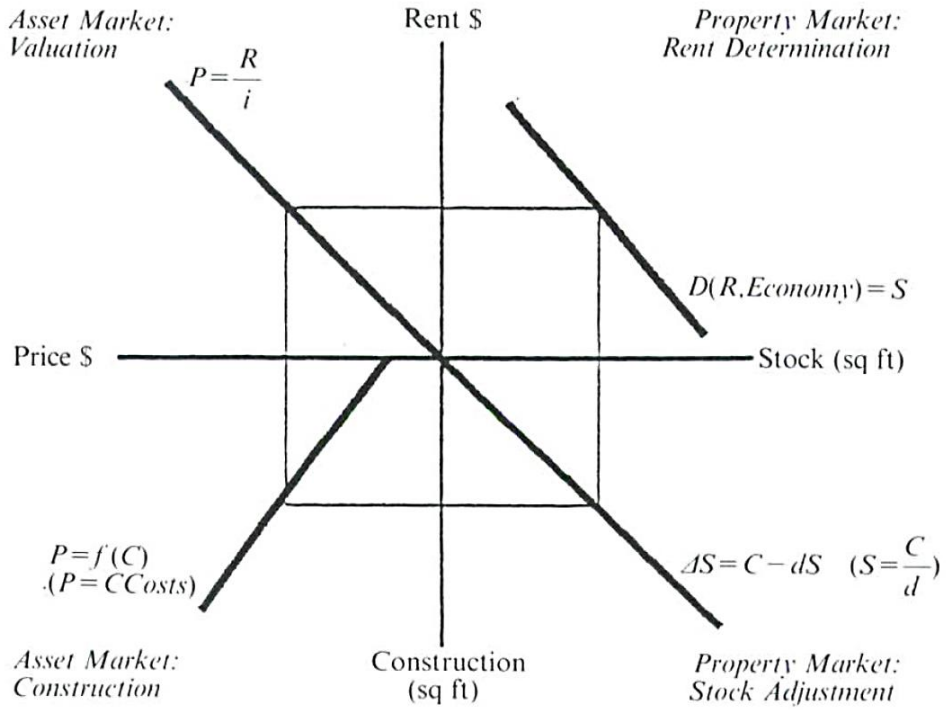
Economic models are simplified representations of reality that are empirically testable and can be used to explain complex real-world phenomena (Ball *et al.*, 1998; Krugman & Wells, 2015). Conceptual models depicting the behaviour of the property market are useful in analysing the interlinkages between economic and financial indicators and how they impact the property market. Models usually make simplifying assumptions using dependent and predictor variables from which it is possible to deduce how different economic agents will behave in an economically rational manner. In the case of property markets, many of these simplifying assumptions may not hold due to the unique characteristics and extreme complexity of the property assets (Ball *et al.*, 1998). For instance, the property market is far from a perfectly competitive one due to its defining characteristics such as lack of homogeneity, imperfect information, high cost of entry and supply rigidity which makes the application of neoclassical economic models limited.

Krugman (1993) argues that no microeconomic conceptualisation of the property market is a complete model. Ball *et al*. (1998) however posit that a partial analysis approach to modelling markets is applicable to the property market. This entails examining one market at a time while holding all other factors constant. Floyd & Allen, (2002) similarly state that when analysing real estate markets, the traditional demand and supply model needs modification because of the special economic characteristics of the real estate market. The existing models of the property market, therefore, employ the partial analysis approach to examine the interaction of the different value determining markets of the property sector and explicate the short-run and long-run adjustment processes. Among the prominent models of the property market are the four-quadrant model (DiPasquale & Wheaton, 1992), the Archer-Ling Model (Archer & Ling, 1997) and the real estate system (Geltner *et al.*, 2006).

2.3.2.1. The four-quadrant model

The four-quadrant model of the real estate market was proposed by DiPasquale & Wheaton, (1992) to provide a simple intuitive analytical framework illustrating how the interlinked components of the real estate market interact and function. A similar version of the four-quadrant model depicting the inter-linkages between the space and the asset (capital) market was first proposed by Fisher (1992). The model addresses four main issues in each of its four quadrants: rent determination in the space market, property (asset) valuation in the asset market, determination of new construction in the development industry and space adjustment in the space market.

Figure 2.2: Interactions between space market, asset market and the development Industry in a four-quadrant model



DiPasquale & Wheaton, 1992

The four-quadrant model is depicted graphically in *Figure 2.2*. The two quadrants on the right side denote the space or user market, whilst the two quadrants to the left characterize the asset market. The upper right quadrant illustrates the determination of rent in the space market with the physical stock of space in the market on the horizontal

axis and rents on the vertical axis. Demand for space as a function of rent is depicted by the downward sloping curve. Market rent is arrived at by tracing the level of stock on the x-axis up to the demand curve and over to the y-axis. The top left quadrant illustrates the valuation process in the asset market, relating the equilibrium property prices on the horizontal axis to the level of current rent on the vertical axis (DiPasquale & Wheaton, 1992). The line in the northwest quadrant represents the capitalization rate: the ratio of annual net operating income to property prices. The purpose of the northwest quadrant is to take the rent level, R, from the northeast quadrant and determine a price for real estate assets, P, using a capitalization rate. The *southwest quadrant* depicts the operation of the development industry where real estate asset production occurs. The relationship in the southwest quadrant is between property prices and the annual amount of construction activity hence the line in this quadrant relates a given level of property price to a given rate of construction. Finally, the *southeast quadrant* completes the long-run integration of the space and asset markets by linking the rate of construction to the total stock of built space available in the usage market. The line in this quadrant relates the average rate of space construction per year to the total stock of space that can be indefinitely maintained in the market.

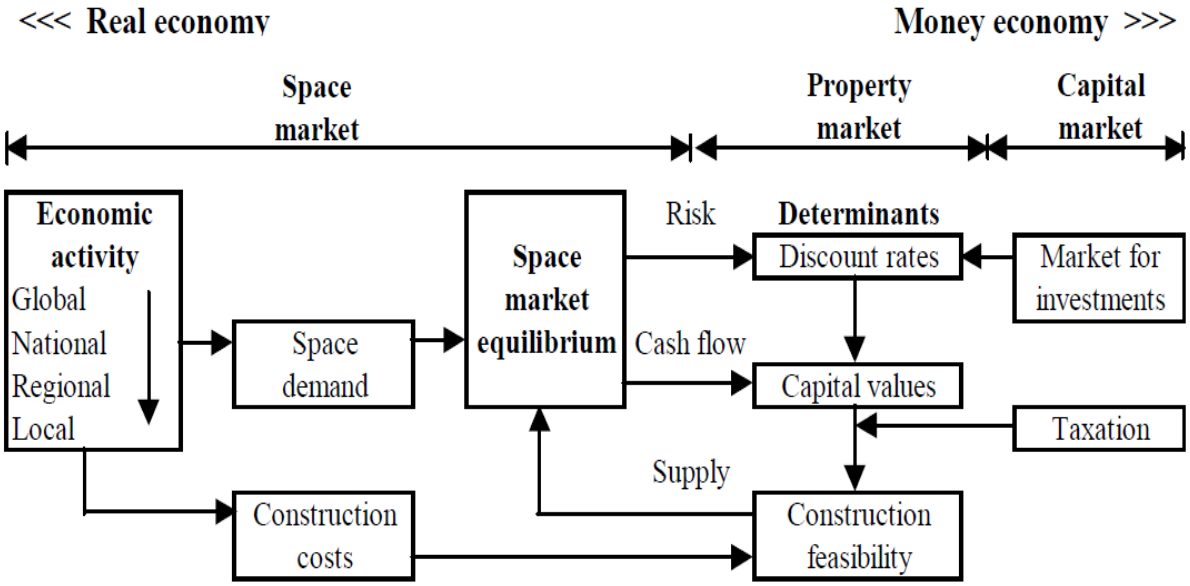
In summary, the model posits that, with a given stock of space, the level of demand in the user market determines rents which then gets translated into property prices in the asset market. Asset prices signal new construction that eventually yields a new level of stock back in the space market. DiPasquale & Wheaton (1992) point out that the four-quadrant diagram depicts a long-run equilibrium in the asset and space markets but is not as suitable for describing short-run market dynamics or the temporary disequilibria that often occur in the real estate sector. They also note that the model only holds when property ownership and use are separated hence in the case of owner-occupied real estate, the assumption of a different space and asset market no longer hold.

2.3.2.2. The Archer-Ling model

While appreciating the contribution of the two-market models distinguishing the space market from the capital market, Archer & Ling (1997) argued that property market should be disentangled from the general capital market. Such a separation permits the

authors to properly incorporate property-specific risks into cap rates determination rather than treating it as exogenously determined as is the case of the two market-model.

Figure 2.3: A model of space, property and capital Markets



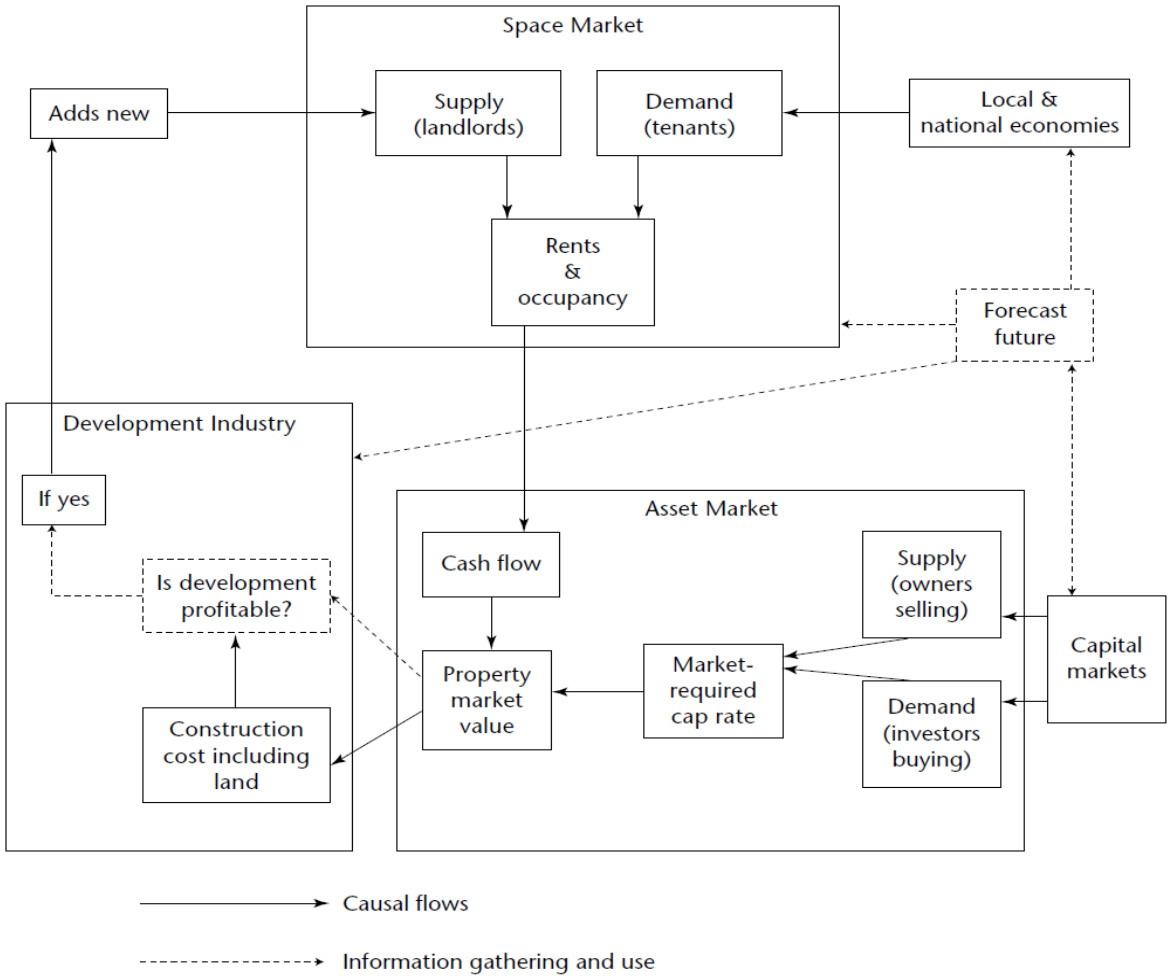
Source: Adapted from Archer & Ling, 1997

The simple model illustrates the interaction of space, asset and capital markets in determining property values. This continuous bidding process governs market values and transaction prices but there are also a host of exogenous factors that shape these dynamics, ranging from demographic and macroeconomic variables to regional land use controls, property rates and income taxation.

2.3.2.3. The real estate system model

The real estate system was conceptualised by Geltner et al., (2006) and seeks to illustrate the functioning of the real estate market in a systemic approach. It highlights the interlinkages between the space, asset and development markets as well as the impacts of exogenous systems including macroeconomic and capital market variables. The system is depicted diagrammatically in Figure 2.4.

Figure 2.4: The Interaction of the Space Market, Asset Market, and Development Industry in the Real Estate System



Source: Geltner et al., 2006

Geltner et al., (2006) consider that the space market, the asset market and the development industry constitute the three main components of the real estate system. These are represented by the three large boxes in Figure 2.4.

In the space market, demand emanates from the consumption and production needs of individuals and firms whereas supply comes from the existing stock of buildings as well as current and past activities of the development industry. The interaction between demand and supply in the space market determines the market rents and occupancy levels.

For investors in the asset market, rents and occupancy from the space market determine the operating cash flow from property assets. Net operating cash flows are translated

into asset values by an approach known as direct capitalisation: dividing net operating income by the investors' required cap rate (Baum, 2015). As real estate investors operate within the broader capital market encompassing other forms of asset, real estate assets are compared with other types of investment opportunities available in the capital markets to determine the required market cap rates (Geltner *et al.*, 2006). Cap rates are dictated by investors' attitudes to and perceptions about the risks and returns of real estate assets as well as forecasts about the future performance of both supply and demand in the space market which helps in forecasting the probable future direction of rent movement. Fisher (1992:163) succinctly points out that "the amount and type of risk for real estate come from the space market whereas the premium for those risk factors that are systematic is determined in the capital market."

Within the development industry, property values represent the key input signal as profit-motivated developers make a comparison between development costs and asset market values (Graaskamp, 1992). Development will only proceed if asset values, at least, equal development costs and when this happens, new space is added to the physical stock on the supply side of the space market.

The key point of the Geltner et al., (2006) model is that the three markets – space, asset and development markets – are interdependent and work together in determining the performance of the property sector. The model further assumes that market participants are forward-looking in some respects. Developers, for example, should be forward-looking to account for the length of time required for construction to complete. The space market is similarly forward-thinking as occupiers need to plan their long-term space requirements as much of the lettable space is often leased under long-term contracts (Geltner *et al.*, 2006). Further, since property values fundamentally depend on the future stream of cash flow, investors must equally be forward-looking in estimating the economic drivers fundamental to the level of demand within the user market and the volume of new construction within the development industry along with capital-market influences, including cost of borrowing, and investor preferences which determine the future asset values.

2.4. The residential housing market

The residential housing market is an integral and sensitive aspect of regional and national economies (Baffoe-Bonnie, 1998; Gibb, 2009; Levitin & Wachter, 2013). The market characteristics of residential property differ considerably from those of commercial and other non-residential properties. This is because housing has at least three dimensions associated with it, namely personal consumption, private investment and social wealth (Garnett & Perry, 2005). This section extends the discussion on property markets further focusing more specifically on fundamental concepts and characteristics of the residential housing market as a subset of the property market. The aim here is to sketch the structure of the residential housing sector to aid subsequent examination of the role of financial and macroeconomic variables in the shaping of prices in the housing market.

2.4.1. Nature of residential housing

The term housing is used generically to connote all types of residential units. Golland & Blake (2004) stress the multifarious significance of housing in the psychological, social, cultural and economic contexts as they highlight that dwellings generally shelter humans from adverse weather; provide households with accommodation for cooking arrangements; safety against invaders; an organized atmosphere for the upbringing of children, caring for the elderly and tending to the sick; private space for meeting social needs, and storeroom for individual and household properties. They further note that in both developed and developing economies, housing acts as a "positional good" which defines one's societal standing. As an investment, housing is also a remarkable hedge against inflation, provides as surety for borrowing, and is an important source of income generation and capital growth (Golland & Blake, 2004).

Residential housing exhibits at least three important dimensions – personal consumption, private investment, and social wealth – which exist simultaneously in all dwellings irrespective of personal tenure (Garnett & Perry, 2005). Housing is a personal consumption in the case of renters and private investment for owners and investors. Underscoring this is the fact that individuals have a proprietary interest in their residential property. At the same time, society as a whole is concerned about houses

because housing is usually partly or wholly funded from the public purse (Garnett & Perry, 2005). This indirect wider societal interest is referred to as externalities.

Another important issue in residential housing is the significance of housing finance. Residential property purchase requires significant financial commitment as housing is often the largest transaction most households ever undertake (Case et al., 2003). This, coupled with the unique characteristic of housing both as an investment and a consumption good and its durable nature, necessitates that housing acquisition is typically funded by long term credit. Housing finance ensures that funds are channelled from surplus units in the economy and made available to housing producers and purchasers who need credit usually through the mortgage market (Ferguson & Smets, 2010). It has been argued, therefore, that availability, access and cost of residential mortgages are critical determinants of the performance of housing markets (Green & Wachter, 2010). Debt finance is vital to the housing industry and access to affordable long-term funding is indispensable to efficient housing market development.

Golland & Gillen (2004) point out two concepts that are fundamental to understanding the nature of residential housing development and housing markets: housing need and housing demand. These two concepts impact the volume of housing production, tenure of new development and the location and type of housing that are built. Admittedly, the concepts of housing need and housing demand are difficult to differentiate in practice. An often-cited definition for housing need is that of Robinson (1979) who conceptualises housing needs as

> *... the quantity of housing that is required to provide accommodation of an agreed minimum standard and above for a population ... without taking into account individual households' ability to pay for the housing assigned to it* (Robinson, 1979: 55-56).

King (2009) observes that this definition presumes the establishment of certain standards of housing provision in terms of quality and quantity. Importantly such need must exclude any ability to pay measures that underlie the private market provision of housing. For this to be feasible, the standards must be defined externally, presumably, by experts from outside the particular population based on established criteria.

Housing demand on the other hand depicts the actual housing requirements of individual households at a point in time "above and beyond the minimum level of provision" (Golland & Gillen, 2004:46). Housing demand depends on both preferences and financial resources since it involves both willingness and ability to pay (Oxley, 2004). Housing demand reveals more about the choices of individual households when moving houses or changing tenures and is more associated with effective demand which is need supported by the ability to pay. It can be argued, therefore, that need is central to social housing whilst demand is what matters to developers and investors in the private housing market.

King (2009) identifies three important aspects of housing that contrasts it with other welfare goods. These are permanence, predictability and understandability. Permanence implies that housing need exists throughout the life of individuals and families irrespective of the circumstances or situation in life. Predictability follows from this and implies that, as a house will always be needed, housing needs can be anticipated and planned for: although the actual preferences of individuals and families change over time as their situations in life change, they can plan and change their housing in a fairly predictable manner. Thirdly, being both permanent and predictable with a slower pattern of change, individuals and households understand their housing needs more than other classes of welfare needs, such as healthcare for instance. As King (2009) points out, even homeless people, when asked, are entirely capable of telling what constitutes good housing and can recognise it when they see it. The principles of permanence, predictability and understandability imply that decision marking in housing can be devolved more readily to the level of the induvial and household and hence housing is more amenable to choose within markets.

2.4.2. Structure of the housing market

Housing markets bring together buyers and sellers of residential property to effect the exchange of rights related to residential properties (Oxley, 2004). It has the basic function of determining the price at which the available housing units are allocated among the existing households. Transfers of rights occur in the housing market at prices that reflect both the readiness of purchasers and the preparedness of vendors to transact.

Hoesli & MacGregor (2000) posit that the residential property market is structured around three major players: developers, investors and occupiers. Developers constitute the supply side whilst investors and occupiers are on the demand side. Residential property developers add new supply to the market with profits as their main motivation. Investors buy new property from developers and let it out in exchange for rental income from occupiers. In some instances, the same individual or organisation may be both a developer and the investor hence investors may sometimes be found on the supply side of the market.

According to King (2009) and Oxley (2004), an important concept in housing and property market studies is the idea of property rights. Property rights are the associated rights and obligations that an individual is endowed with when he/she acquires a property (Oxley, 2004). Trading at a certain price is at the basis on which markets generally operate. But to trade something one needs to have rights over it (King, 2009). The legal rendition of this is famously stated in Latin as "*nemo dat quod non-habet"* implying one cannot give out a property they do not own. Property rights are pivotal, going back to the root and very existence of markets. O'Neill (1988;4) makes it clear in his definition of markets as "contractual forms of exchange in which money and property rights over goods are transferred between agents." The key implication here is that a purchase of a residential property is more than a purchase of the bricks and mortar and properly connotes a purchase of certain rights over the property asset. The idea of property rights is one of the major sources of distinction between renting and owner-occupation as these two primary forms of tenure confer different bundles of rights.

The housing market rarely operate perfectly but it is generally deemed to be working when most people in a country are well housed most of the time (King, 2009). Housing is also mostly allocated by non-market means (Malpezzi, 1999; Gibb, 2009). Government intervention is common in the housing market due to market failures and externalities in the housing market, but the key focus tends to be on housing those who are not well housed and housed and empowering individuals to make decisions on choosing housing that meets their needs.

2.5. Macroeconomic determinants of residential house prices

Due to the nature and characteristic features of the housing market previously discussed, including extensive reliance on infrequent transactions and asymmetric information as well as the lengthy search and bargaining process, prices in the residential housing market are far from transparent (Cho & Kim, 2012). A key element of attention and important concern for housing experts and stakeholders (e.g. authorities, mortgagees, investors and owners) is the market prices of housing and the prospective direction of house price growth. This is particularly true in the UK where house price volatility is remarkably evident amidst a distinctively high level of private capital invested in residential housing and unprecedented levels of debt following the recent waves of house price inflation (Smith *et al*., 2006). House price dynamics is therefore a crucial component of residential market study since volatility within the housing market has significant macroeconomic consequences as it impacts aggregate demand, new construction, the mortgage market and general capital markets.

In the preponderance of the extant empirical research on house price determinants, there seem to be a broad agreement amongst the mainstream economists (Muellbauer & Murphy, 1997; Pain & Westaway, 1997; Ball et al., 1998; Meen, 2012; White, 2015) that house prices are fundamentally driven by the determinants of supply and demand. Muellbauer (2012) states that house prices are determined by supply and demand functions, and a dynamic price adjustment process in which the price mechanism operates to bring supply and demand into balance. This view is espoused by the World Bank who articulated in its Housing Report that "the interplay of supply and demand determines what people pay for housing and what they receive for their money*"* (World Bank, 1993 p3). House price movements are therefore linked to a host of supply- and demand-side variables influencing the space (usage), asset (ownership) and capital (finance) markets.

Many previous studies have consequently modelled house prices along with demand and supply analysis. Meen (2012) notes that, although there is considerable agreement among economists on the basic theoretical factors that determine house prices, in practice, housing economists and researchers tend to embrace diverse approaches and assumptions in their empirical formulations and, consequently, reach different

conclusions on the key drivers. Such conclusions are highly dependent on the model specification and underlying assumptions. Meen (2012) observes that, in earlier studies, relatively little attention was given to time-series properties of housing data such as issues of dynamic specification, unit root tests, and cointegration analysis which are essential in house price modelling.

According to Meen (2012), house prices are essentially modelled from fundamental housing demand and supply functions. Therefore, house prices are determined by a combination of economic and demographic variables that influence both demand for and supply of housing stock. Conventionally, studies on price determination in the housing market have modelled demand as a function of exogenous variables (such as demographic trends and disposable income), the real price of housing, and the user cost of financing that price (Meen, 2012). While user cost was previously considered mainly in terms of mortgage interest rates, it has been suggested that tax-deductibility and expected capital gains from price appreciation should be incorporated in estimating the user cost Muellbauer (2012).

On the supply side, economic models of house price determination evince a differential equation whereby the existing housing stock gradually deteriorates at a given rate but also increases slowly with new construction. The volume of new construction is expected to be influenced by house prices, and exogenous variables influencing supply generally including factor costs and short term borrowing costs (Meen, 2012). Housing demand is driven by demographic trends, such as the rate of urbanization and new household formation, as well as by macroeconomic factors that affect employment and income levels. Other significant factors in shaping housing demand are property rights, access to housing credit, and fiscal policies such as stamp duty and subsidies Muellbauer (2012).

New supply side within the residential property market is very crucial. This is determined by the availability of infrastructure construction materials and ease of obtaining development land and building permits (Adams, 2008). Housing supply is further influenced by the structure of the housebuilding industry, the availability of skilled labour, technological advancement. In the UK, Bramley (2002) notes that the

supply of new housing is comparatively rigid, giving rise to high price volatilities and significant regional price disparities.

Of key importance in house price outcomes determined by demand and supply changes is the elasticity of supply. This is the degree of responsiveness of supply given a change in demand. Considering an outward shift of the demand curve against two supply curves with different elasticities, Malpezzi & Wachter, (2005) demonstrate that the resulting growth in house prices should be greater in the less elastic supply curve. Meen (2012) confirms that demand and supply models generate strong price increases in response to increases in demand if the elasticity of supply is constrained in the short run. The price elasticity of housing supply is conditioned on the availability of developable land as well as land-use planning and building regulations (Malpezzi & Wachter 2005).

The nature and direction planning regulation also impact the housing market. Planning regulations that significantly restrict the supply of new land for housing development are likely to lead to inelastic supply, increase land and house prices and increase housing densities (Adams, 2008). There is however empirical challenges with quantification and modelling, including accurately assessing and quantifying planning controls, the responsiveness of supply and establishing how the housing market adjusts to these effects over time and space Bramley (2002).

Tsatsaranos & Zhu (2004) opine that it is useful when discussing demand and supply for housing, to distinguish between the time horizons in which these drivers impact house prices. They classify prices drivers in the housing market into short term and long term determinants. Meen (2012) advocates a similar convention but espouses the nomenclature of “cyclical” and “trend” drivers for the short term and long term drivers respectively. In the submissions of Tsatsaranos & Zhu (2004) and Meen (2012), the longer run drivers of demand for housing is determined by factors such as growth in household disposable income; shifts in demographics, including population size and structure, family sizes and composition, migration; housing taxation and interest rates. Similarly, the supply of residential housing is driven in the long term by availability and cost of land, cost of construction and investments in the improvement and quality of existing housing stock.

While these long-run drivers usually have wider national impacts, housing markets are intrinsically local and new housing supply and house prices growth can be inhibited in the short term by factors such as the length of planning and construction phases and rigidities in existing planning controls (Tsatsaranos & Zhu, 2004).

Across countries, idiosyncratic domestic factors can lead to significant variances in the dynamics of house prices. Among these significant sources of variation in cross-country house price dynamics are the prevailing conditions under which finance is provided for the purchase of housing, transaction cost associated with home purchase, level of economic activity and uncertainty about prospects following periods of heightened volatility in house prices (Adams and Fuss, 2010; Tsatsaranos and Zhu, 2004).

More than any other category of household expenditure or other investment asset classes, housing purchase decisions depend critically on access to credit. Therefore, the cost, availability and flexibility of debt financing are important drivers of demand for housing (Tsatsaronis & Zhu, 2004; Taltavull de la Paz & White, 2012). As housing supply reacts rather slowly, drivers of demand play a key role in shaping the short-term dynamics of the housing market (Tsatsaronis & Zhu, 2004). Credit availability is therefore considered to be one of the most important drivers of house prices (Said *et al.*, 2014). Lower interest rates, for example, mean that given the same level of income and annual mortgage repayments, mortgagors should be able to afford a higher purchase price (Dipasquale & Wheaton, 1992). In the UK, where a majority of mortgages come with variable interest rates, Calza *et al.*, (2013) emphasize that monetary policy shocks can significantly distort interest rates and mortgage affordability.

Besides the cost of borrowing for housing purchase, the availability and flexibility of housing finance depend on the structure of the housing finance system (Chiquier & Lea, 2009). Where there is reliance on market-based channels of financing such as securitisation of mortgage assets, mortgage lenders can replenish their funds more rapidly and are therefore able to advance more loans to home buyers (Chiquier & Lea, 2009). Moreover, credit institutions that used to hold large volumes of mortgages on their balance sheets can sell and transfer their exposure in the secondary market and focus on their comparative advantage in originating and servicing loans.

Green and Wachter, (2010) argue that changes in housing finance mechanisms are drivers in explaining the dramatic changes in housing markets and housing activity seen in industrialized countries. Lunde & Whitehead (2016) observed that, from the late 1980s, house prices and mortgage debts have moved more closely in parallel, both showing unprecedented growth from the middle of the 1990s onwards. Specifically, in the 2000s, the rate of appreciation in house prices was marked, outpacing growth in household disposable incomes such that several pundits envisaged potential housing bubble in several countries. Underlying this rapid increase in house prices was easier and cheaper access to mortgage credit (Lunde & Whitehead, 2016).

According to Armstrong (2013), Housing finance has long been recognised as a particular weakness of the UK economy, associated with demand and house price booms and busts for decades. Lunde and Whitehead (2016) show that in many European countries the rate of growth of housing credit had accelerated sharply in the decade before the Global Financial Crisis and house prices had risen rapidly in almost every country. They state therefore that "changes in housing finance mechanisms are key drivers in explaining the dramatic changes in housing markets and housing activity seen in recent years" (Lunde and Whitehead 2016, p8).

Government policy also has a central role to play in house price determination as it has both direct and indirect influences on most of the demand and supply variables. If the supply of housing is constrained or demand stimulated by government policy, then all things being equal, prices will rise (Adams *et al.*, 2005). A wide range of governmental and political factors are relevant in the housing market. Taxation, rent controls and subsidies have direct implications on demand for housing and the profitability of property as an investment (Poon & Garratt, 2012). Regulatory policies such as health and safety in buildings and land use controls restrict supply and drive house prices upwards.

Moreover, the government's role in managing the short-term fluctuations in the economy, such as inflation targeting, geared towards maintaining full employment of resources has consequences on the property market (Higgins & Reddy, 2013). Government can achieve expansion in aggregate demand by increasing aggregate injections in the economy - consumer spending, investment, government spending and

exports (Jowsey, 2011). Government influence on demand is further evinced through monetary policy – varying short term interest rates and reserve requirements affects the cost of borrowing and availability of loanable funds, housing affordability and housing demand. This was seen in the Bank of England's Quantitative Easing (QE) policy which began in March 2009 involving the purchase of liquid assets with the intention of expanding the central bank's balance sheet and boosting the supply of money (Churm et al, 2015). According to Warren (2000), fiscal policy is another demand management technique used by the government to intervene in the running of the economy. These include changing the level of government expenditure and taxation.

2.6. Housing finance

Housing finance is often used to refer to the operation of the residential mortgage market as it enables housing consumers and purchasers to borrow against the value of their housing assets (Lunde & Whitehead, 2016b). Mortgage markets enable those who wish to own their homes to spread payment over a long-term matching the longevity of the housing asset financed. It also enables landlords to leverage debt finance to purchase residential properties against future rental income streams thereby amplifying their returns (Brueggeman & Fisher, 2011). In a much broader sense, however, housing finance is a far-reaching concept and goes beyond mortgage loans to include funding through private equity government subsidies, benefits and tax reliefs (Hills, 1991).

Historically, housing markets in many countries were dominated by governments through direct housing development and housing subsidies to ensure affordability and funding was mainly through public borrowing, taxation and subsidies (European Central Bank, 2009; Lunde & Whitehead, 2016a). From the late 1980s, however, government involvement in the housing market has fallen considerably paving way for the use of private finance through the mortgage market in financing residential housing. King (2009) observed that UK housing policy since the 1980s has depended heavily on private finance from the residential mortgage market to meet successive government aims and this is widely accepted as the norm in private rental and owner-occupied housing.

King (2009, p3) opines that housing finance is simply "what allows for the production and consumption of housing." Chiquier & Lea (2009) describe housing finance as a complex arrangement that brings together multi-sector issues driven by constantly changing idiosyncratic national and regional factors, such as a country's legal environment, culture, economic makeup, regulatory environment and political systems. Garnett & Perry (2005) argue that the actual nature and scope of housing finance is more easily appreciated when viewed as a mechanism that links money inputs (sources) to money outputs (expenditure). Housing finance can then be construed as "a system of money and credit that operates to enable all types of residential property to be produced, managed, acquired, maintained, repaired, renewed and exchanged" (Garnett & Perry, 2005:13). Housing finance, in this sense, is necessary for one of two main purposes:

i. capital expenditures incurred to acquire housing or increase the quality of already possessed housing; and

ii. revenue expenditure incurred on non-permanent goods and services necessary to keep the housing asset operational (Garnett & Perry, 2005).

It is important to note that housing finance is not an end in itself, but a means to an end. In the context of housing, the end-use of finance is to design, construct, or purchase dwellings or to maintain and repair existing dwellings and to meet the day-to-day running cost (King, 2009). Housing finance, therefore, encompasses the money households use to build and maintain the housing stock as well as the money needed to pay for it, in the form of rents, down payments and mortgage repayments (Garnett & Perry, 2005; King, 2009). A housing finance system has the basic aim of ensuring that funds are made available to housing producers and purchasers (Boleat, 2005). According to King (2009), the definitive purpose of housing finance and the main reason why governments find it necessary to intervene and regulate markets for housing finance is to ensure that all citizens gain access to good quality housing.

Although, historically, housing finance in many countries relied on funds provided by regulated local depository institutions, following the deregulation and liberalization of financial markets in the 1980s and with the development of capital markets and securitization, funding for housing now comes from a much broader array of sources, including national and international investors (Green & Wachter, 2010). Several

innovations have transpired in the housing finance market resulting in the increased supply of funds for housing (Jorda *et al.*, 2016). At the same time, this has heightened the concentration of risks (Armstrong & Davis, 2014). A plethora of national models of housing finance has emerged around the globe mainly due to government policy.

2.6.1. Housing finance and the macroeconomy

Housing finance is a key factor in overall economic and financial market development. Several authors have demonstrated that the depth of the mortgage market is inextricably linked to the degree and strength of the national economy, hence the level of economic development (Leung, 2004; Stephens, 2007; Taltavull de la Paz & White, 2012b; Gibb *et al.*, 2013; Jones, 2016). Housing finance is also central to financial intermediation and stability as evidenced by the events of the decade leading up to the 2007/08 global financial crisis. Chiquier and Lea, (2009) pointed that an effective housing finance market provides benefits to the economy including increase in homeownership, economic growth, employment opportunities, neighbourhood development, taxation revenue, and social and political stability. Additionally, an efficient housing finance market is a significant source of domestic capital accumulation and retirement policy, with spillover effects on the broader economy (Chiquier and Lea, 2009).

An efficient housing finance system not only supports owner-occupation but also boosts the rental sector as investors and developers can access long term funding secured against future rental income (Lunde & Whitehead, 2016b). Moreover, the capital market is deepened where an efficient primary mortgage market supports the repacking and selling of mortgage-backed securities (MBS) on the capital market (Chiquier and Lea, 2009). There is also improved stability of the financial system where the housing finance market works efficiently (Jaffee & Renaud, 1996). As De Soto (2000) points out, in the absence of an operational housing finance market, a significant amount of vital resources ends up as *"dead capital"* locked up in informally developed and extra-legal housing.

A poorly functioning housing market is to be expected to pollute the rest of the economy with its inefficiencies (Jaffee & Renaud, 1996). The 2007/08 GFC has been blamed on the housing finance market. Critics contend unregulated expansion of the housing

finance markets paved the way for unhealthy competition in the mortgage market, led to the introduction of risky, extortionate and poorly underwritten mortgage-backed securities, made households over-indebted, allowing house prices to increase in an unsustainable way (Case, 2008; Richard, 2011; Schwartz, 2012; Lunde & Whitehead, 2016b). While these arguments have their primary roots in the experience of the US housing market, the experiences in Europe and other markets across the globe were similar regarding the fragility of the mortgage market and the over-indebtedness of households.

Nevertheless, the subprime mortgage crisis does not negate the economic importance of housing finance. What it does indeed show, in the opinion of Bernanke et al., (2013), is the realities of what happens when this expansion is pursued carelessly with no consideration for the dynamic feedbacks in the housing market. According to Green & Wachter (2010), the subprime crisis dictates that lenders ought to pay attention to underwriting standards as "no amount of sophisticated structured finance can overcome the lack of sound underwriting" (ibid, p59). In the absence of sound regulation, investors are confronted with uncertainty rather than risk and are unable to make informed investment choices.

2.7. Nature and operation of the mortgage market

A mortgage may essentially be construed as a credit arrangement secured by real property, resulting when the owner of realty pledges his interest thereof as a guarantee for the due repayment of principal borrowed and any interest accruing thereon. The essential feature of a mortgage loan is that the lender has a security interest in the mortgaged property so that in case the borrower defaults, the lender can recover the unpaid loan balance through foreclosure of the property (Ling & Archer, 2012). Broadly speaking, mortgages are divided into residential mortgages and commercial mortgages; the former being secured by individual homes and the latter by income-producing real estate.

Mortgage lending is an important means of financing private ownership of residential housing in several developed and emerging economies. By mortgage credit, households can purchase homes now and pay for them, with interest, over up to 30 years. The use

of mortgage credit in housing acquisition enables households to circumvent the need to pay huge upfront sums for houses, thereby allows for portfolio diversification in their investments (Floyd & Allen, 2002). Households and institutional investors may, similarly, chose to use mortgages even when equity funds are available because of the associated leverage and tax advantages (Geltner *et al.*, 2006). In the opinion of Boleat (2005), the mortgage market is the most efficient method of financing house purchases.

Mortgages are classified in several ways. One common classification is based on how the principal and interest are calculated and repaid. Interest may be fixed for the entire duration of the loan, with the loan amortized by constant periodic payments or vary over the life of the loan with resultant variations in the periodic payments and the term of the loan. In comparison to other developed economies, the UK has a high proportion of mortgages with variable interest rates. Moreover, within the stock of fixed-rate mortgages, a greater proportion has rates fixed for between 2 and 5 years only (Miles, 2005). The limited availability of long term fixed-rate mortgages in the UK have been linked to potential problems in the capital market. Because of the size of mortgage stock, this represents a significant macroeconomic risk as households are more prone to interest rates and monetary policy fluctuations (Calza *et al.*, 2013).

The mortgage market designates a vast arrangement of institutions and individuals who are involved with mortgage finance. "It is the totality of interactions between suppliers (investors) and consumers (borrowers) with intermediaries (mortgage lenders and brokers) in between, in a framework set by law and regulation" (Scanlon & Adamczuk, 2016). International mortgage markets differ strikingly from one another principally in terms of the sources of mortgage funding, design of the mortgage contracts and role of government in the mortgage market (Campbell, 2012; Stephens, 2007). A wide array of mortgage instrument designs have been developed to meet the varied needs of borrowers and lenders and there is no one ideal mortgage design for any market (Lea, 2010). In the Netherlands and Germany for instance, housing finance is characterised by specialised mortgage banks and funded by mortgage bonds backed by collateral pools while the US has a developed secondary mortgage market (SMM) where mortgages originated by commercial banks and other primary lenders are repackaged

and sold to investors as mortgage backed securities (MBS) which serves an important source of long-term funding (Green & Watcher, 2005; Green 2013).

The UK on the other hand has embraced a more depository cantered type of mortgage market where building societies and commercial banks act as primary mortgage lenders and funding mainly comes from short term deposits insured by the government (Whitehead, 2000; Smith, 2012). Even, within national markets, a complete and fully developed mortgage markets tend to have a diverse product adapted to the current needs of borrowers and lenders (Lea, 2010).

A fully developed mortgage market is composed of two separate and yet connected components: the primary mortgage market where new mortgages are originated and the secondary mortgage market where existing mortgages are bought and sold by third parties (Geltner et al, 2006). In the primary market, the lending institution issuing the mortgage is the buyer of the loan, providing the money upfront in return for the anticipated future cash flows. The borrower, on the other hand, is the seller of the loan, in the sense that he is receiving the money in advance and is in effect taking a short position in the mortgage as an investor (Geltner *et al.*, 2006). Once issued, the mortgage itself is a capital asset - a claim on a stream of future cash flows - and thus can be sold by the original issuer to a third party, who may then sell it again to another party; this is referred to as the secondary mortgage market.

A mortgage lender may originate a mortgage either for resale or as part of its investment portfolio. If a loan is intended for sale rather than to be held by the lender in its portfolio, the loan must meet the secondary-market purchasers' requirements in terms of standardized documentation, underwriting and servicing (Lea, 2000). By selling the loans they originate, primary lenders obtain funds that they can use to make new mortgages. Investors who buy mortgage loans consider these loans as investments and usually pay the lender a fee to continue servicing the loans.

Mortgages in the secondary mortgage market are often grouped based on risk, size and structure, and are then transformed and sold in the capital market as mortgage-backed securities. Different types of mortgage-backed securities are sold on the secondary market. Common types are mortgage-backed bonds (MBBs), mortgage pass-through

securities (MPS), mortgage pay-through securities (MPTS), and collateralized mortgage obligations (CMOs), each with different risk-return profiles and tailored at different investor classes. Investors in mortgage-backed securities receive a return on their investment in the form of periodic payments paid from borrowers' repayment of the mortgage loans that back the securities. MBS are more liquid than traditional mortgages and can be easily traced. The Miles report on Mortgage Finance in the UK held that interventions that address the closure of mortgage-backed funding markets and made them more open and vibrant would bring about increased competition in residential mortgage lending and improve the availability of mortgage finance to homeowners in the UK. (Crosby, 2008).

2.8. The housing finance revolution: 1980s – 2000s

Housing finance deepened radically in several developed countries between the late 1980s and 2007. Research by Jorda et al., (2016) revealed a dramatic boom in housing finance occurring in a very short period between the mid-1990s and 2007. In a cross-country sample of 17 advanced economies, they found "average bank credit to GDP ratio rose from 79% of GDP in 1995 to 112% in 2007" (Jorda et al., 2016: p8). Lunde & Whitehead, (2016a) traced the evolution of housing finance in 21 European countries for 25 years and found that more countries have introduced housing finance systems with mortgages secured against property over the period from 1989 to 2014 with several others improving and expanding already existing housing finance systems. Over this same period, they observed that financial institutions came up with new types of loans and utilised a wide variety of approaches to increase their lending particularly through capital markets and mortgage securitisation.

In the UK, before the early 1980s, residential housing finance was provided primarily by the regulated building societies in a system of direct depository financing drawing upon the surplus savings of the household sector (Pryke & Whitehead, 1994). There was a relatively uncomplicated relationship between the borrower and lender and risk was contained within this "special circuit" (ibid). Significant expansion of the UK mortgage market occurred in the 1980s, following a wave of deregulations across the financial and capital markets and a government policy to sell public rented housing to

sitting tenants at below-market rates (Smith, 2012). Whilst, the outstanding value of residential mortgage loans amounted to 32% of GDP at the beginning of the 1980s, this had climbed to 58% by 1988 and by the mid-1990s, UK mortgage debt amounted to over 60% of nominal GDP (Smith, 2012).

2.8.1. Drivers of the housing finance expansion

2.8.1.1. Macroeconomic drivers

According to (Lereah, 1997), the long-term prospects of housing finance are driven by five important forces namely: the interest rate cycle, demographic trends, technological innovations, changes in the business environment and changes in government policy. Green and Wachter, (2010) argue in favour of three of these - deregulation of housing finance markets, technological progress and lower interest rates - as the key drivers of the housing finance revolution. Chiquier & Lea (2009) similarly highlight macroeconomic factors (interest rate), financial liberalization and technological change as the key drivers of the housing finance expansion. Although the importance of each of these drivers has been highlighted in the literature, White (2015) noted that interaction effects of these factors may be more important than looking at any one of them in isolation. Yet, for the sake of simplicity and clarity, these will be discussed separately.

Several recent macroeconomic trends have played a fundamental role in revolutionising the housing finance market. According to Chiquier & Lea (2009), stable and low-interest rates and stable economic growth appear to be the key factors in mortgage market expansion. Similarly, Jones (2016) observed that the fundamental macroeconomic variables that influence housing demand and house prices were economic growth, interest rates and the availability of mortgage finance. Housing finance is one of the most interest-sensitive industries and as such interest rate movements affect the availability and affordability of mortgage credit. Lower mortgage rates improve affordability conditions and stimulate refinancing transactions whereas higher mortgage rates dampen households' appetite and ability to purchase a home (Muellbauer, 2007; Duca et al., 2010).

Renaud (2009) argue that macroeconomic instability and its corollary of high and volatile interest rates had a disproportionate impact on long-term mortgage finance. Baffoe-Bonnie (1998) used vector autoregressions to show that shocks to macroeconomic variables result in cyclical movements in the housing sector. It was found that housing markets respond to shocks in employment and mortgage rates. Tsatsaronis and Zhu (2004) identified inflation as the key driver of real house prices. Inflationary pressures impact interest rate movement as does government budget deficit. Chiquier and Lea (2009) likewise maintain that growth in overall income and wealth has been a major contributing factor to the growth in housing finance.

Green and Wachter (2010) state that so long as interest rates remain stable and the yield curve remains positively sloped, interest rate risk has little impact on mortgage lenders' profitability and solvency hence mortgage advances will increase. It is argued, therefore, that favourable macroeconomic conditions helped the housing finance system work especially during the decades between the late 1980s to 2007. An important characteristic that allowed housing finance to become more linked to global capital markets was the major decline in interest rates.

2.9.1.2. Regulatory and policy changes

According to Chiquier and Lea (2009), financial liberalization is the single most important contributor to global housing finance growth. Historically, housing finance was provided by heavily regulated local lenders and government-run entities (Green & Wachter, 2010). Presently, however, this situation has changed and given way to the integration of housing finance into capital markets and the linking mortgage finance to international capital flows Scanlon & Adamczuk, (2016). Previously housing finance was constrained by government policies that segmented the financing of the housing into specialised circuits that were cut from the rest of the economy. In the UK for example, housing finance in the early 1980s was predominantly funded by regulated Building Societies that charged below-market rates (Diamond and Lea 2000).

Deregulation of the UK housing finance market resulted in the integration of the housing finance markets into the broader capital market. The Building Societies Act of 1986 led to these institutions offering competitive banking services equivalent to

normal banks and allowed Building Societies to convert to corporate status and operate as corporate firms and access capital markets by the controlled public offering of stocks. The same Act also made provision for commercial banks to offer variable rate mortgage products to borrowers. This levelled the playing field for mortgage lending enabling larger and more financially integrated commercial banks to increase their market share of mortgages leading to the decline of the specialised building societies (Diamond and Lea 2000). Whereas building societies provided 70% of all outstanding mortgages in 1980, by 2000, their share of total mortgages granted had shrunk to less than 15% (Green & Wachter, 2010). Similar transformation and deregulation occurred in Spain, Germany and many other industrialised economies leading to competition, efficiency and increased supply of mortgage loans for residential housing. Scanlon & Adamczuk, (2016) argue that in most countries the deregulation of financial markets brought about consequent product innovation, and this provided borrowers with greater choice and allowed lenders more actively to manage their portfolios of assets.

2.9.1.3. Technological innovations

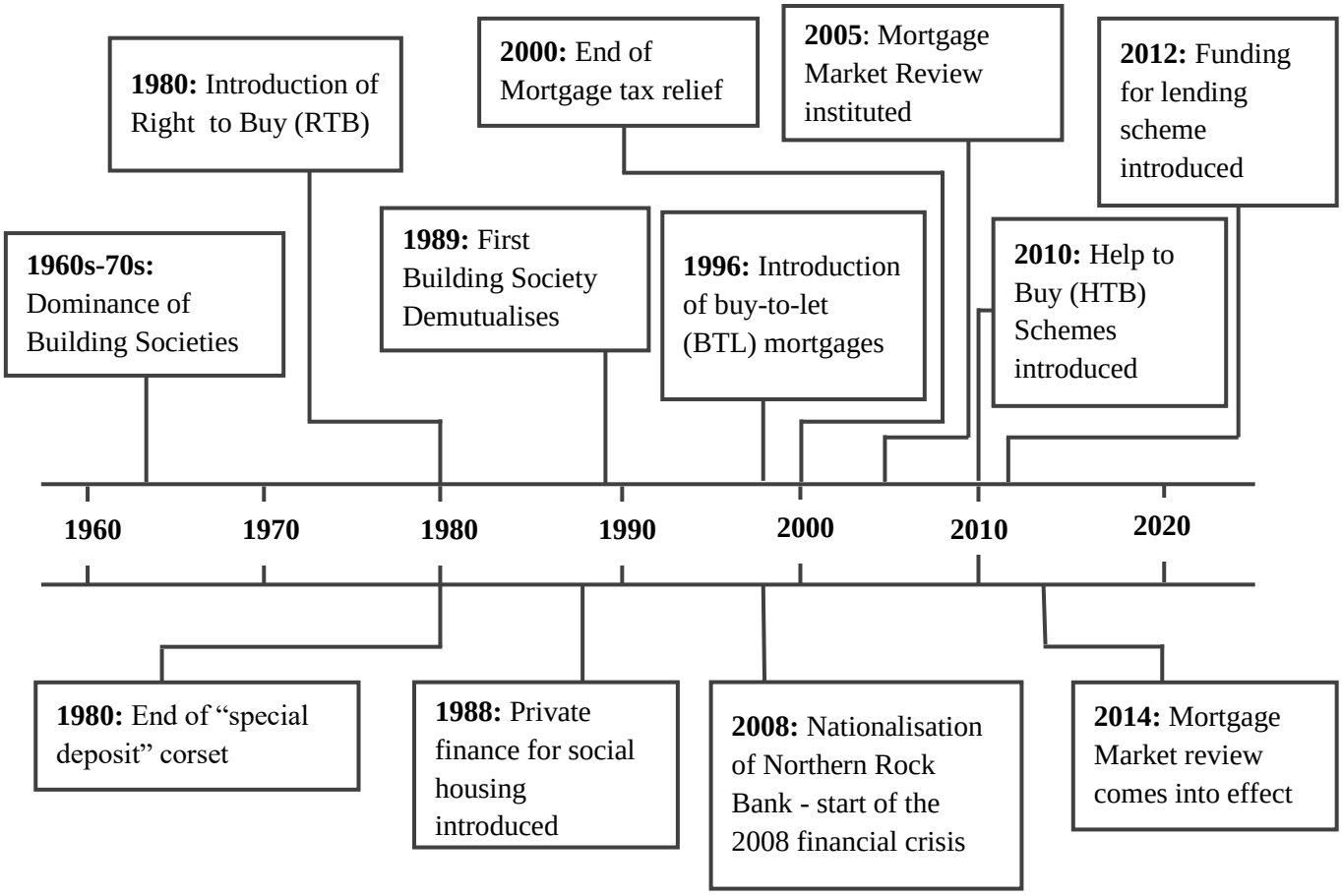
The structure and the quality of the global financial system have been enormously influenced by recent technological advancements (Levine et al 2000) and this has contributed to the vast financial innovations in the housing finance market. According to Green and Watcher (2010), technological innovation has proved instrumental in the changes that have swept housing finance in the last few decades. Advances in technology have permitted the development of money market funds which has eliminated constraints of interest rate ceilings, providing an alternative investment vehicle largely grounded on highly rated, short-term debt securities. Securitization – the pooling of loans and the issuance of securities backed by the cash flow from those loans – is another financial innovation that provides the financing for the vast majority of mortgages in the United States (Levitin & Wachter, 2012). Another example in this regard is the development of the Euro market which accelerated cross border cash flows. Money flowed out from regulated institutions into new, higher-yield money market accounts, diminishing the ability to rely on protected savings deposits to fund loan origination (Green & Wachter, 2010).

The innovations in technology drove down the costs of mortgage intermediation. Lea, Chiquier & Hassler, (2004) argue that significant cost savings were realized through automated underwriting and servicing which meant that mortgage lending no longer has to rely on the costly collection of small deposits for repackaging in larger mortgage loans. Small mortgage loans can be repackaged in large and diversified mortgage-backed securities (MBS), which can access large investors with appetites for non-recourse, long-term investments such as pension funds companies (Chiquier & Lea, 2009). Green and Wachter (2010) state that the consequence of the link to cheap debt provided by global capital flows is increased access to financing for homeownership and a resulting increase in housing demand.

2.9. Mapping out policy and regulatory changes in UK housing finance, 1960s – 2018

Recognising that housing provision and housing finance cannot be safely left to market forces, successive governments have over the years found it expedient to exercise some form of regulatory control in the housing market. Housing finance in the UK has thus seen significant regulatory changes over the years shaping the housing market in a fundamental way into what it is today. This section identifies and assesses the key features of the fundamental policy and regulatory changes in UK housing finance and how these have impacted the housing market. It is widely recognised that changes initiated by the Thatcher government in the late 1970s and early 1980s were pivotal in the institutional and policy transformations in UK housing finance and could be considered a major catalyst for subsequent radical changes and the rapid expansion of the market that followed (Baddeley, 2005). Central to the Thatcherite policy reforms were the important changes in housing subsidies, fiscal incentives encouraging the purchase of government-owned housing stock, the remarkable financial deregulation which saw the removal of constraints on mortgage rationing (Baddeley, 2005; McCord *et al.*, 2011). Figure 3.2 illustrates the key milestones in housing finance in the United Kingdom from the early 1980s to the present. Each of these events served as a trigger for a wider development on particular aspects of the UK housing finance landscape to be examined subsequently.

Figure 2.5: Key milestones in UK housing finance: 1960s – 2018



Source: Author's Construct

2.9.1. The Deregulation and the competition period: 1980 – 1989

The late 1970s to early 1980s marked the beginning of a series of radical changes that would transform the fundamental structure of the housing finance market in the UK. Until the early 1980s, the residential mortgage landscape was completely dominated by building societies whose behaviour was characterised by non-price competition taking the form of a mortgage rate cartel, regulations that prevented bank competition, tax advantages in the personal savings market and large entry costs (Gibb *et al.*, 1999).

The early 1980s saw substantial deregulation in the financial services sector. Deregulation essentially involved the removal or simplification of government rules and regulations that prevented the free market from operating (King, 2012). This removed some of the restrictions and put building societies on even footing with the rest of the financial sector and therefore brought banks into the mortgage market on a

massive scale. Banks' mortgage lending began to gain momentum and their share of new lending grew particularly stronger following the 1988 housing recession. According to Gibb et al (1999), the entry and growth of banks' mortgage lending were enabled, *inter alia*, by the ending of the special deposits corset in 1980 which allowed banks more freedom to lend as well as the collapse of the building societies mortgage rate cartel in the early to mid-1980s which enabled direct price competition between banks and the building societies. Moreover, new legislation, notably, the Building Societies Act 1986 and the Financial Services Act 1986 coupled with technological change and the deregulation of the financial market changed the face of the banking and saving industry making all financial activities including mortgage lending open to intense competition.

The Building Societies Act 1986 introduced significant changes including the redefinition of building society assets which before the passing of the Act was narrowly limited to mortgages and assets necessary for the conduct of the Building Societies' business. Some building societies took advantage of the freedom offered by the new Act to hold new classes of assets to diversify their activities beyond the housing and mortgage markets, but this was still hindered by regulations governing building societies hence the main route taken by lenders to achieve diversification was through "de-mutualisation" entailing a series of mergers, acquisitions and conversions.

In 1989, Abbey National was the first building society to successfully convert to a bank. This was the harbinger of a wave of conversions to follow including the taking over of Cheltenham & Gloucester, one of the big ten societies at the time, by Lloyds. Eventually, by 1996/97, most of the building societies had become full-fledged banks. By 1997 the market share of Banks (including previous societies which had now converted to banks) had surpassed that of building societies, establishing banks as the principal originators of residential mortgage loans.

Another important regulatory change in this period was the introduction of the Right-to-buy (RTB) scheme in 1980. This gave tenants of council houses the option to buy their homes at a discount of up to 60% aside from the right to a 100% mortgage from the local authority at a below-market rate of interest. King (2009) states that the RTB was, arguably, the most successful housing policy over the last 50 years, as it directly

supported the growth of owner-occupation in the UK. An estimated 2.5 million dwellings were sold under the Rights to Buy across the UK (Jones & Munrie, 2006).

2.9.2. The boom period: 1990s – 2007

Following the massive deregulation in the 1980s and the increased participation of banks in the mortgage industry, the period from the 1990s to the early 2000s saw a significant increase in mortgage lending. The period was also marked by rapid consistent economic growth, low inflation and falling interest rates amidst light-touch regulation of the financial sector (Turner, 2008). Economic growth fuelled by consumer confidence in the liberal monetary policy initiatives coupled with innovations in housing finance and particularly the mortgage industry, all served to increase demand within the general economy and housing market in particular (McCord *et al.*, 2011). Owner-occupation also grew considerably in this period fuelled by enriched working-class households and significant government support (King, 2012).

Among the important milestones in housing finance during this period was the introduction of an important new mortgage product, the buy-to-let (BTL) mortgages, in 1996. Following the deregulation of the private rental market by the Housing Act of 1988, residential property investment had become more attractive to prospective investors and private landlords who generally had to fund their purchases by commercial loans or by remortgaging their own homes (Scanlon & Adamczuk, 2016).

The buy-to-let mortgage was developed as a new type of loan by the Association of Residential Letting Agents together with a group of lenders. Assessment for the BTL loan took into account the prospective rental income from the property rather than the landlord's income. BTL increased in popularity as a normal investment with the market share rising from less than 1% of all loans in 1999 to 14% by mid-2014 (ibid). Along with the buy-to-let, the 2000s also saw a significant rise in the proportion of interest-only (IO) mortgage loans, although this had long been previously available in the UK mortgage market in the form of endowment mortgages. Scanlon & Adamczuk (2016) estimate that by 2007, about a quarter of new mortgages took the form of interest only mortgages not backed by any specific repayment vehicle. Wilcox (2013) notes that the introduction of BTL mortgages led to a sharp growth in the private rented sector which

grew sharply to constitute about one-fifth of the private housing market in the decade following the introduction of BTL mortgages.

Economic conditions of the early 2000s were touted by politicians as sustainable and permanent and a key part of this was light-touch regulation that sought to promote growth in the financial services and housing sector (King, 2012). However, the increased liquidity led to a rapid appreciation in house prices resulting in a marked decline in FTB affordability which was manifest in the substantive divergence between house prices and income levels (McCord *et al.*, 2011). It was not long before the signs of the inevitable market correction began to emerge. After the unprecedented solid and prolonged rise in real house prices, the market had begun to cool down in the mid-2000s (Scanlon et al., 2011). Recognizing the mistakes made and overheating the housing market, an official rule book was issued for the mortgage industry and, in 2005, the Financial Services Authority (FSA) instituted the Mortgage Market Review (MMR) to comprehensively examine the mortgage lending activities and practices of UK Banks.

2.9.3. The crisis period: 2007 – 2008

One of the most important episodes in the UK housing finance timeline was the failure and subsequent Nationalisation of Northern Rock in 2008 which is officially considered the start of the 2008 financial crisis in the UK. Northern Rock, which originally began as a building society but had digressed from its roots to seek wholesale funding through securitisation and mortgage-backed bonds, much of which was borrowed on a short-term basis. It had seen remarkable growth and tripled its assets in a few years to become one of the top five mortgage lenders in the UK. By mid-2007, Northern Rock realised it could no longer refinance its short-term debts. The news made its way to the public triggering panic among depositors and a potential run on the bank. The government responded swiftly to stop the bank run by guaranteeing all deposits at the bank and later nationalised the company in 2008.

Mid 2007 to early 2008 represented a turning point in the UK housing market with transactions and housing prices falling dramatically. The collapse of Lehman Brothers in the US in September 2008 officially marked the beginning of the financial crisis that swept across the globe. The UK financial industry was severely affected and underwent

enormous cataclysms in 2008 and 2009 with a series of mergers and government takeovers. The immediate impact of the credit crunch in the UK was to curtail sources of short term and wholesale funds to lenders and to weaken their capacity to operate. The second was to completely reverse expectations of future house prices and the capacity to borrow either to purchase or to develop. This led to a massive restructuring of the mortgage industry, including large-scale nationalisation and the near closure of the wholesale funding market (Scanlon &Whitehead, 2011).

2.9.4. The post-crisis period: 2009 – 2018

The 2008 Global Financial Crisis affected the entire UK financial system, but the impact was most evident and immediate on the mortgage industry with lending remaining stagnated for several years in the wake of the crisis. To curb the increasing political pressures of lack of access to mortgage funding, several policies were introduced by the then government. The first was the Funding for Lending Scheme launched in 2012. The scheme allowed banks and building societies to borrow Treasury funds at below-market rates for an extended period to reduce the cost of lendable funds and encourage more lending. To achieve the goal of incentivising institutions to advance more credit, the scheme was structured such that institutions that increased their lending paid lower rates (Churm *et al.*, 2015).

Another programme introduced by the government to help revive the depressed mortgage market was the Help to Buy (HTB) schemes instituted in 2013. This programme consisted of two separate schemes: first a government equity loan of up to 20% of the value of a new home, and the second a mortgage guarantee for purchasers with small deposits. There were no income limits and purchasers needed not to be first time buyers to qualify under the scheme. There was the Mortgage Market Review (MMR) which came into effect in 2014. The MMR primarily sought to ensure continued access to mortgage finance to those who could afford it and simultaneously address the poor mortgage lending regulatory regime seen in the decade leading up to the crisis. The new rules limited lender's ability to offer some less conventional products, self-certification mortgages were banned, and stricter affordability assessment criteria were introduced.

2.10. Impacts of key policy regulatory changes in UK housing finance since the GFC

The government policies can impact homeowners' access to mortgages and overall activity in the housing market. Over time, the government has introduced several policies and regulations as elaborated in Section 2.9 above. This section discusses the impacts of major government policies implemented following the 2007/08 crisis on access to mortgages and the housing market. It specifically addresses the significance and consequences of the introduction of the Funding for Lending Scheme, the Mortgage Market Review and the Help-to-Buy Schemes in restoring resilience and stability in the mortgage and housing markets.

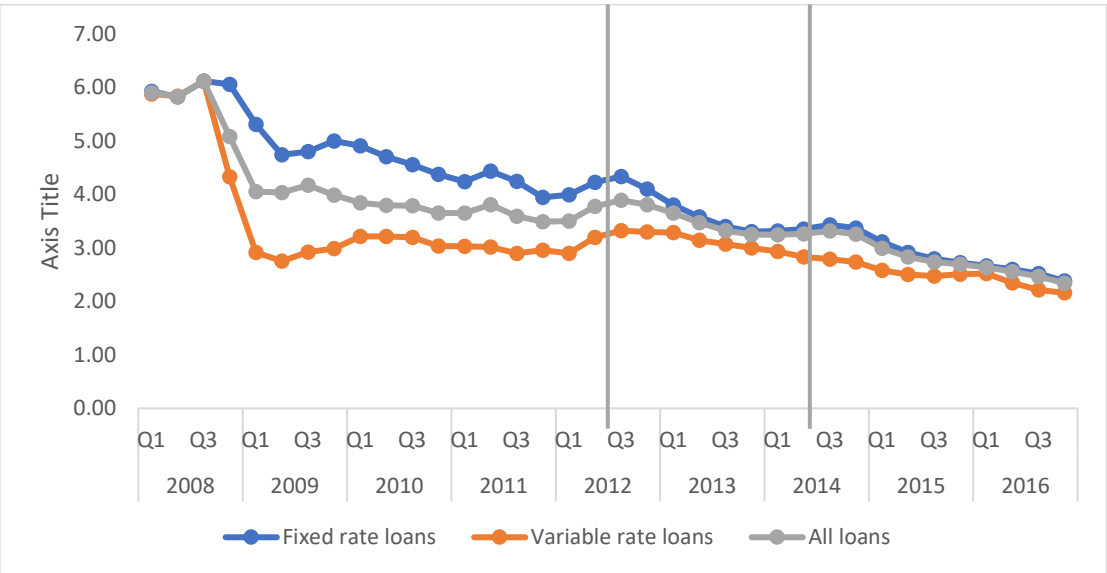
2.10.1. The Funding for Lending Scheme (FLS)

The FLS was officially launched in August 2012 to enhance the capacity of banks and building societies to lend to households and businesses. The scheme sought to halt the downward spiral of lending and borrowing that had plagued the UK since the onset of the crisis and thereby strengthen the economy. The goal was to increase bank lending to the real economy by up to £70bn (Churm *et al.*, 2012). The FLS was one of the unconventional monetary policies introduced in the wake of the GFC, complimenting quantitative easing (Churm et al., 2012; Armstrong & Ebell, 2015). Its focus was on directly reducing bank funding costs to boost bank lending, whereas quantitative easing (QE) sought to bypass the banking channel by boosting asset prices and reducing borrowing costs. To industry players, the introduction of the FLS was seen as a clear effort to ensure the flow of cheap funding for mortgages(UK Finance, 2019). The lower overall bank funding costs was to allow banks to reduce the cost of loans to consumers and ease other non-price terms. The increased supply of credit was expected to boost consumption, investment and overall economic growth. At the end of the first phase of the scheme in January 2014, outstanding drawings stood at an estimated £42.bn (Churm *et al.*, 2015). The government changed the rules in January 2014, such that the FLS could no longer be used to support mortgage lending but banks and building societies were able to access the funds until the end of January 2015.

Identifying and quantifying the exact impacts of FLS is problematic as a myriad of other factors and developments both within the UK and the euro area at the time did affect funding cost and lending conditions facing UK banks. The most obvious and direct impact of the FLS was a reduction in funding costs for participating banks and building societies. King (2012) observed that funding spreads on bank debt in the UK fell by more than those in the US and core European economies. Benetton et al., (2019) estimate that on average, the FLS scheme lowered banks' marginal costs by 30 basis points. Additionally, interest rates, fees, average loan size and the number of mortgages originated improved. This is consistent with the Bank of England's 2013 Credit Conditions Survey responses indicating that that access to FLS played an important role in reducing the cost of loans (Churm *et al.*, 2015).

Figure 6.2 depicts the trend in mortgage interest rates from the onset of the crisis through to the introduction of the FLS. It is evident from Fig 5 that mortgage interest rates were lowered after the introduction of the scheme in the third mid- 2012. This has been linked to the effects of the FLS (Martínez, 2014). Coincidentally, it is also observed that mortgage rates (particularly rates on fixed-rate loans) began to rise by mid-2014 when the FLS was modified to exclude mortgage financing.

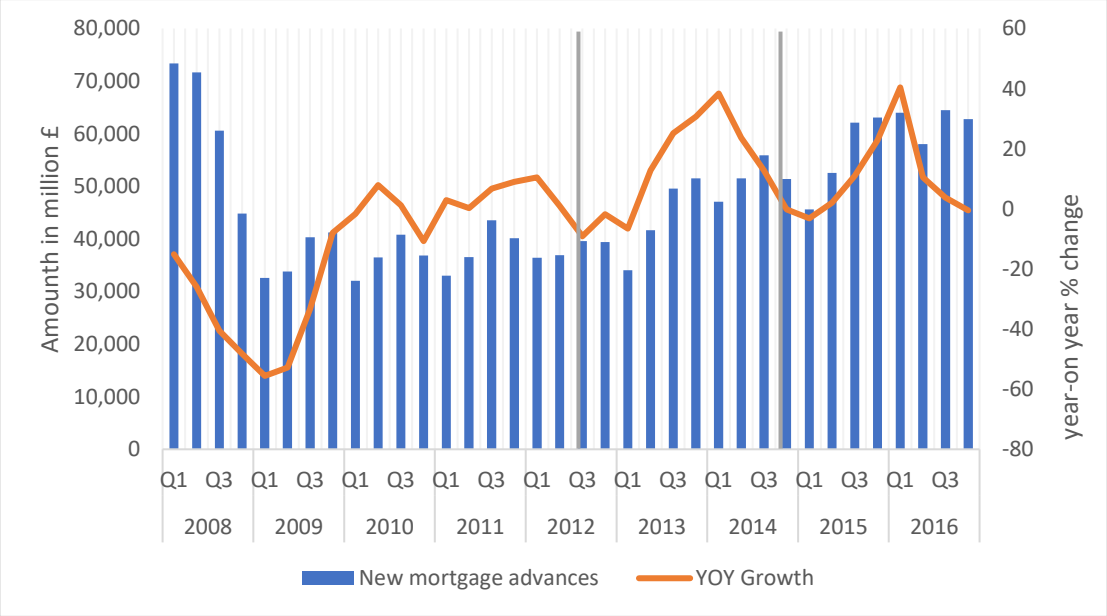
Figure 2.6: Impact of FLS on mortgage interest rates



Source: Bank of England & Financial Conduct Authority: MLAR Statistics (2018)

The Scheme also impacted bank lending in general which began to show some strength in mid-2013 after three years of negative growth rates. These improvements are correlated with an increase in mortgage lending (Martínez, 2014). This is consistent with trends depicted in Figure 2.6 which shows notable improvement in gross mortgage advances in 2013. Also, year-on-year growth in new mortgage advances which had been in the negatives since the crisis took an upward turn following the introduction of the scheme.

Figure 2.7: Impact of FLS on Mortgage lending



Source: Bank of England & Financial Conduct Authority: MLAR Statistics (2018)

The exact timing for which the FLS impacted the market is another problem faced in examining its impacts. While there was an immediate response to the announcement, exactly how long its impacts would last, and the possibility of these impacts being contaminated in the long run is another identification problem. Churm et al., (2015) found a positive effect of 0.8 % on GDP and 0.6 pp on inflation more than a year after the start of the policy.

2.10.2. Mortgage Market Review (MMR)

The Mortgage Market Review (MMR) came into effect in June 2014 as an attempt to constrain the growing macroprudential risks associated with rising households' indebtedness. The MMR primarily sought to ensure continued access to mortgage

finance to those who could afford it while simultaneously addressing the poor mortgage lending practices seen in the build-up to the financial crisis by placing "…affordability at the heart of the lending decision process" (Financial Conduct Authority, 2016). Responsible lending rules were introduced setting out defined standards for assessing affordability as well as clarifying who is ultimately responsible for mortgage lending. In the same year the FCA implemented the MMR proposals, the Bank of England's Financial Policy Committee (FPC) also introduced its macro-prudential housing tools in the form of interest rate stress tests and LTI caps as a means to further strengthen the FCA's affordability assessment (UK Finance, 2019). These measures worked in tandem. The FPC's macro-prudential regulations specified that:

i. Mortgage loans with an LTI ratio equal to or above 4.5 are limited to not more than 15% of banks' new advances.

ii. Stress tests were to be used to ensure that borrowers were resilient and could afford unanticipated interest rates rise of up to 3 percentage points in the first five years of the loan

The key changes introduced by the MMR to responsible lending rules included requirements that:

i. "…assess affordability based on a borrower's verified income, credit commitments, essential expenditure and basic quality of living costs"

ii. "…take into account known or likely future changes to income and expenditure"

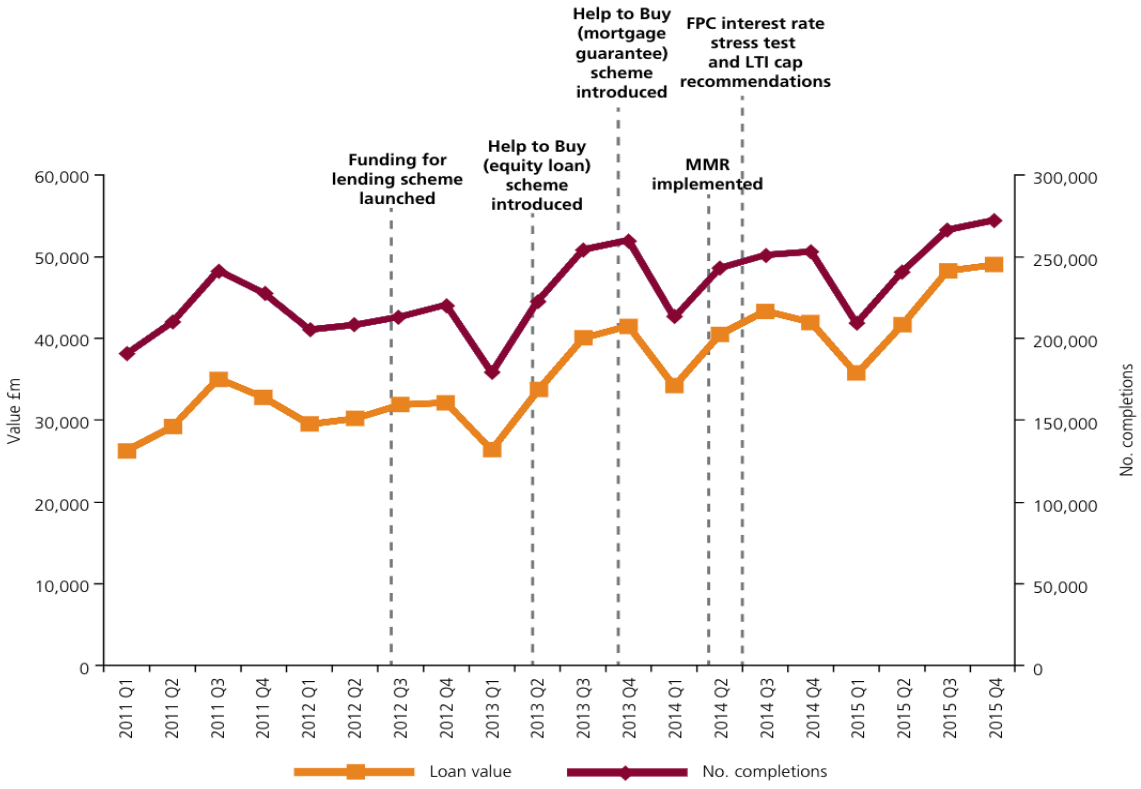
iii. "…consider the effect of expected future interest rate rises

iv. "…not assess affordability based on self-certified income or house price inflation "and

v. "…only grant an interest-only mortgage where the customer has a credible repayment strategy" (Financial Conduct Authority, 2016)

The new rules thus limited lender's ability to offer less conventional products as self-certification mortgages were banned and stricter affordability assessment criteria were introduced. Commentators expressed concern that the responsible lending requirements would restrict access to mortgage credit for some new and existing borrowers. Whilst the FCA admit that the activity in the mortgage market is subdued, it finds in a review report there is no evidence of any significant distortion of lending volumes as a result of the responsible lending rules. This is depicted in Figure 2.8.

Figure 2.8: Mortgage completions trends, 2011-2015



Source: (Financial Conduct Authority, 2016)

Figure 2.8 shows that mortgage completion trends were largely unaffected both in volume and value during the period of implementation of the MMR. This was mainly a result of interest rates remaining low. It was also the case that lenders had already assumed a more cautious approach even before the coming into effect of the new rules (White, 2015). On the other hand, (Wilcox, 2013) opine that the new rules led to a sharp fall in the proportion of high LTV mortgages and there is still no obvious indication of any recovery in their availability. It is further anticipated that the rules will have a

greater impact as interest rates rise and affordability is stretched (Wilcox, 2013). Even in the light of other interventions such as the HTB schemes, access to mortgages will still be restrictive because of credit quality issues which in turn reflect the outcomes driven by the MMR.

2.10.3. Help-to-Buy Schemes (HTB)

The Help to Buy (HTB) was a policy intervention introduced in 2013 geared towards providing a stimulus to the housebuilding industry by increasing the supply of housing through the building of more new homes ((Finlay *et al.*, 2016) Introduced by the Chancellor in the 2013 budget speech, it was acclaimed as "…the biggest government intervention in the housing market since the Right to Buy scheme in the 1980s" (Hilber, 2015) The programme consisted of four separate schemes which provided different forms of support to households aiming to buy a property as owner-occupiers. The first and most popular was an Equity Loan Scheme of up to 20% of the value of a new home. There was also the Mortgage Guarantees Scheme for purchasers with small deposits, the Shared Ownership Scheme and the Help to Buy ISA. There were no income limits and purchasers needed not to be first time buyers to qualify under the scheme, but it is restricted to the purchase of new build properties with prices under £600,000 (Carozzi *et al.*, 2020). The main objectives were to increase housing construction homeownership attainment. The government equity loan could be repaid at any time without penalty and borrowers only needed to repay the loan if they resell the property. When the borrower resells the property, the government will reclaim its 20% equity stake of the sale price, thus, participating in capital gains and losses.

The Ministry of Housing, Communities and Local Government (MHCLG, 2019) estimated that, since from inception in April 2013 until September 2018, over 195,000 properties were bought with a government equity loan provided under the scheme totalling about is £10.7 billion. The success of the HTB program in terms of its ability to accomplish the desired goals has been the subject of intense scrutiny among academics and media commentators. White (2015) suggests that the policy overcame the problems created for potential mortgage borrowers, particularly those for whom the down payment constraint was binding. A study by researchers from the London School of Economics found that the programme led to a significant increase in prices of newly

built houses in the region of 3.2% and 3.9% (Carozzi *et al.*, 2018). The study further finds that the scheme had no discernible effect on construction volumes as more construction only happened in areas with more elastic supply, where planning constraints are less rigid and is therefore comparably easy to build and not in areas not in areas where productivity and employment concentration are highest and new housing is most needed. As the policy pushed up house prices it has been argued that the scheme may not have benefited the population of credit-constrained households in the most unaffordable areas of the country. (Carozzi *et al.*, 2018) further argue that only developers and landowners, not new buyers, benefited from the policy-induced price increases.

2.11. Chapter summary

In line with the objectives of the study, this chapter has provided review of related literature, developed the conceptual foundations for the research and explained foundational concepts which form the basis of the subsequent empirical work. The theory of markets and how this may be applied is in the context of property markets given its peculiar structure and characteristics has elaborated with the aid of conceptual models depicting its complex interactions. A discussion of the residential housing market, its nature and characteristic features was also presented. The chapter has addressed the concept of housing finance, its position in the housing market and drivers of the housing finance expansion observed between the late 1980s and early 2000s. The interconnectedness between housing finance, macroeconomic indicators and house prices has also been discussed in the chapter..

It is found that house price and housing finance growth comes from a combination of macroeconomic, demographic, financial and regulatory and policy variables. Whereas the dominance of housing finance in the housing market and its implications for the is widely discussed in the literature, the drivers fundamental to this revolutionary growth in housing finance have not been given proportionate attention. While some key factors have been highlighted in the existing literature, empirical studies has, to date, not specifically ascertained the impacts of the various factors on housing finance expansion and residential house prices. In the next chapter, a detailed methodological approach

for the remainder of the thesis is presented. Following this will be the two empirical chapters wherein concepts discussed in the present chapter will be incorporated in developing models for identifying UK house price and housing finance drivers and their interconnectedness.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

A fundamental element within any piece of research is the method, or methods, utilized by the researcher to collect, analyse and interpret data. Research methods have developed enormously over time and there is often an overlap between various methods. An essential concept within research is the notion of research paradigm or philosophies which are essentially assumptions made at the onset by the researcher as to the nature of reality, whether it is knowable and how it can be known. The various philosophical perspectives on social research and the philosophical orientation of this study are discussed in this chapter. The chapter reviews the different perspectives on social research and moves on to explain and justify the philosophical orientation of the study. Alternative research approaches are further discussed and the choice of approach for the study reasoned. Details on the research design outlining the methods and techniques for data collection and analysis are also presented in this chapter.

3.2. Perspectives on social research

Researchers can analyse and explain social realities and problems from different perspectives. Hughes (1980) noted that every research tool or procedure is inextricably embedded in commitments to versions of the world and ways of knowing that world. Besides, "no technique or method of investigation is self-validating", rather, the effectiveness of any technique and its "status as a research instrument is ultimately dependent on the philosophical justification" (Hughes, 1980: 13). Similarly, Danermark et al., (2002) stated that our ontological and epistemological assumptions are important in shaping our understanding of the social world. Therefore, in addition to providing both conceptual and theoretical frameworks for the study, researchers are likewise required to specify a clear philosophical stance that will provide the basis for making knowledge claims.

Although different worldviews have accompanied the evolution of social research, all researchers have one common pursuit, and this is to generate scientific knowledge. As a starting point, therefore, there are certain fundamental questions that researchers need to contend with. These include:

(i) Whether social reality exists (ontology)?

(ii) Is it knowable / what is acceptable knowledge (epistemology)?

(iii) How can this knowledge be generated and verified (methodology)?

(Corbetta, 2003; Creswell, 2014).

The ontological question pertains to the very nature of being or reality. Ontology is the branch of metaphysics concerned with the study of the basic building blocks of existence (Moses & Knutsen, 2007). It is essentially the question of "what" and asks if the world of social phenomena is a real and objective world endowed with an autonomous existence outside the human mind and independent from the interpretation given to it by the inquirer (Corbetta, 2003). That is if social phenomena are things in their own right or representations of things based on our perception (Xian & Meng-Lewis, 2018). There are fundamentally two different ontological views, and these have been diversely labelled by different authors. Johnson et al., (2006) use the

terminologies "objective" and "subjective" ontology, while Easterby-Smith, et al., (2015) refer to them as "realist" and "relativist" ontology.

Objectivism or realism perceives social phenomena in terms of objective facts that exist independent of our knowledge. They guide our behaviour and have a real impact on people's lives and experiences. Objectivists are of the view that although some concepts are difficult to measure, we cannot deny that they exist nor can we change the reality of their consequences (Xian & Meng-Lewis, 2018). By researching the objectivist point of view, researchers are attempting to discover the truth or reality as it is. This is the ontology associated with quantitative research. On the other hand, subjectivism or relativism ontology asserts that what we consider to be reality is a construction of what we know because having an understanding of certain social concepts depends primarily on our background, the society we grow up in or the social class we belong to (Xian & Meng-Lewis, 2018: 42). Subjectivists argue that reality is socially constructed, and what counts as the truth can vary from place to place and from time to time (Collins, 1983). Therefore, the goal of social research should not be merely about measuring facts and identifying patterns, but also understanding how people perceive and give meaning to their experiences. This is the principal ontology underlying qualitative research procedures.

The second question "is social reality knowable or what is acceptable knowledge?" is an epistemological question. Epistemology denotes the basic study of knowledge. It deals with the nature of knowledge, its possibility, scope and general basis (Crotty, 1998). Epistemology is a set of assumptions about ways of understanding the world. According to Duberley et al., (2012:16), epistemology is the 'knowledge of knowledge' and "the criteria by which we can know what does and does not constitute warranted or scientific knowledge." Akin to the discussion in ontology, there are also two opposing epistemological viewpoints on how social science research should be conducted. Easterby-Smith et al., (2015) refer to these as positivist versus social constructivist epistemologies.

A positivist epistemology requires an objective ontology that assumes an external reality out there. "It entails that the properties of social concepts can be measured through objective approaches and that researchers can maintain a neutral position in the

research process" (Xian & Meng-Lewis, 2018). In contrast, a subjectivist or constructionist epistemology presumes people's experience to be justifiable evidence. Researchers belonging to this ideology focus on the ways people understand the world and how they communicate and interact with each other (Crotty, 1998). The purpose of social science research is to appreciate people's different experiences, rather than merely discovering external causes or patterns of behaviour. Constructionist epistemology also recognises that researchers are actively involved in the research process and thus bring in their insights and emotions (Corbetta, 2003; Neuman, 2011). This is in stark contrast to the positivist view that researchers ought to take a neutral and detached position.

The final question "how can this knowledge be generated and verified?" is the methodological question. It is the question of how social reality can be studied and therefore regards the technical instruments of the cognitive process (Corbetta, 2003). The methodology is how we acquire knowledge. In other words, "how do we know?" is the basic question of methodology. Whereas methods denote research techniques or technical procedures of a discipline, methodology refers to the investigation of the concepts, theories and basic principles of reasoning on a subject.

3.3. Research paradigms and philosophies

Research philosophy or paradigm is the term given to the alternative knowledge claims and assumptions researchers make about how they will learn what they want to learn during an inquiry (Creswell, 2014). The philosophical perspective of a researcher is founded on the epistemological and ontological assumptions they subscribe to. Several philosophical perspectives exist for conducting research. The main ones are positivism, interpretivism, realism and pragmatism (Saunders *et al.*, 2015).

Positivism is the most widely used social science research approach and seeks to mirror the natural sciences. Therefore, the positivist approach is widely taught as being the same as science (Neuman, 2011). According to Creswell (2014), positivism is associated with deterministic assumptions, it is reductionist in approach and empirically oriented. Positivist researchers employ quantitative research techniques to measure things precisely and objectively about people and test hypotheses by carefully analysing

numbers from those measures. Positivists subscribe to the realist ontological position that there is an objective reality out there waiting to be discovered. They also accept the objectivist epistemology which presupposes that there is a neutral point at which the researcher stands and analyses the outside world objectively (Johnson & Duberley, 2000). The positivist research approach aims to ensure a distance between the researcher and the subject of investigation so that the research process and results are not biased (Johnson *et al.*, 2006). The researcher, therefore, remains detached and objective as he measures aspects of social reality, examines the evidence and replicates research of others (Neuman, 2011). Critics of this approach contend that positivism reduces people to numbers and is concerned about abstract laws and formulas that are of no relevance to the actual lives of real people.

Interpretivism is the major rival to positivism in social science research. Interpretivism contends that positivist methods are unable to capture the rich experiences of human actors and that the social world is too complex to be reduced to a series of definite laws (Xian & Meng-Lewis, 2018). The purpose of social research is to understand life and discover how people construct social meaning, hence, interpretivist researchers use rigorous and detailed methods to gather in-depth qualitative information (Neuman, 2011). According to Creswell (2014:8), the main assumptions of the interpretive philosophy can be summarised in this:

> *"… individuals seek understanding of the world in which they live and work, they develop subjective meanings of their experiences… These meanings are varied and multiple, leading researchers to look for the complexity of views rather than narrowing meanings into a few categories of ideas."*

In a nutshell, the interpretivist philosophy considers people's interpretation of social reality as the starting point for the development of knowledge in the social world (Prasad & Prasad, 2002). Consequently, researchers should rely, as much as possible, on the participants' views of the situation being researched. Interpretivism also recognises the role of the researcher within the knowledge construction framework. Researchers' background shapes their interpretation hence interpretivist researchers position themselves in the research to acknowledge how their own personal, cultural

and historical experiences shape their interpretations. Interpretivism is mainly associated with qualitative research strategies.

Realism is another research paradigm that sits between positivism and interpretivism. According to Xian & Meng-Lewis, (2018), realism shares an objectivist ontology and, like positivism, promotes a scientific and objective approach to doing research but realists differ in terms of their epistemological positions. Bryman & Bell (2015) as well as Saunders et al. (2015) distinguish between two branches of realism. Direct or empirical realism shares an objectivist epistemology and proposes that what we see is what reality is. It considers information collected by our senses as useful evidence which depicts reality but further recognizes that we are, sometimes, unable to see the whole truth because we have insufficient information. Therefore, empirical realists emphasise the collection of data from multiple sources to see the full picture of reality (Xian & Meng-Lewis, 2018). The other branch of realism is critical realism which adopts a more subjectivist or social constructionist epistemological position. Critical realists believe that our knowledge of reality is a result of social conditioning and cannot be understood independently of the social actors involved in the process of generating that knowledge (Saunders *et al.*, 2015). Critical realists argue "we will only be able to understand – and so change – the social world if we identify the structures at work that generate those events and discourses" (Bryman & Bell, 2015: 29). The task of the critical realist researcher, therefore, is to uncover the real mechanisms and structures underlying perceived events.

Pragmatism is the final philosophical position to be considered in this section. Pragmatist researchers believe that it is futile to engage in an endless debate between the positivists and the anti-positivists. Essentially, for pragmatists, "knowledge claims arise out of actions, situations, and consequences rather than antecedent conditions as in postpositivism" (Creswell, 2014). The concern here is about applying solutions that work to social problems hence the problem is more important than the method. In terms of epistemology, pragmatists emphasize practice: our practical knowledge is greater than our theoretical knowledge, as any theory must arise out of practice and individual experience (Mounce, 2000). Pragmatism is the philosophical underpinning for mixed methods research and is strongly endorsed by Tashakkori & Teddlie (1998) as well as Patton (1990) who have emphasised the importance of focusing attention on the

research problem and then using pluralistic approaches to derive knowledge about the problem. When approaching a research problem, pragmatists discard the notion that there are predetermined theories that depict reality (Xian & Meng-Lewis, 2018). Nor do they believe people can construct meaning out of nothing (Rorty *et al.*, 2004). Instead, pragmatists suggest that our research questions determine the method we adopt. A researcher can have both objectivist and subjectivist epistemologies depending on what is being studied. In other words, there is no need to stick to one perspective, and it is perfectly acceptable to adopt variations in ontological and epistemological issues in different projects and sometimes even in the same project.

3.3.1. Philosophical orientation of the study

Saunders et al., (2015) observed that when considering research philosophies, there is the tendency to think that one philosophy is better than another. However, this misses the point because different philosophies are suited to achieving different aims. Johnson & Clark (2006) argued that what is important is not whether our research should be philosophically-informed but how well we can reflect upon our philosophical choices and defend them in relation to the alternatives we could have adopted. Further, Saunders et al. (2015) pointed out that, in most cases, the practical reality is that a research question can hardly be answered within only one philosophical domain. This study aligns itself with this position and therefore subscribes to the pragmatist research philosophy.

This thesis is underpinned by pragmatism as a research philosophy because it seeks to answers questions with both quantitative and qualitative dimensions. As pointed out by Creswell (2014), pragmatism as a research philosophy permits researchers to draw from quantitative and qualitative assumptions. The pragmatist research philosophy generally argues that what works best at a time based on the objectives and questions of the study should be the driving force behind the methodological choices. For the pragmatist, therefore, concepts are only relevant where they support action (Kelemen & Rumens, 2008).

The pragmatic approach to inquiry depicts a process of planning that starts with the research question, leading to a research design, followed by a choice among available

methods (Morgan, 2014). Pragmatism, therefore, asserts that the most important determinants of one's methodological position are the research questions or objectives. If the research questions do not suggest that a particular philosophy should be adopted, then the pragmatist view that it is perfect to work within more than one philosophical domain is justified (Saunders *et al.*, 2015). The choice of pragmatism as a paradigm for this study is built around combining the different strengths of qualitative and quantitative methods to provide a more comprehensive answer to the research objective of looking at both financial and macroeconomic drivers (quantitative) and government regulatory policy (qualitative) in relation to house prices and housing finance. This is further reinforced by Kelemen & Rumens' (2008) argument that pragmatism allows the researcher the freedom to use credible methods that are well-established and relevant to the collection and analysis of data to address the research objectives and questions.

The scope and objectives of the study make it most suited to pragmatist research philosophy as research objectives have elements of realism and constructionism. For instance, the first objectives of the research relating to the financial and macroeconomic determinants associated with the performance of UK house prices and housing finance development fall within the positivist domain assuming an objective reality (i.e. house prices) which is influenced by a host of objective variables (inflation, interest rates, GDP growth, employment, etc.) that can be modelled quantitatively. On the other hand, the objectives relating to the role of regulatory policy in shaping the housing finance environment is more amenable to the social constructivism philosophy and will be analysed qualitatively from the viewpoints of stakeholders and experts from different sectors.

Essentially, this study is about the relationship between the performance of the UK housing market and mortgage credit growth between 1968 and 2018 and identify the key drivers thereof. Adopting the pragmatist position, methods are selected to ensure the objectives are completely fulfilled. Initially, a detailed literature review is undertaken to establish the foundations of the research and to set the context of the study. Having established the position of the research within the context of the literature, the study then moves into an empirical phase where the mixed research approach is followed.

3.4. Approaches to social research

An important characteristic feature of a successful research project is the presence of a meaningful research question and an appropriate strategy for answering that question. Fundamentally, three main approaches exist for researching the social sciences: quantitative, qualitative and mixed-method approaches (Creswell, 2014). Quantitative research can be broadly described as the gathering of numerical information to answer a specific research question. According to O'Leary, (2017) quantitative approach to research is highly reliant on quantifiable data and is often tied to a set of assumptions related to positivism. The investigator primarily uses positivist claims for developing knowledge including cause and effect thinking, reduction to specific variables, hypothesis testing, use of measurement and observation and testing of theories (Creswell, 2014).

On the other end of the spectrum is the qualitative research approach where the enquirer makes knowledge claims primarily from the constructionist, advocacy or participatory perspectives (Creswell, 2014). Qualitative research methodology is far less formal and is generally less structured in nature than quantitative and uses various interactive and humanistic methods. Qualitative research uses strategies of enquiry such as phenomenology, ethnography, grounded theory and case study. The researcher collects open-ended data with the primary intent of developing themes from the data. According to Moore (2000), whereas quantitative methods show the researcher the 'what', qualitative methods provide the 'why', and are concerned with acquiring an in-depth knowledge of an individual or group's opinions, behaviour perceptions.

While a great deal of debate was evident among social science researchers as to the superiority of quantitative or qualitative methods in the past, this has more recently been settled (Creswell & Plano Clark, 2007). It is increasingly becoming more accepted that a sensible approach is to adopt the method that best suits the individual objectives of the research rather than remaining resolutely entrenched in either quantitative or qualitative approaches. Therefore, many researchers have combined both quantitative and qualitative strategies in what has been known as mixed methods research (Tashakkori & Teddlie, 1998; Creswell, 2003; Creswell & Plano Clark, 2007; Dunning et al., 2007). In the mixed-method approach, researchers tend to base knowledge claims

on pragmatic grounds and are consequence-oriented, problem-centred and pluralistic in their strategy (Creswell, 2014). Quantitative and qualitative data are collected either simultaneously or sequentially to understand the research problem.

Research approaches can also be considered in terms of how the inquirer relates to and develops theories from the research. In this regard, the two main approaches are deductive and inductive. Deduction is more associated with scientific research and more aligned with positivist philosophy as it involves the development of theories subject to rigorous empirical scrutiny (Bryman & Bell, 2015). In deductive research, the investigator begins with a theory from which hypotheses are developed and then designs a strategy to test the hypothesis, the result of which will lead to confirmation, rejection or modification of the theory (Robson, 2011). The deductive research approach is usually used in searching for causal relationships between variables and follows a highly structured methodology to facilitate replication (Johnson *et al.*, 2006; Saunders *et al.*, 2015). An alternative to this is the inductive approach where the research begins with data collection and analysis and then develops a theory from the analysis. Thus, the inductive process involves drawing generalizable inferences from observations (Bryman & Bell, 2015). Inductive researchers often use a grounded theory approach to data analysis and theory generalization which is essentially an iterative process of weaving back and forth between data and theory.

3.4.1. Choice of research approach for the study

When determining the research approach for a study, the primary concern is the fit of the approach for answering the research questions. Creswell (2014) suggests that the most important consideration in determining the methodological fit for a study is the research questions. Therefore the researcher ought to consider alternative methods and select the one(s) that offer(s) the best opportunity to obtain useful answers and valid conclusions. As previously stated, the primary concern of the thesis is examining the relationship between the performance of the UK housing market and mortgage credit growth and identifying the key drivers thereof. This, unambiguously, is not amenable to a monomethod analysis as it evinces objectivist and constructionist dimensions. The determinants and impacts of macroeconomic and financial indicators on housing finance and house prices is amenable to quantitative modelling whilst the evolution of

regulatory policy and its impacts is best approached from the constructionist perspective. The key research questions enumerated in section 1.3 suggest that different methodological approaches are required to adequately address the topic. Against this backdrop, this dissertation adopted a mixed research approach.

Mixed methods research represents an attempt to overcome the ideological divide between qualitative and quantitative conformists and, instead, focuses on the practical significance of each approach (Trahan & Stewart, 2013). According to Mckim (2017) researchers intending to use mixed methods must first ask themselves if mixed methods are going to add more value than a single method study especially in light of the added resources, time, and expertise required to execute mixed methods study. Johnson & Onwuegbuzie, (2004:5) formally define mixed research methods as "a situation where a researcher mixes or combines qualitative and quantitative research techniques, methods, approaches and concepts in a single study." It is a central premise of mixed methods research that "the use of quantitative and qualitative approaches, in combination, provides a better understanding of research problems than either approach alone" (Creswell & Plano Clark, 2007:27). By combining quantitative and qualitative approaches, researchers can answer a specific research question more comprehensively, increase the tools available to conduct a research study, and broaden the scope of research. A mixed-methods approach offers a logical and practical alternative as opposed to the polarised positivist (quantitative) versus subjectivist (qualitative) methodological strands. The value of mixed methods research rest in the acceptance that all methods have inherent weaknesses hence the collection of both qualitative and qualitative data allows investigators to minimize the weaknesses and maximize the strengths of each approach.

Adopting mixed methods research, therefore, permits the researcher to draw on the strength of the two main approaches in a single study while at the same time minimizing the biases that usually plague studies of this nature that tend to rely solely on quantitative or qualitative approaches. For instance, much of the existing research on drivers of house prices have been purely quantitative using econometric time-series modelling to identify price determinants (see for example (Ball, et al., 1998; Muellbauer, 2015; Muellbauer & Murphy, 1997; Taltavull de la Paz & White, 2012; White, 2015, and references therein). These tend to identify and highlight key drivers

associated with house price fluctuations as independent variables. But this begs the question of whether the so-called independent variables are self-determining? There are a host of political decisions by central and local governments that have an impact on these so-called determinants hence a purely positivist research is unable to address the whole truth. By using mixed research methods, the reasons behind some of the political and regulatory decisions can be explored through semi-structured interviews with experts and stakeholders in the housing industry to enhance our understanding of drivers of the housing market more comprehensively.

3.5. Research design

Research design is a framework for the collection and analysis of data. It reflects decisions the researcher makes, and the priority given to a range of dimensions in the research process. According to Saunders et al., (2015), a research design is the general plan about how the researcher intends to go about answering the research questions, implying that it is essential to have clearly defined research objectives. Hakim (2000) compares a research design to an architect designing a building. He states that, like an architect, the research design must achieve a purpose within the practical constraints of time and funding available to the researcher.

Quantitative and qualitative research are each associated with various research designs which researchers may choose from. Research designs also differ according to the philosophical orientation of the researcher. Positivist researchers tend to use quantitative approaches and employ research designs such as experiments (including quasi-experiments) and surveys. On the other hand, constructionists prefer qualitative research designs such as archival research, ethnography, grounded theory, case study, phenomenology and narratives (Creswell, 2014; Easterby-Smith *et al.*, 2015).

As noted earlier in this chapter, the study uses a mixed-methods research approach to draw from both positivist and constructionist epistemologies and combines both quantitative and qualitative methods. Mixed methods differ from multi-methods which is a situation whereby the researcher uses multiple methods of the same kind (Easterby-Smith *et al.*, 2015). It has been pointed out by Venkatesh et al., (2016) that after one has established the appropriateness of mixed-methods research, the next important task

is to make the primary design decisions associated with the different phases of research, the priority of methodological approaches, design the investigation strategies, mixing strategies and time orientation.

There are two primary considerations when considering the design of mixed-methods research: these are the sequencing and dominance of quantitative and qualitative elements. Sequencing implies which method goes before the other, whereas dominance addresses the question of whether one method takes up more time and resources than the other or whether they are fairly balanced (Johnson & Onwuegbuzie, 2004; Easterby-Smith et al., 2015). A summary of these primary considerations in mixed methods research design is shown in Table 3.1.

Table 3.1: Choices in designing mixed methods research

Design features	**Alternatives to Consider**
Sequencing of methods	Qual → Quant; Quant → Qual; Qual + Quant
Dominance of methods	Predominantly Qual or predominantly quant, or balanced***

****Note on notation: "→" implies sequential priority given to the first method over the latter, "+" stands for concurrent or simultaneous application of both methods*

Source: Easterby-Smith et al., (2015)

Table 3.1 indicates that a mixed methods study may start with either quantitative or qualitative research followed by the other or start both concurrently. Further, either method could be given a higher priority, or both could be equally balanced. After considering the different ways in which the sequencing and dominance issues are handled in different publications using mixed methods research, Johnson & Onwuegbuzie (2004) came up with a four-quadrant matrix depicting the various ways in which mixed methods research may be designed. Table 3.1 provides a summary of the four main designs in the matrix. Notice that capitalized letters (QUANT or QUAL) denote high priority or dominance for quantitative or qualitative methods respectively, and lower-case letters (qual or quant) denote lower priority or weight.

Figure 3.1: The four-quadrant model mixed-method design matrix

Paradigm Emphasis Decision	Time Order Decision: Concurrent	Time Order Decision: Sequential
Equal Status	QUAL + QUAN	QUAL → QUAN QUAN → QUAL
Dominant Status	QUAL + quan QUAN + qual	QUAL → quan qual → QUAN QUAN → qual quan → QUAL

Source: Johnson & Onwuegbuzie (2004)

Figure 3.1 indicates that generally in designing a mixed-method study, the researcher must make two primary decisions

(a) Whether to operate largely within one dominant paradigm or not, and
(b) whether to conduct the phases concurrently or sequentially

Johnson & Onwuegbuzie, (2004).

The upper two quadrants indicate a situation where the researcher chooses to use both quantitative and qualitative methods giving equal priorities to each method and conducting the studies concurrently (1st quadrant) or sequentially (2nd quadrant). The bottom two quadrants also indicate where the researcher chooses to make either quantitative or qualitative approach dominant in the study and again this can be done concurrently (3rd quadrant) or sequentially (4th quadrant).

It should already be apparent that a mixed-methods study can take a variety of forms depending upon how the research is carried out. Johnson & Onwuegbuzie (2004) recognized that researchers can easily create more user-specific and more complex designs than the one depicted in their model. Nevertheless, there are, generally, three

core mixed methods research designs that have been advanced in the literature: these are the:

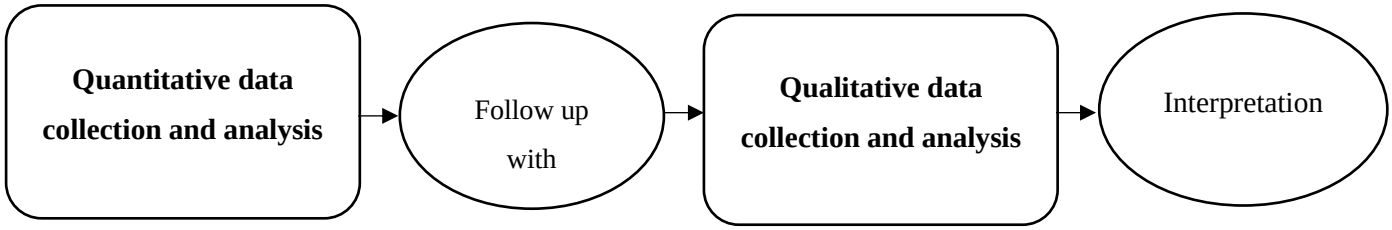
(a) sequential-explanatory mixed methods design
(b) sequential-exploratory mixed methods design, and
(c) convergent parallel mixed-methods design

(Creswell, 2014; Creswell & Plano Clark, 2018).

In sequential designs, either the quantitative or qualitative study is conducted and completed before initiating the second study whereas in a concurrent design both qualitative and quantitative studies are conducted during the same period. The main distinction between the two sequential designs is that in the explanatory design, quantitative data is given prominence, collected and analysed first before following up with the collection and analysis of qualitative data to explain or expand the quantitative results. When the reverse occurs, it is termed sequential-exploratory (Creswell & Plano Clark, 2018).

The thesis uses the explanatory sequential mixed methods research design. The first step in the empirical design was to design and execute a strategy to collect and analyse quantitative data. The findings from the quantitative research were then used to inform the subsequent qualitative study. According to Hanson et al., (2005) this model is more appropriate to use when research and theory regarding the research topic are available but incomplete which is exactly the case in the present study. It is only after both the quantitative and qualitative datasets have been analysed that the results are integrated interpreted. Creswell & Plano Clark (2018) further suggest that a researcher may also choose to report the findings of both data analyses separately and use a final discussion session to integrate both findings. Figure 3.2 is a flow chart illustrating the explanatory sequential mixed methods research design

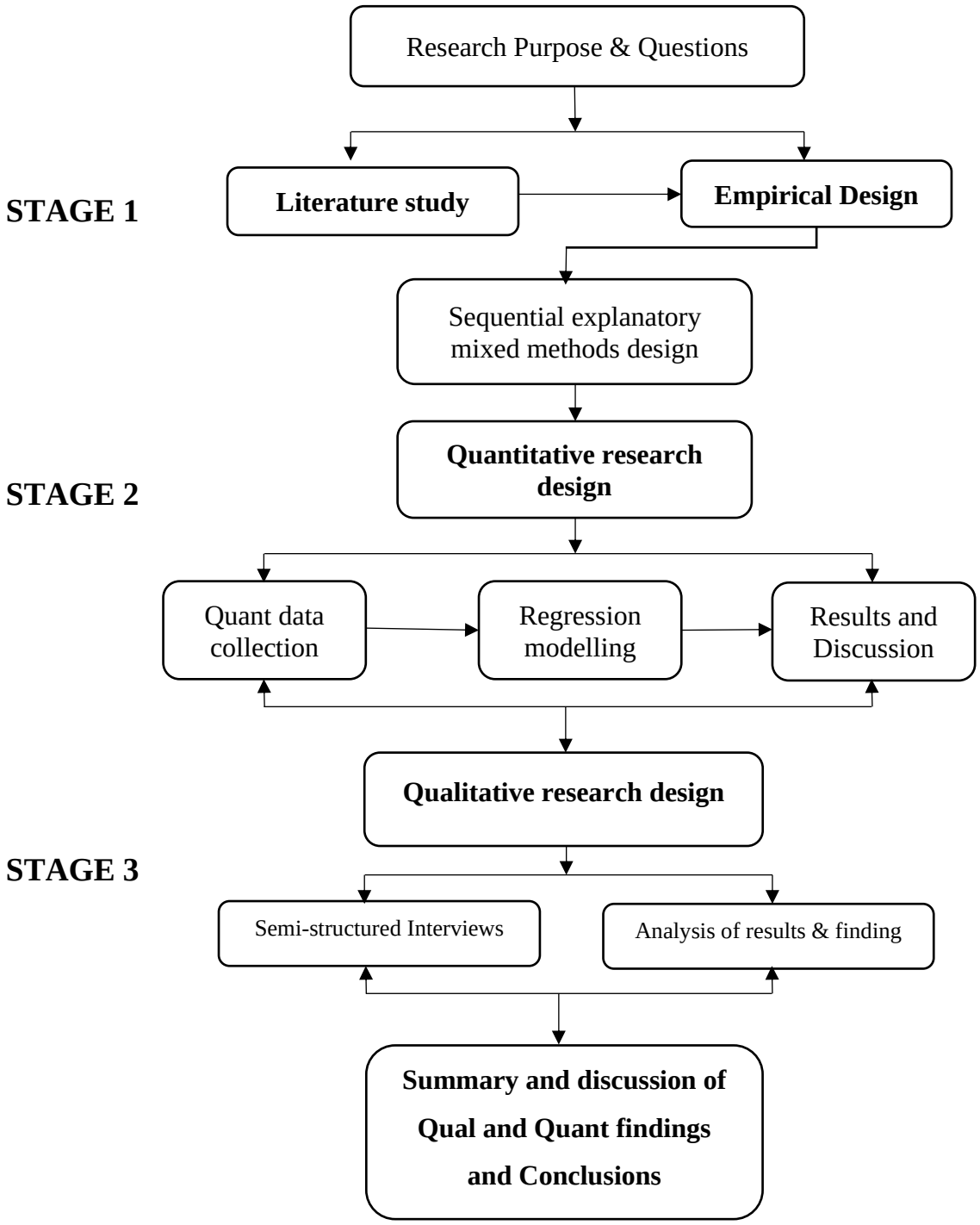
Figure 3.2: Explanatory-sequential mixed methods research flow chart



Source: Creswell & Plano Clark (2018)

For the thesis, a slightly modified version of this approach is adopted to incorporate the comprehensive literature review that was conducted before the empirical research began. Following the review of literature were the two sequential phases: the quantitative and qualitative research phases. The quantitative phase entailed using statistical and econometric techniques to analyse the performance of the UK house prices over a 50-year period from 1968 to 2018 to ascertain the key drivers of the observed trends and establish the contribution of housing finance to house price growth. Within the quantitative research framework was also an analysis of the macroeconomic determinants of mortgage credit expansion in the UK using vector autoregressions. These quantitative studies relied mainly on secondary time-series data. Following this was the qualitative research phase which was designed to give more depth to the findings of the quantitative research, validate the results and discuss the implications of the findings for future housing policy and regulation. The qualitative phase of the research sought to go beyond the regression analysis and examine in detail from the viewpoints of experts and stakeholders, the impacts of the various government policies on housing finance in the UK over the years. A flow chart detailing the specific activities involved in the research process is presented in Figure 3.3.

Figure 3.3: Research design flow-chart



3.6. Data sources and analysis: quantitative data

The quantitative research depended mainly on secondary time-series data which was collected from a wide range of sources. The data can be categorised into three broad themes: housing market data, capital (mortgage) market data and macroeconomic data. These were gathered from reputed sources trusted by industry practitioners and used in several previous studies. The sources for the relevant data required for the quantitative research are summarised in Table 3.2.

Table 3.2: Sources and types of data

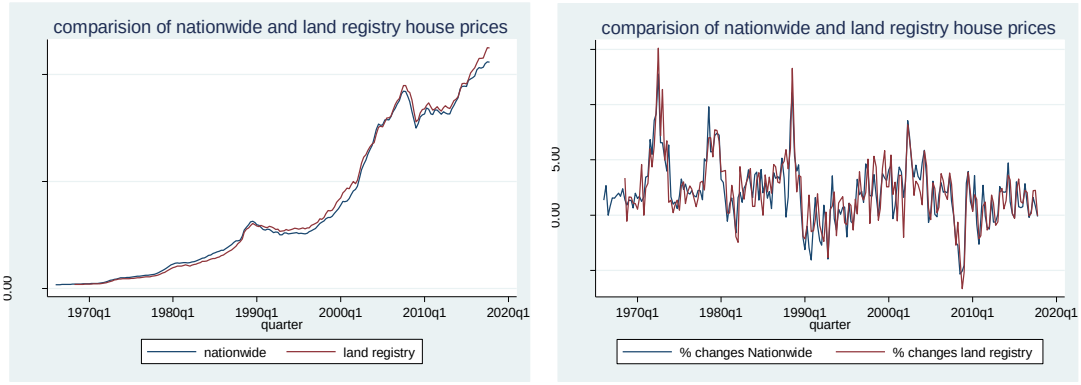
Data category	Variables	Projected Source(s)
Housing market data	House price index – 1968 to 2018	Nationwide / Halifax & Land registry database
	Property Transaction volumes	Office of Nation Statistics (ONS)
	Housing starts/completion	Department for Communities and Local Government (DCLG) statistics
	House price-to-income ratio	Office of Nation Statistics (ONS)
Mortgage market data	Gross annual residential mortgage lending	Council of Mortgage Lenders (CML) / Financial Conduct Authority (FCA) European Mortgage Federation (EMF)
	Net annual outstanding residential mortgage balances	Council of Mortgage Lenders (CML) / Bank of England (BOE)
	Mortgage-to-GDP ratio	ONS/FCA/BOE
	Average Loan-to-value ratio	CML/FCA/BOE
	Average mortgage rate	CML/FCA/BOE
Macroeconomic (Policy) – variables	CPI-Inflation	ONS
	Government expenditure	ONS
	Household income	ONS
	Demographic changes	ONS
	Employment growth	ONS
	Money-supply	Bank of England (BOE)
	BOE Base rate	BOE
	Interest rates	ONS/BOE

The above sources were consulted, and the relevant data was organised in Microsoft excel. Care was taken to include only data sets that met the required criteria particularly in terms of the time scope (1968-2018) and frequency of reporting (quarterly). The modelling strategies adopted in chapters 4 and 5 implied that only data series available for the period between 1968-2018 were considered and sources reporting these on a quarterly or more regular basis were preferred to annual reporting.

The main source of data relating to UK House prices for the study was from the Nationwide house price index. Nationwide produces quarterly mixed-adjusted house price series for the whole of the UK. Before settling on this, two alternative UK house price index measures were also considered: the HM Land Registry house price index and Halifax house price index. It is acknowledged that there are differences in the data sources and methods used in constructing the indices leading to differences in the indices published. Nationwide and Halifax indices are based on their mortgage approvals which enables them to process and update the data quickly without the need to have to wait for the receipt of data from other lenders. The downside, however, is the limited market coverage as only properties mortgaged to them are considered. The HM Land Registry house price index on the other hand is nationwide data covering all completed and registered property transactions in the UK. This however has the limitation of not being up to date as there is a time lag between the completion of sales and the registration (HM Land Registry, 2018).

The Nationwide house price index was settled for due to its period of coverage and availability for the entire period covered under the study. It is available for a much longer period, going as far back as 1952. The dataset is presented on a quarterly basis and provides an index, average price and annual percentage change for four categories: all houses, new houses, modern houses and older houses. None of the other indices had all these features making the Nationwide dataset the *defacto* choice. Nonetheless, a comparison of the Land registry and nationwide house price datasets showed they are largely consistent with each other. Figure 3.4 compares the Nationwide and HM Land registry datasets confirming they are consistent both in terms of house prices levels and growth rates.

Figure 3.4: Comparison of Nationwide and HM Land Registry house price indices



Source: Nationwide, 2019

Statistically, the two datasets are strongly correlated exhibiting a correlation of 0.998 in house price levels and 0.886 in growth rates. This implies that the choice of house price index will not have any significant implications for the empirical analysis to be conducted.

3.6.1. Analysis and modelling approaches

To examine the role of housing finance in house price appreciation in the UK, 50-years of UK house price data was examined covering the periods between 1968 and 2018. In the analysis of house price performance determinants within the housing market, real UK house prices were constructed by deflating the Nationwide house price series by the Consumer Price Index (CPI all items) supplied by the Office of National Statistics (ONS). Real house price was then modelled in terms of selected macroeconomic, financial and demographic determinants. This entailed adapting and extending established house price models with the main innovation being endogenizing housing finance and adopting dynamic model specifications.

The study makes use of correlation matrices, multivariate least square regression analysis, vector autoregression, error correction models and statistical significance tests to examine the existence and significance of relationships. The determinants of house prices were selected following insights from the literature review presented in Section 2.6. The works of Taylor (2007), Tsatsaronis & Zhu (2004), Vargas-Silva (2008) and White (2015) provided useful insights and inspired the choice of the vector autoregression (VAR) and vector error correction (VECM) models which are

considered the more appropriate for analysing the effects of macroeconomic policy shocks on housing finance due to the endogeneity of housing finance to macroeconomic indicators. A VAR is a reduced-form linear dynamic simultaneous equation model in which all variables are treated as endogenous allowing the reduced form representation to be consistently estimated by regressing each variable on a number of lags of all endogenous variables (Tsatsaronis & Zhu, 2004). A VECM is a special case of the VAR model used when the variables are non-stationary and exhibit a cointegration relationship.

Compared to other estimation techniques, VAR and VECM models provide more flexibility, and the results are more robust. Hamilton (1994) further inspires the use of the VAR model because of its convenience for estimation and forecasting time series data. The study, accordingly, used alternative specifications of VECM and VAR models to examine whether changes in the selected drivers significantly account for the fluctuations in housing finance. Statistical software packages, mainly EViews, STATA and SPSS were used at various stages of the data analysis to run and analyse the models. Detailed discussion on the development of the models is presented in sections 4.3: Modelling UK house price determinants and 5.5: A vector autoregressive model for housing finance drivers.

3.7. Data sources and analysis: qualitative data

The qualitative research phase involved the use of primary and secondary data. Primary data was be sourced through semi-structured key informant interviews with purposively sampled policymakers, mortgage lenders, government agencies, experts and stakeholders in the housing market. Due to the nature of information required, no hard and fast rule for determining sample sizes was adopted. The data collection was done on an ongoing basis using a snowballing technique where known experts and authorities in the field were approached and interviewed and were further asked to recommend other experts who they knew had the knowledge and expertise to contribute to the study. This was extended until adequate responses were obtained for the research. A summary of the desired and actual numbers of informants interviewed in the qualitative research phase is given in Table 3.3 below.

Table 3.3: List of interviewees contacted and actual numbers interviewed

Key Informants	*No. Contacted*	*No. Interviewed*
Bank of England	1	0
Financial services regulatory authority	1	1
Mortgage lenders – commercial banks	2	1
Mortgage lenders – building societies	2	1
Leading think thanks (independent researchers)	1	1
Real Estate Academics	1	1
Professional regulatory bodies	1	1
Developers' associations	1	0
Property services consultancy	1	1
Total	**10**	**7**

The interviews were held between September and December 2019, typically lasting between 45 minutes to 1 hour and were recorded with the prior consent of the interviewees to allow subsequent transcription. Some interviews were conducted face-to-face at the interviewees' offices whilst others were held remotely via Skype and telephone calls. In all cases, the questions and approaches used were the same. All participants were sent summaries of the preliminary research findings and the key points to be deliberated ahead of the interview, so they had ample time to reflect on the issues to be discussed. Information from interviews was corroborated with secondary data from reports and policy documents obtained from government agencies and institutional stakeholders connected with the housing market. As expected, the interview data was mainly qualitative and was thus be subjected to qualitative data analysis approaches involving thematic analysis and discussion of the responses. The qualitative responses allowed the objectives of the study to be examined at a greater depth from the perspective of different stakeholders involved in diverse ways with the housing market.

3.8. Ethical considerations

Throughout the research, attention was paid to important ethical concerns in compliance with the University's ethics requirements. Appropriate citation and referencing of all ideas, materials and data from other people were closely observed. The research followed the Harvard system of referencing and adhered strictly to the University's

policy and regulations on plagiarism. Any collaborative work involving the researcher that has been used in the dissertation, whether in whole or in part, is duly acknowledged and the extent of the researcher's contribution is specified.

As the study involved the collection of both objective and subjective data from human participants based on their professional knowledge obtained through industry experience and involvement with particular organisations, it was the researcher's role to ensure that information obtained from participants was treated with strict confidentially and stored following the University's requirements. Confidentiality of data gathered from interviews was ensured by anonymising responses and omitting the names of the respondents and their institutions from the write-up. Generic titles such as "*Chief Economist at a Building Society*" or "*Director of Research of a Global Property Services Company"* were used where it was deemed that adding positions or titles of respondents would improve the credibility and quality of the research findings. These were discussed with the interviewees beforehand as part of the informed consent negotiations to which they accepted. Statistics used in the study were also mostly aggregated to ensure anonymity.

Results of the research are presented in an honest, concise and unambiguous manner in a way that makes the findings reproducible and consistent. This involves sufficient description and explanation of the techniques, software and data used. Findings and results were presented and discussed with supervisors on a progressive basis during and throughout the research and write-up stages. Finally, proper work ethics and basic health and safety protocols were followed to ensure that this research was carried out safely and healthily.

3.9. Chapter summary

Research methods form an important component within any study and significantly underscore the validity and reliability of the piece of work. The chapter has detailed the established methodological framework for the study, setting and justifying the philosophical and epistemological positions of the study. The chapter explored emerging paradigms and perspectives on social research and explained how and why the pragmatist philosophical position formed the basis of the study as the research

objectives have both quantitative and qualitative dimensions. This choice permitted combining the strengths of qualitative and quantitative research approaches in a mixed-methods framework to provide comprehensive answers to the research questions. The chapter has further detailed the research design followed, outlining the specifics of methods and techniques for data collection and analysis. This thesis followed an explanatory sequential mixed methods research design where a quantitative empirical study was designed and carried out first and the findings were used to inform a subsequent qualitative study.

CHAPTER FOUR

MARKET PERFORMANCE AND PRICE DETERMINANTS WITHIN THE UK HOUSING MARKET

4.1. Introduction

This chapter builds on the theoretical considerations established in the previous chapters and presents the empirical results of the research. The chapter is devoted to the analysis and presentation of quantitative data collected for the study to address the research objectives. The analysis in this chapter empirically addresses the first two research objectives, focusing specifically on the performance and determinants of housing prices in the UK in the long and short run. Empirical evidence in this chapter is established utilizing statistical and econometric modelling techniques to analyse time-series data gathered and where necessary constructed from diverse sources as detailed in the text. The chapter is structured as follows: The first section presents an overview of UK house price performance in the last 50 years, highlighting the cyclical nature of house price movements and the underlying trend. This is followed by the modelling of house price determinants where the key drivers are identified and examined. The model developed is then diagnosed to assess its validity and consistency

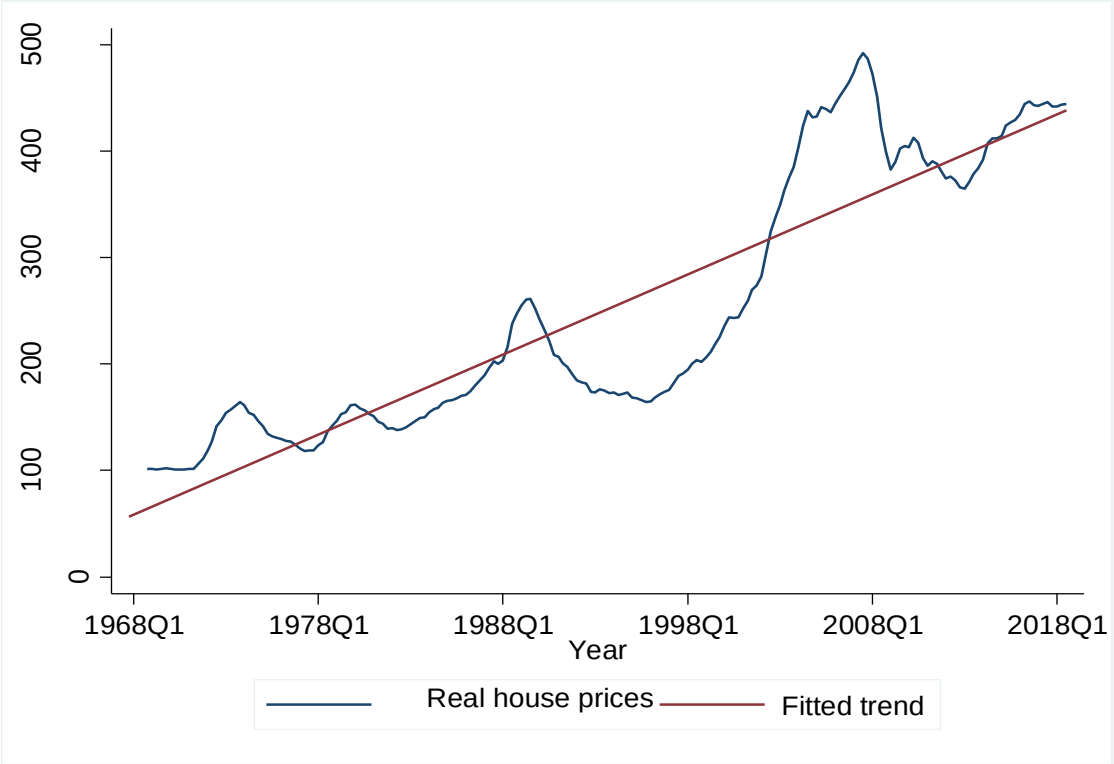
with the underlying assumptions before alternative specifications and controls are carried out. The chapter then moves on to analyse the short and long-run dynamics of house price changes using a vector error correction modelling (VECM) framework and concludes with an examination of the behaviour of UK house prices at defined periods and in the light of different economic events.

4.2. UK House price performance: 1968 – 2018

Knoll, Schularick & Steger, (2017) presented a novel dataset on the evolution of housing prices for several advanced economies for the period from 1870 to 2012. The data on UK house price evolution revealed that for most of the period before World War II, UK house prices had stayed relatively flat. However, after World War II, house prices began rising consistently with particularly high rates of appreciation beginning in the 1960s. This section analyses the evolution of UK residential house prices over between 1968 and 2018, showing the trends and cyclicality of house price movements and then goes on to examine the key drivers of this trend.

House prices data for this study is from the Nationwide House Price database which reports quarterly mixed-adjusted house price series for the whole of the UK along with a regional breakdown. As previously noted, the Nationwide house price index was chosen due to its period of coverage: it is available for a much longer period, going as far back as 1952. As shown in section 3.7 the Nationwide house price index is also highly consistent with the HM Land Registry house price index with a correlation of 0.998. The dataset is presented quarterly and provides an index, average price, and annual percentage change for four categories of housing: all houses, new houses, modern houses and older houses. From this, real house price figures were constructed by deflating the Nationwide nominal house price series by the Consumer Price Index (CPI all items) obtained from the office of the National Statistics (ONS) database. Figure 4.1 depicts the evolution of the real house price series from the first quarter of 1968 to the first quarter of 2018. The chart shows the upswings and downturns along with a fitted linear trend line.

Figure 4.1: Real UK house prices (1968 – 2018)



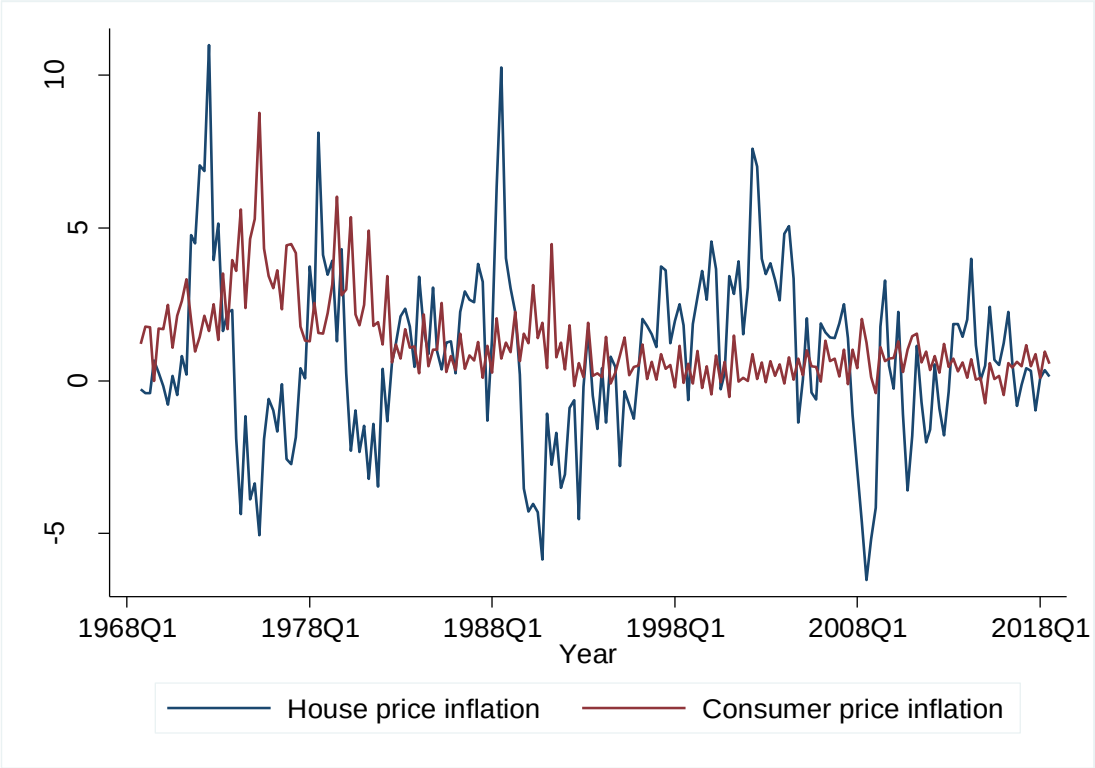
Source: Nationwide, 2019

From Figure 4.1, it is observed that over the 50 year period between 1968 and 2018, there have been at least four noticeable episodes of booms and busts in real house prices in the UK. The first episode of real house price growth began in the first quarter of 1971 and continued to the last quarter of 1973. This was followed by a downturn from 1974 to 1977 where house prices declined by 27.5% in real terms. Figure 4.1 further captures the large increases in house prices in the late 1980s. Real house prices increased consistently from £64,000 in 1982q2 to a peak of £119,600 by the third quarter of 1989 accompanied by a prolonged steady decline. The downturn started from 1989q4 and continued through the recession of the early 1990s. It was only after 1995 that price appreciation resumed, after approximately six years of falling real prices. On average, a 40% fall in real house prices occurred in the UK from the peak of 1989 to the trough of 1995, such that house prices in 1995 were just about the same level as they were in the early 1980s. Brown *et al.*, (1997) maintain that the substantial appreciation in house prices that occurred in the late 1980s was fuelled mainly by deregulation of the financial market and increased competition in the mortgage market activity as a result of the

removal of mortgage market constraints. A similar assertion was made by Pain & Westaway (1997), who maintain that widespread financial deregulation in the early 1980s raised the availability of mortgage finance and stimulated the demand for housing.

After house prices stabilised in the mid-1990s, rapid appreciation resumed from the early 2000s. There is a sustained rapid increase from 2001 through 2004 before a slowdown in the rate of growth. House prices more than doubled within this period in real terms. The market peaked in 2007 before a downturn following such unexpected events as the run on Northern Rock, the collapse of Lehman Brothers and the ensuing global financial and housing market collapse. Real house prices plummeted at this time such that the price index in 2011 had about the same value as it had had in 2002. Studies by Brown et al. (1997) and White (2015) have shown that there were regional variations in the house price dynamics across the different regions of the UK. However, the boom leading up to the 2007/2008 crisis was a nationwide phenomenon as house price increases were observed across all the regions. Jones (2012) notes that the impacts of the GFC were felt nationwide with all regions of the UK showing a significant downturn in the housing market following the credit crunch, albeit, at varying magnitudes and timing. Figure 4.2 illustrates the volatility in UK house prices along with the quarterly percentage change in consumer price inflation.

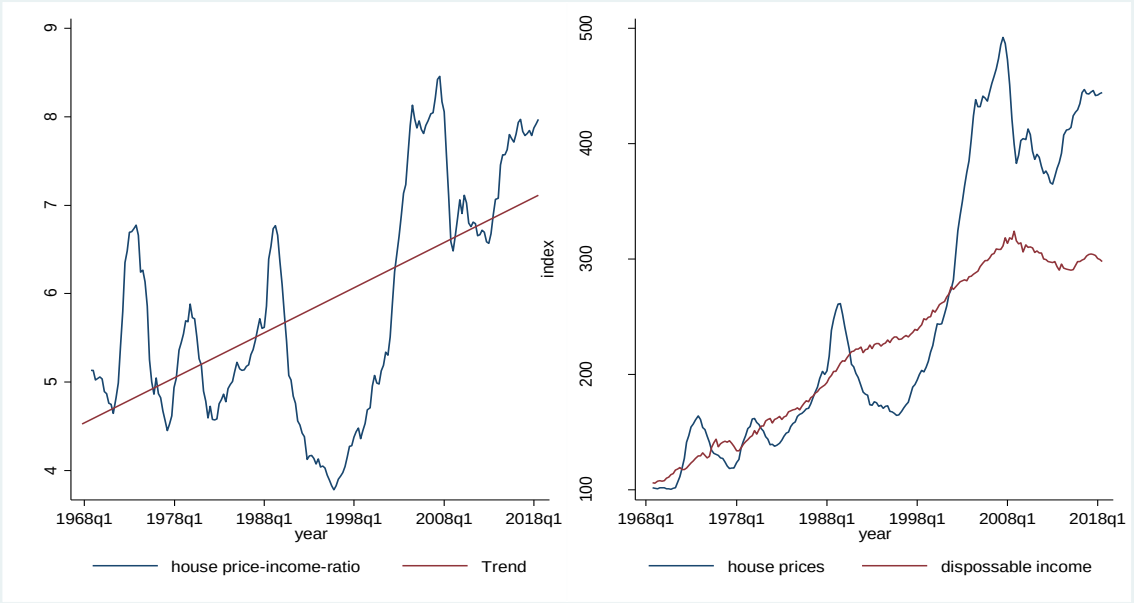
Figure 4.2: Quarterly percentage changes in UK house prices, 1968 – 2019



Source: Nationwide, 2019; ONS, 2019

Figure 4.2 shows the UK national level quarterly real house price growth between 1968 and 2018 was highly volatile, with growth rates fluctuating between 32% and –18%. In addition, Figure 4.2 provides evidence that UK real house price inflation has generally been more volatile than the general consumer price inflation with variances of 7.8 and 1.9 respectively. Although the two exhibit some form of comovement over the sample period, house price inflation outstripped consumer price inflation for the periods 1971Q3-1973Q4, 1978:Ql-1979Q2, 1982Q4-1989Q2, 1996Q2-2007Q3 and 2013Q2 to 2016Q3. Figure 4.3 further shows that the recent increase in house prices has not only been in absolute terms but also in comparison to income levels.

Figure 4.3: Real UK house prices vs real disposable incomes: 1968 – 2018



Source: Nationwide, 2019; ONS, 2019

House price growth has outstripped growth in average disposable incomes in the early 2000s. While average house price to income ratios was been about 3.7 in 1995, the figure had more than doubled to 8 by the end of 2006. After the crisis of 2007-08, there was some form of reversal but this upward trend has resumed since 2014 with the disparity between house price and income growth continuing to widen.

4.3. Modelling UK house price determinants

Following the literature reviewed in Section 2.6, potential drivers of house prices were identified. As discussed in that section, there is broad recognition in the housing literature that prices are driven by a combination of macroeconomic, financial, demographic, and property market variables that influence both the demand and supply of housing. Typical macroeconomic conditions that affect house prices include inflation, household disposable income, interest rate, GDP growth, employment and construction cost. Besides, credit conditions in the financial markets also play a key role in house price determination due to the substantial reliance on debt finance for housing purchase. The cost (mortgage interest rate) and the availability (flow) of housing finance are therefore expected to impact significantly on housing finance. Since

mortgage flow comes from the financial sector, the supply of money in the economy is further expected to have an impact on mortgage availability and therefore house prices.

The basic house price model used in this study follows a specification used in several studies including Meen's (2001). House prices are derived from structural housing demand and supply equations highlighting the interplay of a combination of the economic and demographic variables which influence both demand for and supply of housing supply. This can be written as

$$HD_t = \gamma \left[real_{income_t}, dem_t, mortgage_{flow_t}, HP_t, user_{cost_t}\right] \quad \text{.....(4.1)}$$

Thus, Housing demand (HD) at a time (t) is a function of real household disposable income, demographics, mortgage finance, house price and the user cost of housing. The user cost of housing is conventionally represented as a function of the income tax rate, mortgage interest rate, depreciation and capital gains from appreciation, expressed mathematically as:

$$user_{cost_t} = HP_t \left[\frac{1-incometaxrate}{interestrate} + depreciation - capitalgains\right]$$

On the supply side, the model involves a differential equation whereby the existing housing supply expands gradually with new construction and slowly depreciates at a rate (δ)**.** New housing construction is, in turn, assumed to depend on house prices, HP_t and exogenous variables generally including factor costs and short-term interest rates.

$$HS_t = \delta\left[exist_{stock_t}, new_{constn_t}, depeciation_t, HP_t, factor_{cost_t}, interest_{rate_t}\right] \text{...(4.2)}$$

The basic assumption in equations (1) and (2) is that, at any time, house prices (HP_t) adjust to equate the demand (HD_t) for housing with the existing supply (HS_t). HP_t can, therefore, be obtained by solving the two equations simultaneously and is conventionally represented in a reduced form function of the form:

$$HP_t = \beta_1 + \beta_2 pop_t + \beta_3 income_t + \beta_4 house_{stock_t} + \beta_5 mortage_t + \beta_6 user_{cost_t} + \beta_{it} X_{it} + \varepsilon_t \quad \text{..... (4.3)}$$

Where X_i's are other macroeconomic and control variables, and ε is a stochastic error term.

The potential house price determinants selected for this study are:

i. Housing market – the total housing stock, housing completions and construction cost.
ii. Macroeconomic indicators – exchange rate, inflation, government expenditure, household disposable income, unemployment rate, and money supply
iii. Demographic conditions – net migration and total working population to reflect demographic conditions
iv. Housing finance (capital market) – outstanding residential mortgage stock, gross mortgage advances mortgage interest rates.

The basic house price equation is conceived as being driven by forces from the three interrelated sub-markets of the property market; that is the property (asset/supply) market, space (demand) market and the capital (mortgage) market. This takes the form of:

$$HPXRL = \beta_1 + \beta_2 HSTOCK + \beta_3 HCOMP + \beta_4 CCOSTINF + \beta_5 MORTGAGE + \beta_6 CREDIT + \beta_7 WKPOP + \beta_8 AVGINC + \beta_9 GDP + \beta_{10} GOVEXP + \beta_{11} INF + \beta_{12} EXCHRT + \beta_{13} UNEMPRT + \beta_{14} REALMINT + \beta_{15} BOERATE + \beta_{16} TERMSTR + \beta_{17} SAVINGS \quad (4.4)$$

A summary of the key variables, their definitions and sources is given in Table 4.1

Table 4.1: Summary of key data used in study

VARIABLE ID	NAME	DESCRIPTION	SOURCE	UNIT
HPXRL	Real House prices	Nominal house prices deflated by CPI (all items)	Nationwide / ONS	£m
HCOMP	Housing completions	The number of housing completions.	DCLG	No. of house
HSTOCK	Housing supply	The total stock of dwelling units in the United Kingdom	DCLG	No. of houses
MORTGSTK	Mortgage stock	Amounts outstanding of MFI's net secured lending to individuals deflated by CPI	BOE / ONS	£m
MORTGFLOW	Mortgage flow	Gross residential mortgage lending deflated by CPI	BOE / ONS	£m
GOVEXP	Government expenditure	Real Government Consumption of Goods and Services in the United Kingdom	ONS	£m
GDP	Gross domestic product	Gross Domestic Product: chained volume measures	ONS	£m
POP	Population	UK resident population: mid-year estimates (Quarterly data interpolated from annual figures)	ONS	No. of people
M4	Broad Money	Quarterly amounts outstanding of M4 (MFI's liabilities to the private sector)	BOE	£m
AVGINC	Average disposable income	Average Weekly Earnings: Whole Economy Level (£)	BOE	£
CCOSTINF	Construction output price inflation	Quarterly percentage change in Construction output price indices	BCIS	%
UNEMPRT	Unemployment rate	Unemployment rate (aged 16 and over, seasonally adjusted)	ONS	%
INFQ	CPI Inflation	Quarterly percentage change in CPI Index (All items)	ONS	%
EXCHRT	Exchange rate	Effective exchange rate: British pounds / US Dollars	BOE	N
REALMINT	Real Mortgage interest rate	Household standard variable mortgage interest rate	BOE,	%
BOERATE	Base Rate	Bank of England Base rate	BOE	%
TERMSTR	Term Structure	Difference between Long-Term (10yr) Government Bond Yields – short term (90-day) Rates: Treasury Securities for the United Kingdom,	BOE	%
SAVINGS	Savings	Households' saving ratio (per cent): Current price	ONS	%
CREDIT	Credit	Total Credit to Households % GDP	ONS	%

4.3.1. Data examination and description

The data employed in this study consists of 200 quarterly observations spanning a 50-year period from 1968q3 to 2018q3. In this section measures of central tendency, dispersion and shape are used to examine the essential statistical properties of the dataset before proceeding with the regression modelling. A descriptive summary of these statistical properties of all the variables is shown in Table 4.2 using the typical measures of the mean, median, standard deviation, range, skewness, and kurtosis statistics.

Table 4.2: Descriptive statistics

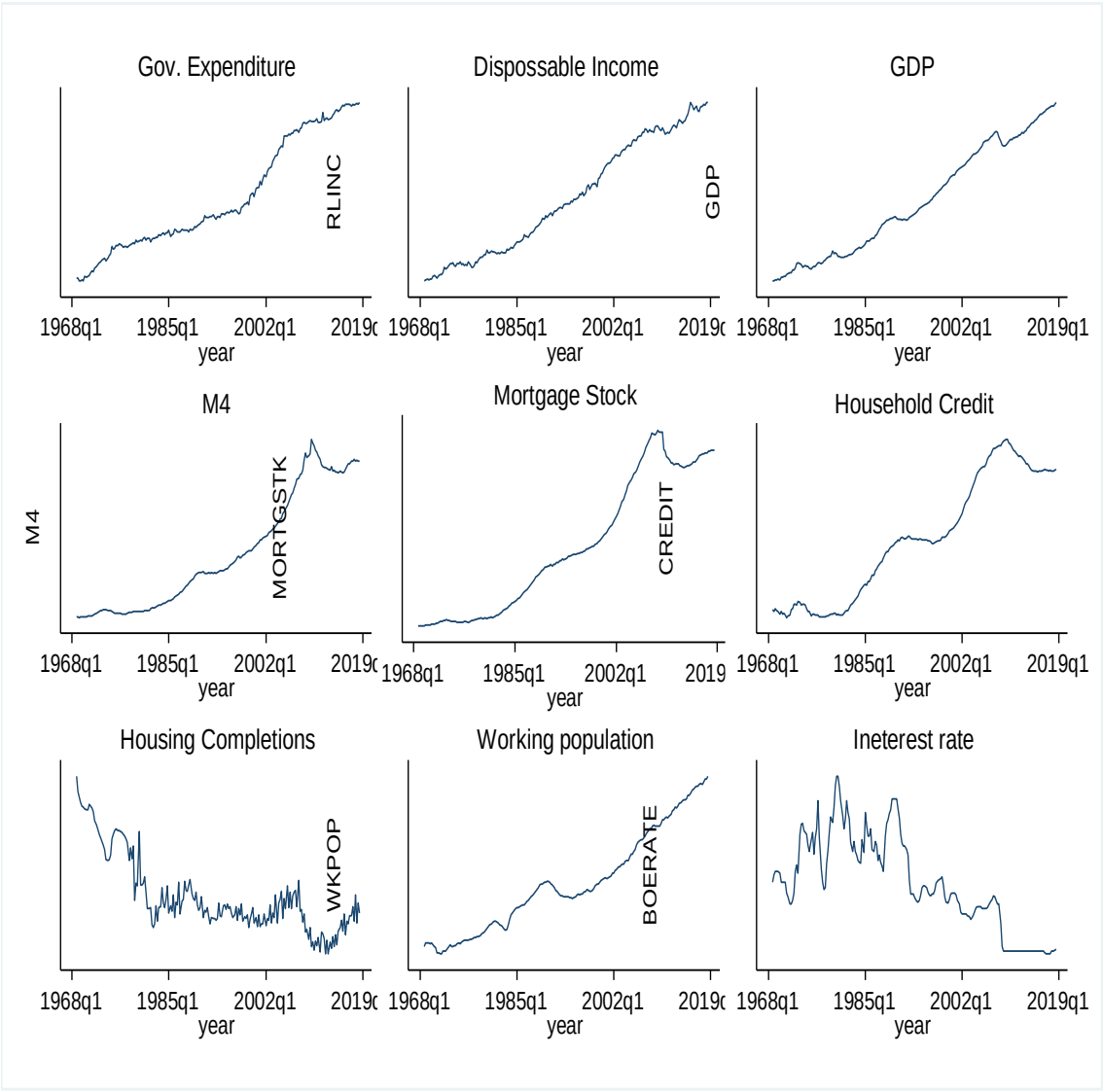
Variables	Mean	Std.Dev.	Min	Max	Skew.	Kurt.
HPXRL	113,000	56,328	45,741	225,000	0.60	1.77
HCOMP	55,587	17,523	30,160	108,000	1.18	3.61
HSTOCK	23,218	2,853	18,137	28,156	-0.05	1.86
MORTGSTK	559,000	410,000	77,301	1,277,197	0.37	1.63
MORTGFLOW	49,649	26,363	16,828	114,000	0.95	2.78
GOVEXP	64,490	16,287	40,509	92,514	0.44	1.80
GDP	322,000	108,000	163,160	517,029	0.23	1.65
POP	58,842	3,157	55,086	66,535	0.99	2.75
M4	1,050,000	734,000	249,000	2,522,133	0.58	1.86
AVGINC	359	115	165	534	-0.12	1.59
RCOSTINF	0.33	1.85	-5.43	5.99	0.31	4.40
UNEMPRT	6.78	2.40	3.20	11.90	0.59	2.18
INFQ	1.27	1.37	-0.74	8.77	1.90	8.04
EXCHRT	1.78	0.35	1.12	2.62	0.78	2.61
REALMINT1	3.89	2.67	0.23	15.54	1.38	5.24
BOERATE	6.96	4.40	0.25	17.00	0.13	2.19
TERMSTR	1.08	1.62	-3.98	5.72	-0.21	3.25
SAVINGS	8.95	2.52	3.90	14.40	0.18	2.18
CREDIT	57.25	22.46	28.80	94.90	0.21	1.62

Table 4.2 reveals some issues worth addressing and taking into consideration when modelling house prices in terms of the selected variables. First is the high disparity in the means of the variables. Even among the level trending series, high variances were observed in means being low as 23,200 for housing supply, compared with 1,050,000 for money supply (M4). This is because these variables are all measured in different units; whilst housing supply, supply is in count (thousands of units of houses), money supply is in pounds sterling (million £). This in itself should not pose a problem in the

modelling but will more admittedly complicate the interpretability of estimated parameters. Hence a logarithmic transformation is used to transform all the level trending series to ensure consistency and ease of interpretation of the regression coefficients.

Another important remark is with regards to the high levels of dispersion within the variables. It is not surprising to see high standard deviations when looking at trending time series. While the values of all variables measured in monetary terms are real values, with inflation removed, there is still a clear upward trend in a lot of variables. It is evident that while some variables have a noticeable upward trend (e.g., a government expenditure, household disposable income, GDP, M4, mortgage stock and household credit.), others (e.g., housing completions and interest rates) have a downward trend. Figure 4.4 depicts the trends in a selection of the variables.

Figure 4.4: Graphical display of trends in selected variables



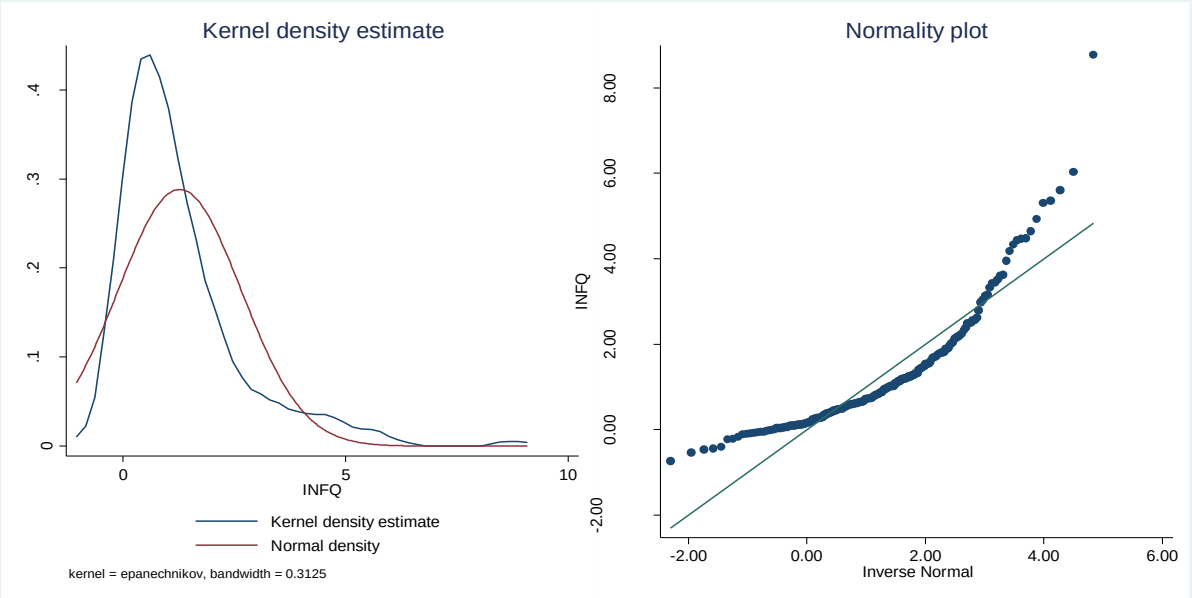
Source: ONS, BOE, DCLG, 2019

It is not unusual to come across trending data when dealing with macroeconomic data (Wooldridge, 2013; Piazzesi & Schneider, 2016). It is further generally acknowledged in the analysis of time-series data that trending variables do not necessarily violate the classical linear model assumptions (Hamilton, 1994) as long as steps are carefully taken to allow for the fact that unobserved, trending factors could affect both the dependent and explanatory variables (Wooldridge, 2013). In such cases, it is important to carefully apply appropriate econometric treatment and avoid spurious regressions models (Sims, 1980, 1992).

Generally, with trending variables, conducting further investigation with unit root and cointegration analysis could reveal the best way to reliably estimate the dynamic relationship between the variables (Sims *et al.*, 1990). One such approach is differencing the trending variables to make them stationary. Granger and Newbold (1974) have proven that regressions with random variables could be spurious when performed on the levels but not on the differenced data. Differencing variables however limits the scope of questions that can be answered with the data hence alternative ways dealing with non-stationary time series variables have been advanced. In cases where cointegration exists, including an error correction term to capture the dynamic relationship and long-run adjustment in regression models is a more appropriate way to model the dynamic relationship between the variables (Engle & Granger, 1987). Stationarity and cointegration will be further discussed in more detail in the next section.

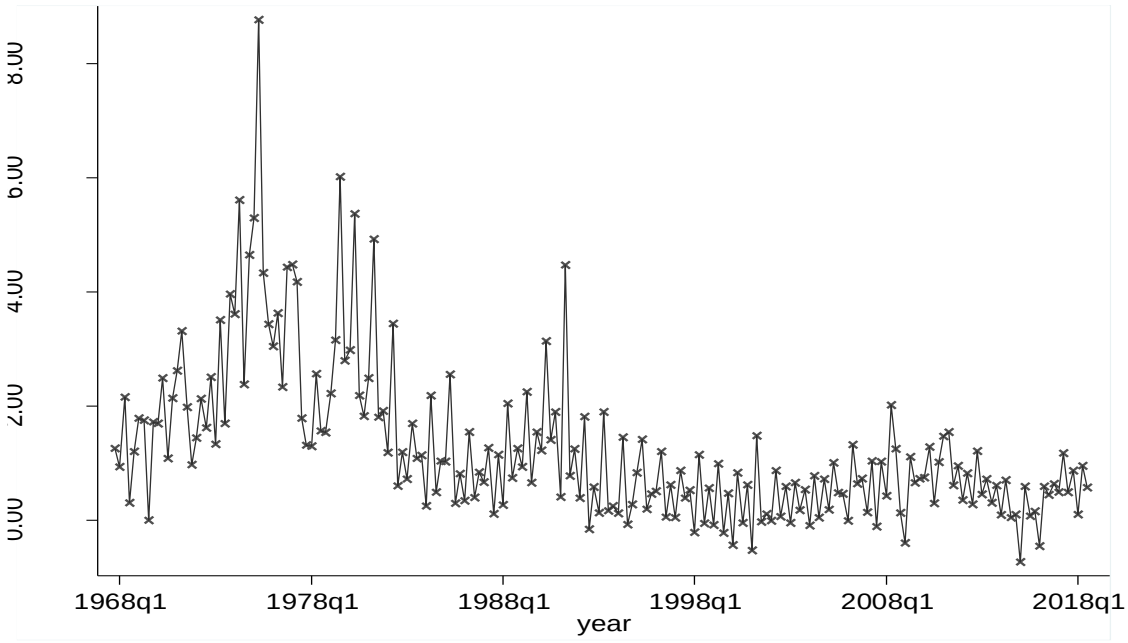
As a final remark on the descriptive statistics, information regarding the shape and normality of the distribution of the datasets can be gleaned from the skewness and kurtosis figures. Whilst skewness describes the degree of symmetry or asymmetry, kurtosis relates more to the peakedness of a distribution. Both indicate how close the distribution of the variable is to the standard normal distribution which has a skewness value of three and kurtosis of zero. It is evident in Table 4.2 that much of the skewness and kurtosis values, although do not reflect a perfectly normal distribution, are within acceptable ranges with a few exceptions. Generally, the skewness values show a positively skewed dataset which is not farfetched given the quarterly dataset spanning a very long-time frame is used. One variable which stands out is inflation (INFQ) which is positively skewed (skewness = 1.89) and leptokurtic (kurtosis = 7.95). The kernel density plot confirms a peaked asymmetrical right tail distribution.

Figure 4.5: Kernel density and normality functions of inflation



When the inflation series was examined, it was seen that there were a few periods of hyperinflation. The mid-1970s to the early 1980s and the early 1990s saw particularly higher levels of inflation as shown in Figure 4.6.

Figure 4.6: UK consumer price inflation, 1968 -2018



Source: ONS, 2019

Inflation was exceptionally high in 1975. This has been associated with the Organization of Petroleum Exporting Countries (OPEC) oil supply shock and consequent crisis of 1973/74 that damaged economic activity in several advanced economies (Barsky & Kilian, 2001; Merrill, 2007). These exceptionally higher and influential values are responsible for the skewed nature of the distribution. Normality assumptions in real-life data can, however, be compensated for by large sample size. More importantly, normality is not required to obtain unbiased estimates of the regression coefficients.

4.3.2. Stationarity and cointegration tests

Since the study makes use of long time-series data, an important first step in the data analysis should be to determine the stationarity of the dataset. Knowing whether or not the variables are stationary, whether in the level of differenced form is necessary for specifying the right model. The stationarity of the data can be checked using the augmented Dickey-Fuller and the Phillips-Perron test. The null hypothesis of these tests is that there is the existence of a unit root in the dataset, i.e., the time series data is not stationary. We, therefore, reject the null hypothesis in favour of the alternative hypothesis (the data has no unit root or is stationary) if the p-value associated with the test statistic is below the alpha value of 0.05. Results of the test are represented in the table below.

Table 4.3: Augmented Dickey-Fuller tests for unit roots

	ADF TEST			
	Levels		1st Difference	
Variables	test statistic	p-value	test statistic	p-value
HPXRL	2.441	0.358	6.054	0.000*
HCOMP	2.863	0.175	12.143	0.000*
HSTOCK	3.061	0.116	4.042	0.076*
MORTGSTK	2.183	0.496	3.663	0.025*
MORTGFLOW	1.969	0.618	4.272	0.004*
GOVEXP	1.146	0.921	7.890	0.000*
GDP	2.351	0.406	5.686	0.000*
POP	0.810	0.964	2.923	0.1549
M4	1.942	0.632	6.378	0.000*
AVGINC	0.145	0.995	7.546	0.000*
CCOSTINF	6.151	0.000*	25.306	0.000*
UNEMPRT	2.386	0.387	4.064	0.007*
INFQ	5.079	0.001*	18.683	0.000*
EXCHRT	2.614	0.273	7.739	0.000*
REALMINT	2.516	0.319	16.301	0.000*
BOERATE	3.276	0.007*	7.771	0.000*
TERMSTR	3.909	0.012*	7.953	0.000*
SAVINGS	2.626	0.268	9.838	0.000*
CREDIT	1.782	0.713	3.609	0.029*

The results suggest the presence of a unit root in all the variables except for the inflation (INFQ), changes in construction cost (CCOSTINF), Bank of England base rate (BOERATE) and the term structure of interest rates (TERMSTR). The first differences of all the variables are however stationary as expected, indicating that the variables are integrated of order 1 except for the total population (POP) series which is integrated of order 2. Since being I(1) is a necessary pre-condition for the application of the cointegration analysis, the total working population (WKPOP) which was found to be I(1) will be used as a proxy for the total population (POP).

As it has been identified that several variables are integrated of order I(1), there is the need for cointegration tests to examine if a long-run relationship exists between them. Although using the differenced values of these variables will ensure stationarity in the dataset, differencing, unfortunately, leads to loss of vital information and limits the scope of questions that can be answered with the data. Therefore, it is sensible to test variables for cointegration before differencing. The existence of cointegration makes regression models involving non-stationary data meaningful (Wooldridge, 2013). The concept of cointegration was originally

developed by Engle & Granger (1987). The basic idea of cointegration is that two non-stationary variables may share the same stochastic process resulting in a linear combination with a stationary error process (ibid). Establishing whether or not cointegration exists is necessary for electing the right model specification (Wooldridge, 2013). If the data are not stationary and cointegration exist, then the basic VAR framework needs to be modified to allow consistent estimation of the relationships among the series. If cointegration is discovered, then the system of equations can be modified to allow for the cointegrating relationship between them. Introducing the cointegrating relationship leads to a model known as the vector error correction model (VECM). The vector error correction (VEC) model is therefore a special case of the vector autoregression model (VAR) applicable to variables that are stationary in their first differences. The VECM can also consider any cointegrating relationships among the variables.

Cointegration of the variables in the model can be tested via the Engle-Granger two-step method (Engle and Granger, 1987) whereby both variables are initially tested for stationarity and if found to be I(1), regressed against each other with appropriate lags to remove autocorrelation. If the residuals of this auxiliary regression are found to be stationary, this is evidence of cointegration. Results of the Engle-Granger cointegration test is shown in Table 4.4:

Table 4.4: Johansen test for cointegration

Trace statistics					
maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	132	-14111.391	.	434.036	277.71
1	153	-14060.806	0.392	332.868	233.13
2	172	-14021.248	0.323	253.752	192.89
3	189	-13988.767	0.274	188.790	156.01
4	204	-13964.733	0.211	140.722	124.24
5	217	-13942.521	0.196	96.298	94.15
6	228	-13928.399	0.129	68.0538*	68.52
7	237	-13917.641	0.101	46.538	47.21
8	244	-13908.472	0.087	28.199	29.68
9	249	-13900.018	0.079	11.291	15.41
10	252	-13894.459	0.053	0.174	3.76
11	253	-13894.372	0.001		
Trend:	constant		Number of obs:	201	
Sample:	1968q3 - 2018q3		lags:	4	

The test statistics confirm there are at least six cointegration equations. Implying that at least six of our independent variables have a long-run relationship with real house prices. Therefore it is justifiable to estimate a cointegrated var (the vector error correction model (VECM) to account for this cointegration relationships and to capture both the long-run and short run dynamics.

4.3.3. The vector error correction model

Having identified the existence of cointegration, a short-run relationship between house price and its determinants is specified using the Vector Error Correction Model (VECM). The VECM equations define a system of equations in which each variable is a function of its lags and the lags of the other variables in the system. Specifically, all the variables in the equation are jointly determined hence the use of VECM eliminates the need to make assumptions regarding the direction of the causality and the existence of temporal causality relationships amongst the variables involved in the regression model because all variables in the model are jointly determined at the same time (Arestis & González, 2014). The VECM technique is an extension of the well-established VAR modelling framework and thus allows the relaxation of the assumptions regarding the exogeneity or endogeneity of the explanatory variables (Sims et al., 1990; Sims, 1992). This approach circumvents the problems of endogeneity of the regressors and reverses causality, which cannot be dealt with easily utilizing other techniques, including the traditional OLS model or instrumental variables. Moreover, the VECM has advantages over conventional regression estimators, including VARs, which only have good properties when applied to covariance-stationary time series, but encounter difficulties when applied to nonstationary integrated processes. These difficulties have been well documented in the literature (Goodman, 1988; Hamilton, 1994; Granger, 2007; Meen, 2012a; Bates et al., 2014; Panagiotidis et al., 2016).

The VECM model for specification in this study takes the functional form of

$$\triangle HPX_t = \beta_0 + \sum_{l=1}^{n} \varphi \triangle HPX_{t-1} + \sum_{l=1}^{n} \varphi \triangle X_{t-1} + \alpha E_{t-1} + \varepsilon_t \ldots\ldots\ldots\ldots\ldots\ldots \quad (4.5)$$

Where △HPX represents changes in real house prices: X is a composite vector that captures housing market, macroeconomic, demographic and housing finance variables*;* E is the error correction term representing long-run adjustment to equilibrium and ε is the random error term. β, φ, and α are coefficient parameters to be estimated.

4.4. Empirical results

This section presents the results of the model for house prices determinants formulated in Section 4.3. First, a base model representing the long-run impacts of financial, macroeconomic and demographic factors that drive residential house prices in the UK is presented. The analysis here begins with a multivariate ordinary least square estimation (OLS). This is followed by diagnostic checks to assess the model's effectiveness and validity. Alternative model specifications are then, considered, including logarithmic transformations of the variables and introduction of lags, leads, structural breaks other control variables. The base model as specified in equation 4 is:

$$\begin{aligned}\mathrm{HPXRL} = {} & \beta_1\,\mathrm{HOUSINGSUPPLY} + \beta_5\mathrm{MORTGAGEFLOW} + \beta_6\mathrm{CREDIT} + \beta_7\mathrm{WKOP} + \\ & \beta_8\mathrm{INCOME} + \beta_9\mathrm{GDP} + \beta_{10}\mathrm{GOVEXP} + \beta_{11}\mathrm{INF} + \beta_{12}\mathrm{EXCHRT} + \beta_{13}\mathrm{UNEMPRT} + \\ & \beta_{14}\mathrm{REALMINT} + \beta_{15}\mathrm{BOERATE} + \beta_{16}\mathrm{TERMSTR} + \\ & \beta_{17}\mathrm{SAVINGS} \qquad (4.6)\end{aligned}$$

The model specifies real house prices on the left side as the dependent variable in terms of a linear combination housing market, macroeconomic and financial and demographic variables on the right (the explanatory or predictor variables) have already been defined (see Table 4.1 for the variable list and definitions). In the base model, all variables are entered in their level forms without any transformations.

First, the basic elements that make a valid regression estimate are addressed. One such pre-requisites is the linearity test. It is crucial to establish if a linear association indeed exists between house prices and the selected variables. This can be done qualitatively by examining the scatter plots between real house prices and each of the explanatory variables. Due to the sheer number of variables involved in the model, this relationship was assessed quantitatively by way of a correlation matrix. A table of the Pearson correlation coefficients between the key variables is shown in Table 4.5.

Examining the pairwise correlations coefficients confirms the existence of significant linear relationships between real house prices and the selected variables. Prices have particularly strong positive correlation with housing supply (cor=0.895), government expenditure (cor = 0.955), real disposable incomes (cor = 0.901), money supply (cor = 0.938), population (cor = 0.899) and mortgage stock (cor = 0.959). Conversely, a negative relationship is identified between real house prices and interest rates, inflation, exchange rate, unemployment rate, term structure of interest rates and construction cost inflation. These are all coherent with *apriori* theoretical expectations.

Another observation from examining the correlation table is that some of the explanatory variables exhibit high levels of cross-correlation. This the particularly the case within the financial and macroeconomic series. Real disposable income, for example, correlates strongly with money supply, government expenditure and credit availability. GDP also correlates strongly with mortgage stock, money supply, and real disposable income. These present important limitations in the dataset especially in OLS modelling as could lead to multicollinearity. Multicollinearity does not necessarily reduce the predictive power or validity of the model as a whole, but the estimated parameters associated with the individual predictors become unstable and highly susceptible to changes in the model or data. It was therefore deemed necessary to drop some of the variables (if cross-correlation was greater than 0.8) and settle for a rather parsimonious model. It is also for these reasons that further diagnostics checks and alternative model specifications are conducted following the base model estimation.

Table 4.5: Correlation between selected variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
HPXRL (1)	1																	
HPXRL_GR (2)	-0.215	1																
HSTAT (3)	-0.53	0.455	1															
§HCOMP (4)	-0.602	0.256	0.886	1														
HSTOCK (5)	0.895	-0.292	-0.754	-0.829	1													
CONSCOST (6)	0.936	-0.314	-0.71	-0.77	0.99	1												
REALRATE (7)	-0.327	-0.065	0.004	-0.01	-0.227	-0.273	1											
EXCHRT (8)	-0.428	0.21	0.691	0.793	-0.694	-0.622	-0.063	1										
INFQ (9)	-0.411	0.194	0.363	0.409	-0.516	-0.509	-0.381	0.436	1									
GOVEXP (10)	0.955	-0.276	-0.659	-0.722	0.967	0.987	-0.354	-0.57	-0.446	1								
AVGINC (11)	0.919	-0.276	-0.697	-0.764	0.986	0.987	-0.236	-0.622	-0.529	0.966	1							
UNEMPLOYMENT (12)	0.041	-0.243	-0.606	-0.634	0.293	0.231	0.22	-0.648	-0.256	0.171	0.188	1						
UNEMPRT (13)	-0.137	-0.183	-0.49	-0.512	0.113	0.045	0.299	-0.559	-0.170	-0.017	0.008	0.98	1					
GDP (14)	0.94	-0.261	-0.66	-0.740	0.985	0.992	-0.271	-0.601	-0.517	0.981	0.992	0.149	-0.036	1				
NETMIG (15)	0.932	-0.179	-0.553	-0.649	0.925	0.942	-0.264	-0.55	-0.507	0.948	0.945	0.066	-0.107	0.958	1			
M4 (16)	0.937	-0.309	-0.626	-0.673	0.946	0.974	-0.371	-0.508	-0.468	0.979	0.954	0.133	-0.061	0.968	0.926	1		
REALMINT (17)	-0.706	0.06	0.2	0.297	-0.686	-0.725	0.446	0.252	0.489	-0.756	-0.736	0.201	0.356	-0.762	-0.765	-0.797	1	
MORTGSTK	0.939	-0.292	-0.641	-0.712	0.973	0.988	-0.312	-0.562	-0.516	0.981	0.982	0.154	-0.037	0.99	0.945	0.986	-0.792	1

4.4.1. Long-run equilibrium determinants of house prices

The base model specified in Equation 4.4 was estimated in STATA with 200 quarterly observations for each variable from 1968q3 to 2018q3. Results are presented in Table 4.6.

Table 4.6: Base model: OLS summary

Real house prices	Coef.	St.Err.	t-value	p-value	95% Conf. Interval		Sig
Interest rate	-660.193	304.312	-2.17	0.031	-1260.518	-59.869	**
Inflation	-629.281	641.749	-0.98	0.328	-1895.279	636.718	
Exchange rate	3809.924	3069.638	1.24	0.216	-2245.647	9865.494	
Unemployment	-428.614	319.768	-1.34	0.182	-1059.430	202.202	
Term structure	-1487.923	456.055	-3.26	0.001	-2387.596	-588.250	***
Construction cost	980.697	297.586	3.30	0.001	393.641	1567.753	***
Housing supply	-19.145	2.118	-9.04	0.000	-23.324	-14.966	***
Gov expenditure	217.912	15.614	13.96	0.000	187.110	248.713	***
Disposable income	68.707	24.993	2.23	0.029	-20.053	157.466	**
Money supply	0.004	0.006	0.72	0.472	-0.007	0.015	
Mortgage flow	0.509	0.051	9.91	0.000	0.408	0.611	***
Working population	16.201	1.765	9.18	0.000	12.719	19.682	***

Mean dependent var	114516.246	SD dependent var	56077.020
R-squared	0.985	Number of obs	200.000
F-test	718.03	Prob > F	0.000
Akaike crit. (AIC)	4122.463	Bayesian crit. (BIC)	4165.341

*** p<0.01, ** p<0.05, * p<0.1

First, considering the analysis of variance (ANOVA) at the bottom panel of Table 4.6 which assesses the overall fit of the model. The model has an F-test statistic of 718.03 with an associated p-value < 0.001indicating the overall model is statistically significant. This implies the independent variables, taken together, reliably explain house price changes. Further, the R-Squared indicates the proportion of variance in the real house prices that can be accounted for by the explanatory variables. The model has a very high R-squared ($R^2 = 0.985$) indicating the predictor variables together explain up to 98.5% of the variance in real house prices. Considering the large number of explanatory variables, the adjusted R-squared gives more reliable information regarding the explanatory power of the model and this is still very high (Adj R-Squared=0.977).

The estimated parameters representing the β values in the model specification together with the associated t-statistics and p-values are given in the top panel of Table 4.6. Eight (8) out of the twelve (12) variables appear significant in the model. The results suggest that holding other factors constant, interest rate, the term structure and housing supply have significant negative impacts on house prices. High interest rates imply a high cost of borrowing and thus discourage the use of mortgages for housing purchase. Conversely, low-interest rates lower debt servicing costs and encourage borrowing for housing purchase which feeds directly into house prices.

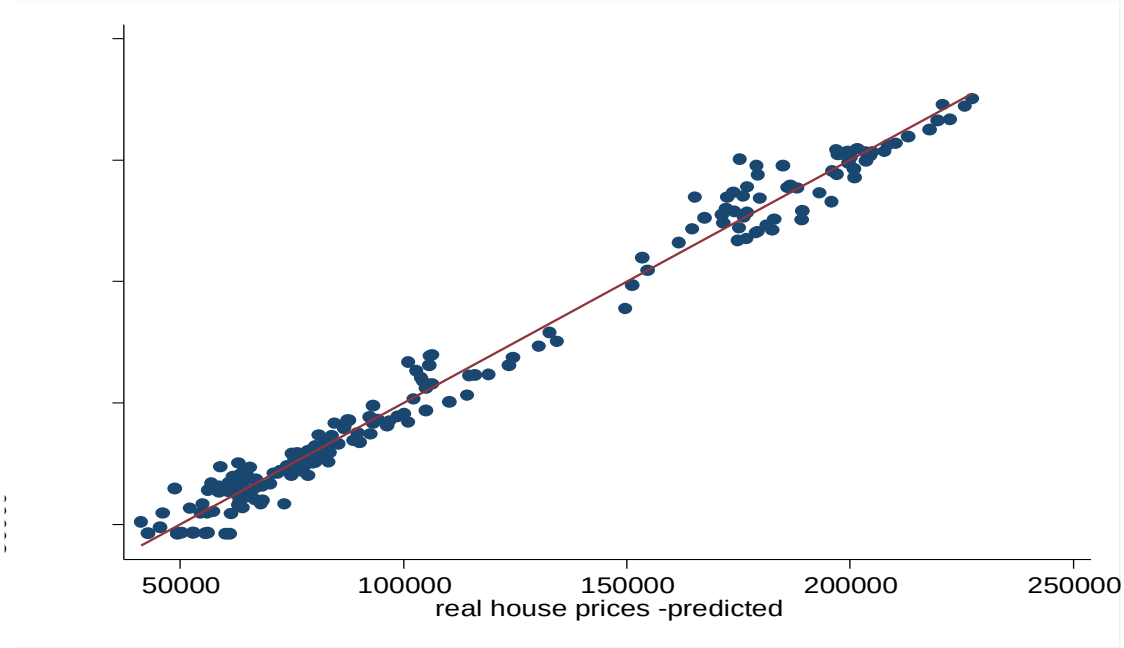
Another explanation for this is that lower interest rates improve mortgage and housing affordability by lowering debt-service ratios for borrowers. The term structure of interest rates also returns a significant negative coefficient suggesting that future interest rate expectations are also important drivers of house prices. Similarly, the housing supply is a proxy variable representing the supply industry. Increasing supply (both in terms of new construction and renovation) leads to increased availability of housing units and thus, drives down prices in the long run. Unsurprisingly, inflation appeared insignificant since all variables used were real variables.

On the other hand, the flow of residential mortgage, government expenditure, real disposable incomes, and the total working population appear as significant positive drivers of house prices. Mortgage stock and government expenditure, in particular, appear to be highly significant drivers ($p<0.001$). This, together with the role of mortgage interest rates emphasizes the idea that the mortgage market plays a significant role in the housing market and that increased mortgage availability has been a major contributor to sustained house price growth.

4.4.2. Base model diagnostics

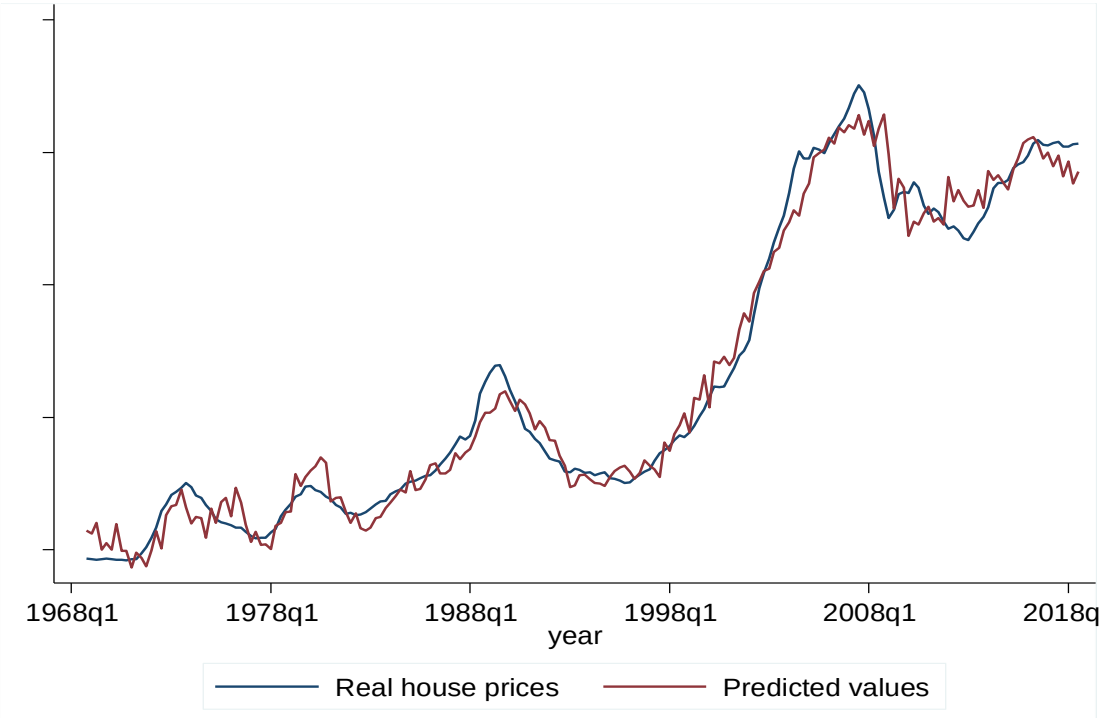
Having fitted and estimated the model for house price determinants, some diagnostic tests are conducted to assess the validity of the estimated model and the consistency of the data with the underlying OLS assumptions. Generally, how good the model is determined by how well it predicts the dependent variable, its linearity and the distribution of the residuals. These factors are assessed in the model along with tests of normality, homoscedasticity, independence and adequacy model specification. Figure 4.7 shows how well the model predicts the values of real house prices.

Figure 4.7: Actual vs predicted values of real house prices



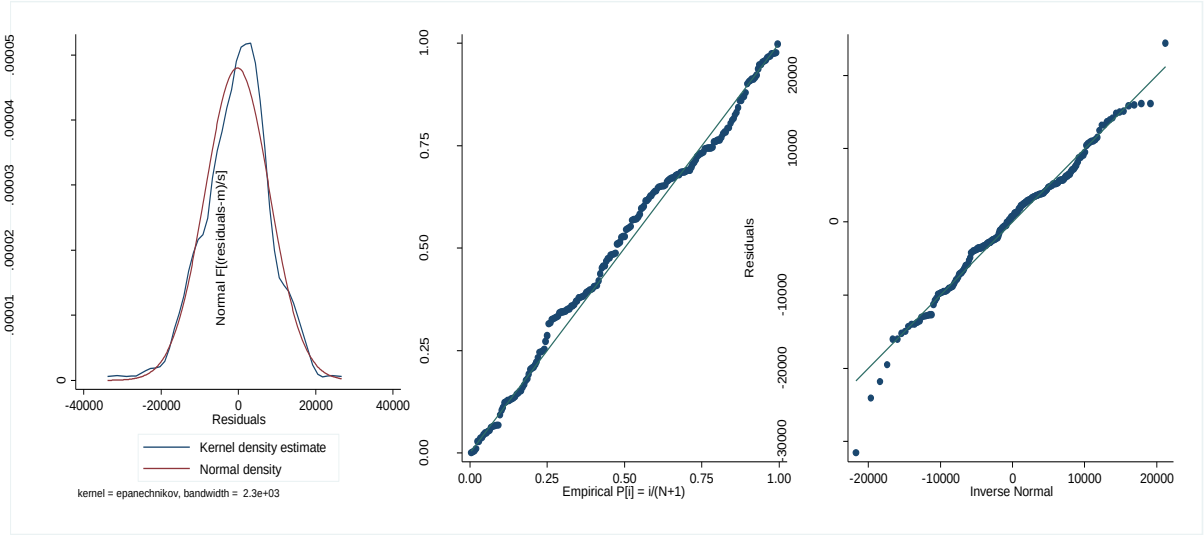
The predicted values of real house prices based on the model closely mimic the observed values and trend, only slightly overestimating house prices in the late 1960s and 1970s. The model's goodness of fit is very high in that it captures all the major cyclicality in house prices movements over the last 50 years. The model also shows that house prices in 2017/18 are slightly above the level predicted by fundamental determinants.

Figure 4.8: Model performance eveluation: actual vs predicted house prices



Next, the residuals of the model was assessed to check for normality. The residuals must be normally distributed to ensure the validity of the p-values for the t-tests and F-test statistics. The normality of the residuals is checked by *kdensity*, *qnorm* and *pnorm* command in STATA to produce kernel density plots for the residuals.

Figure 4.9: Normality of model residuals

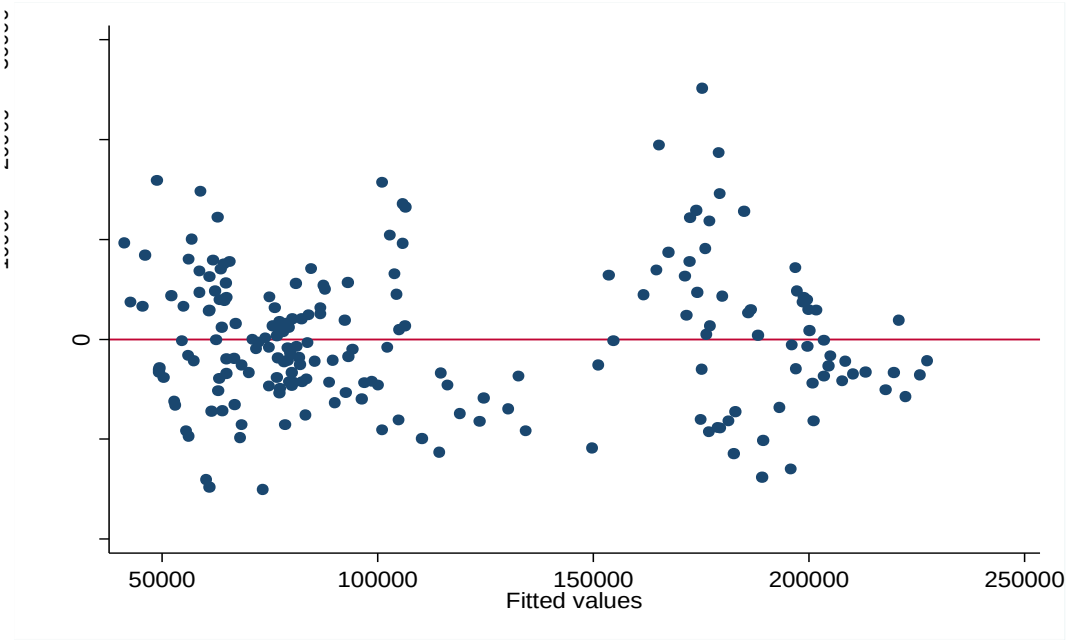


The rightmost chart is the kdensity command which examines the overall normality of the residuals, comparing the same to the standard Gaussian distribution. Next to it are the pnorm and qnorm plots which further emphasise normality in the middle range and near the tails of data, respectively.

Figure 4.9 shows minor skewness of the distribution to right. The *pnorm* function shows no significant indication of non-normality whilst the *qnorm* function shows a slight deviation from normality at the lower and upper tails of the distribution. Overall, there seems to be only a minor and trivial deviation from normality hence it can be accepted that the distribution of the residuals is close to normal. Using the Shapiro-Wilk W test for normal data, the null hypothesis that the residuals are normally distributed could not be rejected.

Another important assumption underlying the ordinary least squares regression model is homoscedasticity. This refers to the homogeneity of variance within the residuals. For a well-fitted model, no pattern should be identified when the residuals are plotted against the fitted values of the dependent variable. Heteroscedasticity arises when the variance of the residuals is not uniform over the range of values of the predictor variables. This is examined graphically by plotting the residuals against predicted values of real house prices. There is some slight indication of heteroscedasticity as the pattern in the distribution of the residuals tends to broaden slightly at the right end.

Figure 4.10: Residuals vs fitted values of real house prices



Heteroscedasticity of the residuals was further assessed numerically by the Breusch-Pagan test which evaluates the null hypothesis of homogenous variance in the residuals. The test results indicated a chi-squared value of 2.89 and a p-value of 0.089 hence the null hypothesis cannot be rejected (at 95% confidence level) that the distribution of the residuals is homogenous. At a 90% confidence level, however, the null will be rejected and conclude that residuals are not homogenous. The rvfplot and the Breusch-Pagan test both suggest the possibility of slight heteroskedasticity in the model. These tests are very sensitive to model assumptions, such as the assumption of normality, hence alternatives model specifications will be considered in the next section.

Another diagnostic check that is considered is multicollinearity among the predictor variables. Collinearity signifies if two variables are almost perfect linear combinations of one another. Multicollinearity refers to a situation where more than two variables are involved. If the predictor variables in the model exhibit a perfect linear relationship, the parameters for the regression model cannot be uniquely computed and as the degree of multicollinearity increases, estimated parameters of the coefficients become unstable and the standard errors for the coefficients get inflated. Multicollinearity was tested by calculating the variance inflation factor (VIF) and tolerance which by definition is the inverse of the VF. Table 4.7 presents these statistics which generally indicates multicollinearity exists among some of the variables.

Table 4.7: Collinearity diagnostics

Variable	VIF	SQRT VIF	Tolerance	R- Squared
Interest rate	2.83	1.68	0.3534	0.6466
Inflation	3.01	1.73	0.3326	0.6674
Exchange rate	4.12	2.03	0.2425	0.7575
Unemployment	2.1	1.45	0.4756	0.5244
Term structure	1.69	1.3	0.5907	0.4093
Construction cost	1.18	1.08	0.8497	0.1503
Housing supply	108.82	10.43	0.0092	0.9908
Gov expenditure	38.9	6.24	0.0257	0.9743
Disposable income	56.2	7.5	0.0178	0.9822
Money supply	1.44	1.2	0.6961	0.3039
Mortgage flow	1.61	1.27	0.6204	0.3796
Working population	31.74	5.63	0.0315	0.9685
Mean VIF	21.14			

The generally accepted thresholds are 10 for VIF and 0.1 for tolerance(Wooldridge, 2013). The values in Table 4.7, therefore, suggest that housing supply, government expenditure, disposable income and total working population exceed these thresholds. Indeed, this is consistent with the prior observation in section 4.4.2 that these variables exhibit high correlations with one another. An explanation for this was also hinted at in Figure 4.4 which showed that all these variables had an upward trend. Since there is no plausible theoretical underpinning to suggest these variables are a linear combination of one another, the high VIF observed here could be attributed to the trending nature of the variables which again is acceptable in the case of time-series observations. The multicollinearity together with the heteroscedasticity issues identified suggests some transformation of the variables may be more appropriate. Therefore, logarithmic transformation is used in the subsequent alternative model specifications.

The final diagnostic check considered is the adequacy of the model specification. A misspecified model is one in which one or more relevant variables are omitted or one or more irrelevant variables are included. Excluding relevant variables from the model may wrongly attribute the common variance they share with included variables to those variables. On the other hand, including irrelevant variables in the model could lead to them wrongly taking up the common variance they share with included variables (Chen, et al, 2003).

Misspecifying a model can substantially affect the estimated coefficients. Two tools in STATA were employed to examine the adequacy of the model specification: the *linktest* and *ovtest* commands. Linktest checks for specification error in the model by re-specifying the model using two variables *(_hat* and *_hatsq*) generated from the predicted values of the dependent variable. If the model is correctly specified, *_hat* is expected to be significant but *_hatsq* should not be significant as the former is based on the predicted values. The results of the linktest are displayed in Table 4.8.

Table 4.8: Link test for model specification

Hpxrl	Coef.	Std. Err.	t	P>t	95% Conf.	Interval
_hat	0.902	0.080	11.340	0.000	0.745	1.059
_hatsq	0.001	0.001	1.240	0.217	-0.001	0.001
_cons	5089.324	4314.038	1.180	0.240	-3418.300	13596.950
R-squared		0.979	Number of obs		200.000	
F-test		4653.691	Prob > F		0.000	

The results of the linktest above suggest the linktest fails to reject the assumption that the model is specified correctly as _hatsq test is not significant. It seems therefore that the model is specified correctly. This was cross-checked with the *ovtest* command which calculates the Ramsey regression specification error test (RESET) using powers of the fitted values of real house prices against the null hypothesis that the model has no omitted variables. The ovtest returns F(3, 184) = 8.69 with a p-value, Prob > F = 0.000. Thus, the ovtest rejects the assumption of no omitted variables in the model. Possible omitted variables in the data could be leads and lags of the variables as house prices are not expected to react contemporaneously to changes in the identified drivers. As these two tests are giving conflicting and inconclusive results, alternative specifications of the model and adding some control variables including leads and lags will be considered in the next section.

4.4.3. Alternative specifications

This section explores alternative specifications for the base model and examines if the model's goodness of fit may be improved. The analysis here begins with the logarithmic transformation of the variables. Log transformation of variables in a model could be desirable in several situations including when there is a need to accommodate

nonlinearity in the regression relationship. It could also help reduce right skewness in the error distribution which has been identified as a potential issue in the diagnostics conducted previously. The logarithmic transformation could also eliminate the heteroskedasticity problem identified. We, therefore, re-examine the model with the log-transformed values for all variables with non-negative values. These are real house prices, housing supply, government expenditure, disposable income, money supply, mortgage flow and the total working population. The model is essentially the same, but the interpretation of the estimated coefficients should now be construed in terms of elasticities rather than the absolute values of the βs. Table 4.9 presents the results of the model.

Table 4.9: Alternative specification 1: logarithmic-transformation

Real house prices (ln)	Coef.	St.Err.	t-value	p-value	Sig
Interest rate	-0.005	0.002	-2.08	0.039	**
unemployment (ln)	-0.044	0.021	-2.12	0.035	**
Term structure	-0.019	0.005	-4.03	0.000	***
Construction cost inflation	0.010	0.003	3.51	0.001	***
Housing supply (ln)	-4.938	0.434	-11.37	0.000	***
Gov. expenditure (ln)	2.403	0.139	17.33	0.000	***
Disposable income (ln)	0.014	0.191	0.07	0.943	
Mortgage flow (ln)	0.148	0.021	7.18	0.000	***
Money supply (ln)	0.211	0.059	3.59	0.000	***
Total working population (ln)	3.554	0.428	8.30	0.000	***

Mean dependent var	11.531	SD dependent var	0.485
R-squared	0.982	Number of obs	200.000
F-test	1018.865	Prob > F	0.000
Akaike crit. (AIC)	-502.207	Bayesian crit. (BIC)	-465.925

**** p<0.01, ** p<0.05, * p<0.1*

The ANOVA statistics suggest a very significant model with high predictive power. F statistic is highly significant (Prob>F = 0.000) and *R-squared* is very high (0.982). The *t* and *p* values associated with coefficients indicate all the variables entered in the model, except for real disposable incomes, are significant drivers of real house prices. The signs of the coefficients are also consistent with apriori theoretical expectations just as was the case in the base model. A major difference between the log-transformation and previous specification is that money supply enters as a significant driver of house prices whilst real disposable income does not, whereas, in the initial specification, the reverse

was the case. Table 4.10 compares the results of the two specifications. Notice that standardised betas are used to ensure estimated parameters have the same unit to make the comparison meaningful.

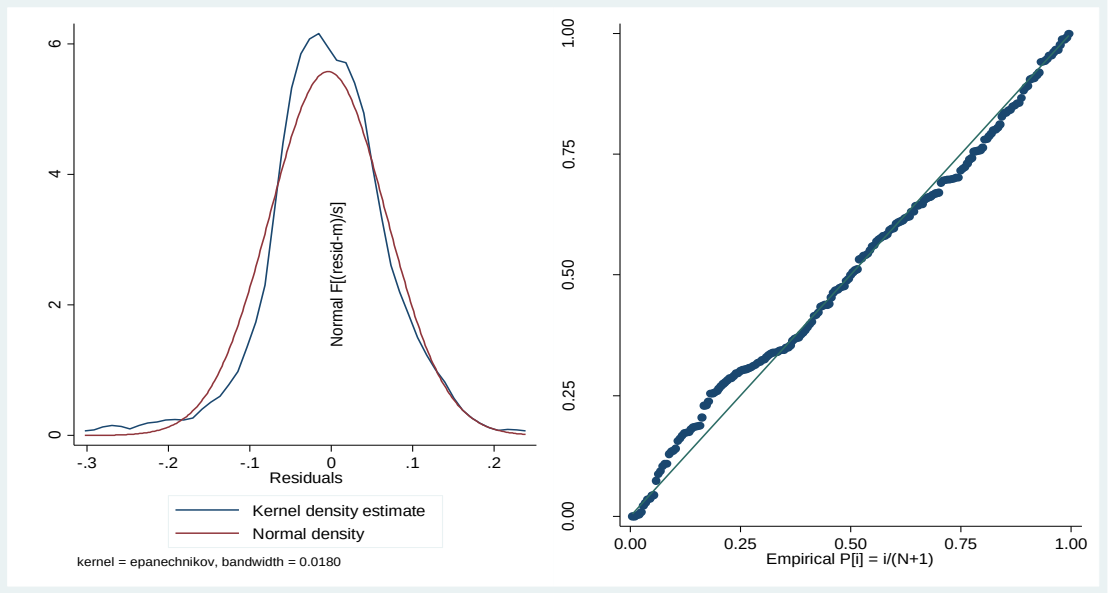
Table 4.10: Base model vs log-transformed model

	Dependent variable: Real House prices	
	Base model	Log transformation
Interest rate	-0.025*	-0.026*
	(-238)	(-0.003)
Unemployment	-0.031**	(-0.031*)
	(-266.2)	(-0.021)
Term structure	-0.036**	-0.062***
	(397.7)	(0.005)
Construction cost	0.034***	0.039***
	(-297)	(-0.003)
Housing supply	-1.053***	-1.235***
	(-1.671)	(-0.434)
Government expenditure	0.841***	0.972***
	(-14.2)	(-0.139)
Disposable income	0.214**	0.01
	(-33.23)	(-0.191)
Mortgage flow	0.257***	0.335***
	(-0.0442)	(-0.021)
Total working population	0.746***	0.588***
	(-1.133)	-0.428
Money supply		0.331***
		(0.059)
R2	0.985	0.982
Adj. R2	0.984	0.981
N	200	200

Standardized beta coefficients; Standard errors in parentheses, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

The key observation from the results in Table 4.10 is that specifying the model in logarithmic form does not necessarily improve the goodness of fit, in fact, the R-squared is slightly higher in the base model (0.985) compared to the logarithmic specification (0.982). However, what is obvious is that logarithmic transformation significantly reduces the standard errors associated with the estimated coefficients (see numbers in parenthesis). Moreover, examining the residuals of the model in Fig 4.11 show that the logarithmic transformation has further reduced the right-skewness of the residuals and brought the distribution closer to a normal distribution. Therefore, the p and t statistics in model specification 2 are deemed more reliable than those in model 1.

Figure 4.11: Normality of log-specified model residuals



The effects of lagged values of the variables in the model are next explored. The original model specification assumes that house prices react instantaneously to changes in the fundamental drivers, but this is not theoretically plausible. Due to the nature of the property market, particularly, supply inelasticity, some form of lag should be expected in the adjustment of prices to changes in the fundamental drivers of demand. Further, specifying the model as the instantaneous response of house prices to changes in fundamental drivers assume exogeneity of the variables in the model which is not the case. Mortgage flow, for instance, is not the only driver of house prices but is in itself also influenced by house prices. Specifically, whilst increased mortgage accessibility improves housing affordability and stimulates demand, rising house prices also lead to rising mortgage debt as higher amounts of loans will be required for house purchase. Rising housing values also lead to more borrowing as it allows existing borrowers to take further advances against their rising equities. Since exogeneity cannot be assumed in the model as it stands, attributing causality becomes problematic due to the possibility of bi-directional causality.

One way of circumventing these problems is to lag the independent variables. By lagging the independent variables, the model allows some time for house prices to react to any changes in the fundamental drivers. Also, since past values of the drivers are being used to estimate house prices, causality can be attributed strictly to the independent variables and not the reverse. With this intuition, the model is re-examined

including the lagged values of the predictor variables. The optimal lag length was determined to be 2 quarters based on the Bayesian Information Criterion (BIC) estimated in STATA. In Table 4.11 the results of using the first and second lagged values of the predictors in the model are shown in columns 2 and 3 and compared with the original results of the base model in column 1.

Table 4.11: Alternative specification 2: including lagged values of predictors

	Dependent variable: real house prices		
	Base Model (No lag)	1st Lag	2nd Lag
Interest rate	-513.6*	-436.3	-176.6
	(-2.16)	(-1.66)	(-0.58)
Unemployment	-727.7**	-787.6**	-983.0**
	(-2.73)	(-2.68)	(-2.89)
Term structure	-1226.9**	-779.6	-350.0
	(-3.09)	(-1.78)	(-0.69)
Construction cost	1037.6***	1300.8***	1456.3***
	(3.49)----	(3.97)	(3.84)
Housing supply	-21.16***	-18.10***	-15.83***
	(-12.67)	(-9.71)	(-7.24)
Government expenditure	220.9***	216.9***	219.6***
	(15.55)	(13.76)	(11.94)
Disposable income	106.2**	59.49	28.81
	(3.20)	(1.60)	(0.66)
Mortgage flow	0.499***	0.559***	0.570***
	(11.28)	(11.35)	(9.88)
Total working population	17.81***	16.22***	14.68***
	(15.72)	(12.98)	(10.14)
R^2	0.985	0.982	0.975
adj. R^2	0.984	0.981	0.974
AIC	4120.9	4139.1	4176.3
BIC	4153.9	4172.0	4209.1
N	200	199	198

t statistics in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4.11 shows that indeed the effect on house prices of some of the fundamental drivers are both instantaneous and persistent. This is indicated by the highly significant coefficients in the lagged models. The results indicate that changes in unemployment, construction cost inflation, housing supply, government expenditure, mortgage flow and the total working population do not only have instantaneous impacts on real house prices, but their effects continue, at least, for the next two quarters. The lagged effects of mortgage supply and construction cost are stronger in the lagged specification. On

the other hand, interest rate, term structure and disposable incomes only exhibit immediate impact on house prices as they do not appear to be significant drivers in the lagged specifications. This means any effects of changes in these drivers is transmitted to house prices in the same quarter whereas, in the case of the other variables, the impact is both on house prices in the same quarter as well as house prices in subsequent periods.

In Table 4.12, the model includes not only lagged values of the predictor variables but also the lagged value of real house prices. This allows current values of house prices to influence future values. This intuition here derives from the longevity of housing as an asset and the forward-looking attitude of both investors and developers in the housing market. Thus, the model is modified to include both the current and lagged values of fundamental drivers as well as lagged values of house prices.

Table 4.12: Alternative specification 3: including lagged values of real house prices

Dep Var: House prices	Coef.	St.Err.	t-value	p-value	Sig
Lagged house prices	0.968	0.029	32.86	0.000	***
Interest rate	103.493	92.476	1.12	0.265	
L.Interest rate	118.923	92.078	1.29	0.198	
Unemployment	-3879.820	944.762	-4.11	0.000	***
L.Unemployment	3739.191	935.352	4.00	0.000	***
Term structure	-250.532	293.330	-0.85	0.394	
L.Term structure	591.289	301.526	1.96	0.051	*
Construction cost	59.705	117.078	0.51	0.611	
L_Construction cost	99.853	114.975	0.87	0.386	
Housing supply	-54.726	20.923	-2.62	0.010	**
L_ Housing Supply	55.333	21.028	2.63	0.009	***
Gov expenditure	8.585	16.398	0.52	0.601	
L_Gov expenditure	6.322	16.341	0.39	0.699	
Disposable income	33.586	49.139	0.68	0.495	
L_Disposable income	-68.153	48.855	-1.40	0.165	
Mortgage flow	0.252	0.035	7.27	0.000	***
L.Mortgage flow	-0.175	0.038	-4.56	0.000	***
Working population	0.188	3.016	0.06	0.950	
L.Working population	-0.653	2.943	-0.22	0.825	

Mean dependent var	114516.246	SD dependent var	56077.020
R-squared	0.998	Number of obs	200.000
F-test	5241.972	Prob > F	0.000
Akaike crit. (AIC)	3716.817	Bayesian crit. (BIC)	3782.784

*** p<0.01, ** p<0.05, * p<0.1, L1 = 1 period (quarter) Lag

Table 4.12 indicates that when lagged values of house prices are considered, the only significant drivers of house prices that remain are unemployment, term structure of interest rates, housing supply and mortgage supply. Except for the term structure, these variables exert significant influences on house prices in both their current and lagged forms.

Figure 4.12: Model performance based on log transformation and the inclusion of lagged values

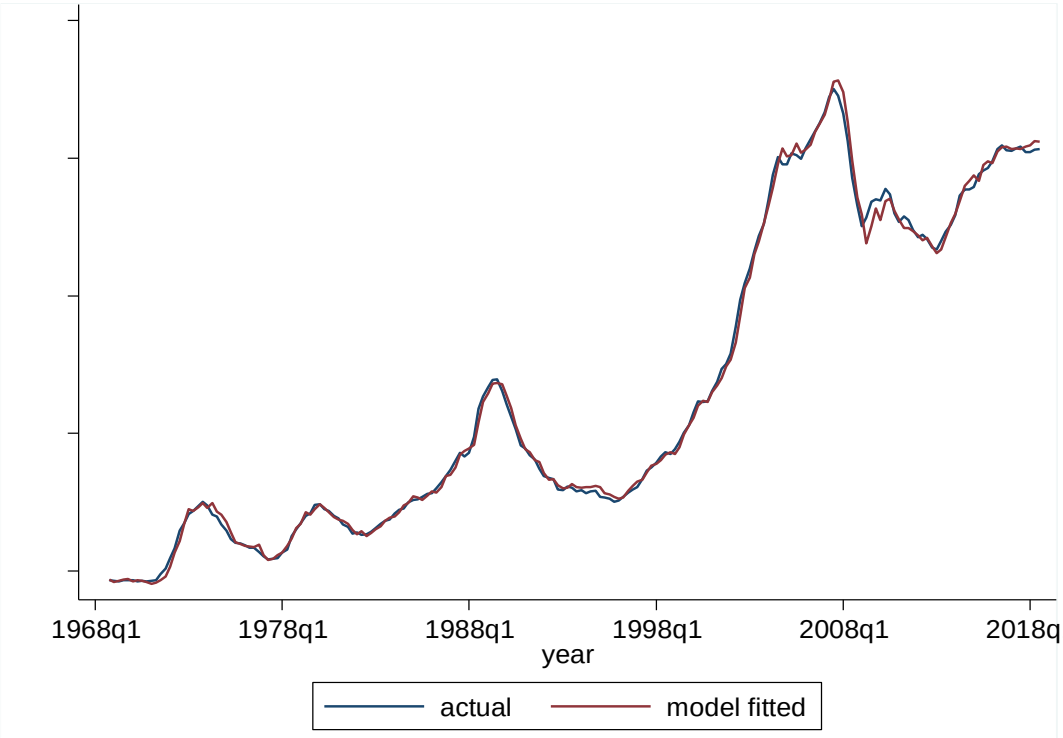


Figure 4.12 compares the predicted values of real house prices. It is shown that incorporating lagged house prices in the model significantly improves the goodness of fit of the model.

4.5. Summary of long run drivers of house prices

Based on the foregoing analysis, alternative models have been developed for examining the fundamental drivers of UK house prices in the long run. The implications of the series of analyses in 4.4 were to establish which variables have played a significant role in shaping UK house prices over the last 50 years. A wide array of macroeconomic, financial, demographic and housing market variables has been examined. Results from

the OLS model suggested that between 1968 and 2018, real UK house price levels have been driven mainly by nine (9) key factors: the term structure of interest rates (future interest rate expectations), government expenditure, real disposable incomes, total working population, employment/unemployment rate, construction output price inflation, housing supply (proxied total housing supply), mortgage credit availability and real mortgage interest rates. Specifying the model in logarithmic form highlighted that money supply is another key driver. It is important to note that several other macroeconomic variables which the literature suggest may affect house prices were not found to be significant including inflation, exchange rate, GDP and savings. By examining the lagged effects of these variables on house prices, it was observed that unemployment, construction cost inflation, housing supply, government expenditure, mortgage flow and the total working population have longer-term consequences on house prices whereas for real mortgage interest rates, future interest rates expectations and real disposable income, the impact on house prices is instantaneous - usually transmitted to house prices in the same quarter. This suggest that these are factors that the house buyer would consider in the price paid for a house.

4.5.1. Changing dynamics of house price determinants

This section looked out the evolution of the house price drivers over the decades. First, the effect on the model of including decade dummies is examined. This highlights which of the drivers remain significant after controlling for unobserved decade-specific factors. The model includes dummies for each decade for the 1980s, 1990s, 2000s and 2010s and omit the 1970s as the reference category. Notice also that the 1970s dummy covers the period from 1968 to 1979, this was because there were only a few observations from the 1960s. The 1970s was selected as the reference category as it contains the first full episode of boom and bust in house prices. The average quarter-on-quarter real house price growth for this period was 1.08%, which is higher than the overall average for the entire period of 0.78%. There was also a wide dispersion in house price changes over the period ranging from -5.1% to 6.8%.

Table 4.13: House price determinants accounting for decade specific events

	Dep Var. Log of Real House prices	
	(1)	(2)
Interest rate	-0.005*	-0.003
unemployment (ln)	-0.043*	-0.205***
Term structure	-0.019***	-0.008*
Construction cost inflation	0.010***	0.005*
Housing supply (ln)	-4.938***	-5.101***
Gov. expenditure (ln)	2.403***	2.170***
Disposable income (ln)	0.014	0.440*
Mortgage flow (ln)	0.148***	0.140***
Money supply (ln)	0.211***	0.335***
Total working population (ln)	3.554***	2.184***
_1980		0.131***
_1990		-0.088*
_2000		-0.137**
_2010		-0.041
_cons	3.588	17.140***
R2	0.982	0.988
adj. R2	0.981	0.987
N	200	200

1 - OLS Model without decade specoific controls: 2 – OLS Model with decade dummines
**** p<0.01, ** p<0.05, * p<0.1*

The results in Table 4.13 indicate that controlling for decade specific factors improves the overall goodness of fit of the model as suggested by the marginal increase in adjusted R-squared. The significance of mortgage interest rates is diminished reflecting the fact that changes in taxation and mortgage interest deductions over the decade could have altered the role of interest rates in house prices. The coefficients of the dummies for the 1980s, 1990s and 2000s are all significant and suggest that house prices in the 1980s performed relatively better compared to the period from 1968-1979. House price performance was relatively weak in the 1990s and significantly weaker in the 2000s.

Next, analysing the key house price drivers in each of the decades could help reveal what factors have been responsible for the upward and downward swings of house prices in each decade. The key determinants of house prices in each of the decades from the 1970s to the present is therefore examined using the same model but splitting the period into the respective decades. Table 4.14 shows the results.

Table 4.14: House Price determinants in five (5) decades

	Dependent Var: Real House Prices (Ln)				
	1970s	1980s	1990s	2000s	2010s
Total working population (ln)	3.027***	2.121**	4.980***		-3.309***
Disposable income (ln)	0.475**	0.688***	1.403**		0.700***
Mortgage flow (ln)	0.034	0.087***	0.184***	0.112***	0.078**
Term spread	-0.008		-0.026***	0.039***	
M4 (ln)	1.461***				
Housing supply (ln)	-1.668**		-4.774***		
Construction cost		0.005	0.012***		
Unemployment rate		-0.032***		-0.039***	-0.074***
Mortgage interest rate				-0.007*	
Government expenditure (Ln)				1.891***	
_cons	-24.740**	-14.820*	-1.540	-3.240***	41.820***
R^2	0.980	0.987	0.952	0.991	0.967
adj. R^2	0.976	0.985	0.941	0.989	0.963
N	45	40	40	40	35

*** p<0.01, ** p<0.05, * p<0.1

The results in Table 4.14 shows that some of the identified drivers have played a consistent role in house price determination over the decades, others have dwindled in their relevance whilst some have just recently become more significant. Key drivers of house prices in the 70s included the size of the working population, disposable incomes, money supply and housing supply. In the 1980s, money supply and housing supply were no longer significant. Mortgage supply becomes significant from the 1980s coinciding with the liberalisation of the mortgage market and the removal of mortgage market constraints. From this point onwards mortgage supply is a significant driver of house prices in every decade. Disposable incomes appear significant in all decades except the 2000s. The term spread of interest rates was more significant in the 1990s and 2000s whilst construction cost was only significant in the 1990s. The drivers in the 2010s would suggest that the disposable incomes, mortgage flow and employment are the key drivers of house prices at the moment as they appear to be the only significant variable in the 2010 model.

This conclusion would, however, be simplest and could be misleading due to the smaller samples in each decade. To have a better picture of past and present drivers, it is relevant to have a defined reference point. The year 2008 was assumed to be this reference point as it marked the onset of the global financial and housing market crisis which significantly impacted the housing market and led to several policy and regulatory changes. We, therefore, investigate the key drivers of house prices were before the onset of the GFC and from that time onwards. The results are shown in Table 4.15.

Table 4.15: House price determinants before and after GFC

	Dependent Var: Real House Prices (Ln)	
Key Determinants	pre-gfc	post-gfc
M4	0.209***	0.565**
Mortgage flow	0.186***	0.076**
Exchange rate	0.0858**	
Total working population	2.937***	-2.500***
Term spread	-0.0168**	-0.014*
Construction cost	0.00942**	
Housing supply	-5.057***	
Gov. expenditure	2.548***	
Real interest rate		-0.005**
Unemployment		-0.069***
Disposable income		-0.936
_cons	9.573	36.160***
R^2	0.971	0.910
adj. R^2	0.970	0.895
N	156	44

Table 4.15 reveals eight key drivers of UK house prices before the 2008 GFC. Housing supply and term spread of interest rates are identified as significant negative drivers of house prices before 2008 whilst money supply, mortgage flow, exchange rate construction cost and government expenditure appear as significant positive drivers of house prices. Post-2008, these drivers have changed substantially. Exchange rate, housing supply, construction cost government expenditure and disposable incomes are no longer identified as significant house price drivers. Money supply and mortgage flow and term spread are identified as the only significant positive determinants of house prices both before and after 2008 whilst the unemployment rate and mortgage interest rate appear as new drivers. Notice that the total working population appears significant but had changed significantly and thus will be disregarded until further examination.

4.5.2. House price drivers at defined economic periods

This section employs the use of splines to examine the behaviour of the determinants of house prices under various periods marking significant changes in the UK housing market. The 50 years covered by the analysis was broken down into six (6) splines as detailed below.

Spline 1: 1968 -1977: This period covers a full housing cycle and contains the first major house price boom in the early 1970s which peaked in 1975, followed by a steady decline. Mean house price growth ranged from -5% to 11%. This was a period of rising inflation resulting from the energy supply disruptions from the OPEC oil crisis of 1973/74 (Barsky & Kilian, 2001; Merrill, 2007) which dealt a critical blow to economic activity in most advanced economies. This period was also notable for the rising importance of homeownership: more than half of all households owned their homes by 1976 (Stephens, 2011). The period also marks the beginning of significant changes in government monetary policy particularly in taxation in what became known later as monetarism (Lawson, 1992).

Spline 2: 1978 – 1989: This period contains the next housing boom that peaked in 1988. Mortgage finance was deregulated, and credit became much more widely available to lower-income groups and on a wider range of properties. Lenders also became willing to grant much larger loan-to-income and loans (Stephens, 2011). Multiple mortgage interest relief for unmarried couples and groups of friends was to be ended 1988 budget which triggered a surge in housing transactions as there was a rush to beat the 5-month deadline (Scanlon & Adamczuk, 2016). Right to Buy (RTB) was introduced in October 1980 encouraging sweeping sales council houses to their tenants at a discount. Local authorities sold 1.3 million dwelling units between 1979 and 1988, amounting to about one-fifth of their stock (Hills, 1991).

Spline 3: 1990 – 1999: The housing market had stabilised and revived since the mortgage finance deregulation. Bank of England base rate fell to 6% in 1996. Most building societies started to convert into banks starting with Abbey National from 1995 onwards such that in 1997 the market share of banks exceeded that of building societies (Scanlon & Adamczuk, 2016). Investment in rental properties was given a boost by the introduction of innovative mortgage credit to private landlords under the Buy-to-Let

(BTL) initiative introduced in the mid-1990s. The Housing Act of 1988 deregulated the private rental market and further increased the attractiveness of rental housing as an investment.

Spline 4: 2000 – 2007: This is the period leading up to the crisis. It marks a period of rapid price increases. The early 2000s saw strong growth in interest-only loans and by 2007, about 24% of new mortgages were interest-only. (Scanlon & Adamczuk, 2016). Mortgage interest rates reached a then record low in 2003 and although they began to increase again they remained historically low (Jones, 2016). Tax relief mortgage interest payments was phased out by 2000. Owner occupation peaked at 70% in 2006. Mid-2007 represented the apex of the UK housing market; transactions and prices fell dramatically after that.

Spline 5: 2008 – 2012: This marks the period from which the early signs of the most recent financial crisis were first observed and covers the recession period. The collapse of the Lehman Brothers in September 2008 officially marked the beginning of the Global Financial Crisis. A wave of upheavals and mergers and government takeovers occurred in the UK (Scanlon & Adamczuk, 2016). The majority of lenders, particularly those that relied on securitisation and wholesale funds were severely affected leading to a massive decline in gross lending.

Spline 6: 2012 – 2018: This marks a period of regime change in the accessibility of mortgage finance following the tightening of public finance and dampening of expectations (Jones, 2016). Lending and house prices had remained depressed for years after the crisis. Help-to-Buy (HTB) schemes were introduced in 2010 to address the growing concern with the lack of access to housing finance. The funding-for-lending scheme was also introduced in 2012 to encourage banks to increase lending. Mortgage Market Review (MMR) was introduced in 2014 to ensure continued access to the mortgage market to those who can afford it while addressing poor mortgage lending practices seen in the past.

In analysing the determinants of house prices in each of the defined episodes, the significance of the defined splines was first assessed. This was achieved utilizing dummy variables for each defined period taking the value of 1 for all observations in that period and 0 otherwise. Then to examine which factors played significant roles in

the respective periods defined, a stepwise regression methodology was used to evaluate which variables were significant drivers of house prices in each of the six episodes described above. The results are presented in Table 4.16 and Table 4.17 respectively.

Table 4.16: Significance of defined splines

hpxrl	Coef.	St.Err.	t-value	p-value	Sig
Interest rate	-368.729	215.590	-1.71	0.089	*
Exchange rate	9124.082	3028.090	3.01	0.003	***
Unemployment	-1165.542	431.678	-2.70	0.008	***
Term structure	-494.074	462.575	-1.07	0.287	
Construction cost	602.449	270.891	2.22	0.027	**
Housing supply	-16.718	2.680	-6.24	0.000	***
Gov expenditure	175.098	17.986	9.73	0.000	***
Disposable income	175.550	59.261	2.96	0.003	***
Money supply	0.017	0.007	2.54	0.012	**
Mortgage flow	0.335	0.057	5.83	0.000	***
Working population	16.866	1.913	8.82	0.000	***
Spline_1	20619.248	5702.026	3.62	0.000	***
Spline_2	22233.885	4781.312	4.65	0.000	***
Spline_3	1682.970	3153.160	0.53	0.594	
Spline_5	-20500.000	5184.185	-3.96	0.000	***
Spline_6	-18300.000	6084.338	-3.01	0.003	***
Constant	-279000.000	53151.193	-5.24	0.000	***
Mean dependent var	114516.246	SD dependent var			56077.020
R-squared	0.989	Number of obs			200
F-test	993.497	Prob > F			0.000
Akaike crit. (AIC)	4079.209	Bayesian crit. (BIC)			4135.281
*** p<0.01, ** p<0.05, * p<0.1					

Using dummies in a regression model requires that one of the dummy variables be omitted as the reference category to avoid perfect collinearity. In the model above, the fourth spline was omitted as the reference category. Spline 4 covers a period of rapid sustained house price growth and thus served as a good reference point since all the other splines cover periods of both rising and falling house prices. The results in Table 5.16 indicated that 4 out of the 5 splines are significant hence we proceed to investigate the drivers of house prices in each of the defined periods. The results are presented in Table 4.17. Each column in the table represents a separate model run for a particular spline.

Table 4.17: Spline analysis of house price drivers

	Dep Var: Real House prices					
	Spline1	Spine2	Spline3	Spline4	Spline5	Spline6
Total working population	0.111***	0.162*	0.259			
	(4.01)	(2.12)	(1.89)			
Mortgage flow	0.061*	0.185***	0.405***		0.979***	0.112*
	(2.41)	(3.95)	(4.40)		(7.77)	(2.73)
M4	1.074***			-0.927***	0.658***	0.259***
	(34.07)			(-4.09)	(6.29)	(4.23)
Disposable incomes	0.186	0.628***	0.722***	-0.326*		-0.081
	(1.82)	(7.35)	(3.67)	(-2.49)		(-2.07)
Housing supply	-0.407***		-1.348***	1.746***	-0.351**	-0.495***
	(-3.99)		(-4.75)	(4.71)	(-3.82)	(-5.02)
Unemployment		-0.316***	-0.321			-0.968***
		(-11.77)	(-2.00)			(-10.25)
Term structure		-0.100***	-0.350***	0.063**	-0.360**	
		(-4.15)	(-3.94)	(3.12)	(-3.01)	
Exchange rate			-0.238***	0.248***		-0.151**
			(-4.10)	(5.93)		(-3.53)
Construction cost			0.158**			
			(3.46)			
Gov. expenditure				0.263**		0.229***
				(2.91)		(5.20)
Interest rates					-0.736***	-0.066**
					(-7.05)	(-3.32)
R2	0.986	0.988	0.960	0.996	0.975	0.997
adj. R2	0.984	0.986	0.950	0.996	0.964	0.995
N	40	48	40	32	20	23

Table 4.17 results indicated the key drivers of house prices in each of the defined periods. Population, housing supply and general liquidity appear to be key drivers of house prices in the period from 1968 to 1977. The significance of liquidity in this period supports Lawson's (1992) assertion that the period marked pivotal changes in government monetary policy in what became known as monetarism. For the second period, mortgage flow and disposable income were key positive drivers of house prices whilst unemployment was a significant negative driver. Again, term structure appears significant and negative showing the importance of long-term interest rate expectations. Results for spline three are consistent with spline 2 but two new variables (exchange rate and construction cost) also become significant.

4.6. Short run dynamics of house price drivers: a vector error correction model approach

This section examines the short-run dynamics between residential house prices and the fundamental drivers using a Vector Error Correction Model (VECM). The VECM is a general framework used to describe the dynamic interrelationship among differenced-stationary time-series variables taking into account any cointegrating relationships among the variables. A VECM was preferred to a VAR model because it was established in Section 4.3 that the time series is not stationary in levels but are in their differences and that the variables are cointegrated. This was confirmed by the Augmented Dickey-Fuller test and Johansen cointegration test (refer to See section 4.3 and tables therein). The short run error correction model is specified as:

$$\triangle \mathrm{HPXRL_t} = \beta_0 + \sum_{i=1}^{k-1} \varphi \triangle \mathrm{HPXR_{t-i}} + \sum_{j=1}^{k-1} \varphi_t \triangle \mathrm{X_{it-j}} + \alpha \mathrm{ECT_{t-i}} + \varepsilon_t$$

Where, $\triangle HPXRL_t$ is the quarter-on-quarter changes in real house prices, X_i is a vector that captures quarterly changes in 10 endogenous variables namely: real house prices, real mortgage interest rates, unemployment rate, term spread, construction cost, housing stock, government expenditure, real disposable incomes, money supply (M4), mortgage flow and the total working population. ECT is the lagged error correction term with a long-run adjustment parameter = α. *K* is appropriate for the number of lags to be included, which is reduced by 1 in the model due to the differencing applied and ε is a vector of the residual terms of impulse responses. Although the model is in effect a matrix of 10 systems of equations showing how all of the variables influence one another, the house price equation is the only equation of interest for now. The estimated equation for the determinants of short run-changes in real house prices is thus represented in full as:

$$\begin{aligned}\Delta \mathrm{HPXRL_t} = {} & \beta_0 + \beta_1 \Delta \mathrm{HPXRL_{t-1}} + \beta_2 \Delta \mathrm{INCOME_{t-1}} + \beta_3 \Delta \mathrm{UNEMPLMNT_{t-i}} + \\ & \beta_8 \Delta \mathrm{GOVEEXP_{t-1}} + \beta_4 \Delta \mathrm{HOUSINGSUPPLY_{t-1}} + \\ & \beta_5 \Delta \mathrm{MORTGAGEFLOW_{t-1}} + \beta_6 \Delta \mathrm{INTERESTRATE_{t-1}} + \beta_7 \Delta\, \mathrm{M4_{t-1}} + \\ & + \beta_9 \Delta \mathrm{TERMSTR_{t-1}} + \beta_{10} \Delta \mathrm{POPLUTATION_{t-1}} + \alpha \mathrm{ECT_{t-i}} + \varepsilon_t\end{aligned}$$

The model describes a system in which each variable is a function of its own lagged difference and that of the other variables in the system. Essentially, the model estimated here is similar to

the basic long-run model but is fitted to the first differences of the variables and a lagged error-correction term is added to the relationship. It is expected that a significant negative coefficient (α) on the error correction term (E_{t-1}) indicates that real UK house prices respond to temporary deviations in the fundamental drivers.

4.6.1. VECM estimation and results

The optimal lag length was assessed using the *varsoc* command in STATA. The appropriate lag length was estimated using the AIC and SBIC and HQIC information criteria. Whilst AIC and HQIC criteria indicated maximum lags of 4, the SBIC suggested a maximum lag of 2. We chose to go with the 4-period lag which is considered ideal in the case of the quarterly dataset. The model was estimated in Stata using the *vec* command. As a system of equations with 4-lags, the VEC results, particularly the significance of the individual short-run coefficients are difficult to appreciate, hence Granger Wald test was used to examine the causal effects of each of the variables in the model on house prices. The model summary and the results of the Wald test are discussed below.

Table 4.18: Short-run vector-error correction model for house price determinants

Dep Var: ∆Real House Prices	Coef.	St.Err.	z	P>|z|	Sig
Cointegration parameter (*ECT*)	-0.071	0.015	-4.770	0.000	***

Error correction Model			
Sample:	1968q4 - 2018q3	Number of Obs	= 199
R-sq.	0.699	z = 373.851	p>z = 0.000
Log likelihood	-9360.018	AIC	= 98.764
Det(Sigma_ml)	1.16e+26	SBIC	= 104.117

The results indicate a highly significant model (z = 373.851, p>z = 0.000). The R-squared value is 0.699 indicating the model explains approximately 70% of short-run variations in house prices. The VECM results, taken altogether show there is a strong causal effect on house prices from the fundamental drivers. This relationship is valid for both the long term and the short term. The validity of the long-term relationship is indicated by the highly significant p-value on the coefficient of the error correction term. The coefficient on the error correction term is negative (as expected) and statistically significant at 99.9% indicating that indeed there is a long-run causal effect on house prices from the fundamental drivers and that UK house prices respond to a

temporary variation or disturbances in the fundamental drivers. The adjustment parameter is -0.071 which indicates that precious years' deviation of real house prices from the long-run equilibrium is corrected for in the current year at a convergence speed of 7.1%. These findings are consistent with those of (Taltavull de la Paz & White, 2012a), who also found there is long term convergence to equilibrium of UK house prices when a shock to fundamental drivers occurs in the market. The estimated speed of adjustment is however slightly higher.

The short-run coefficients are detailed in Table 4.19. Together with the p and t statistics, these show which variables have a short-run causal effect on real house prices and at which lags. The results indicate that interest rates, mortgages and money supply (liquidity) are the key statistically significant drivers of short run (quarterly) changes in house prices when only the first two lags are considered. The relationship between interest rates and real house prices is negative and significant whilst real mortgages and money supply have strong positive effects on house prices. Additionally, housing supply appears significant but only at lag3 confirming the slow inelasticity of housing supply in the UK to changes in demand as suggested by Ball (2008) and Jones, 2012) The model also includes a structural break for 2008 capturing the effects of the Global Financial Crisis which also show significant with a negative impact on house prices. The Granger-Wald causality test can be used to determine which variables have significant causal impacts on house prices in the short run.

Table 4.19: Short run causal impacts of house price determinants

	GRANGER-WALD TEST		
DEP VAR: ∆REAL HOUSE PRICES	chi2	Prob > chi2	Sig
Interest rates	10.5	0.0148	**
Exchange rate	4.72	0.1935	
Unemployment	5.71	0.1266	
Term structure	0.71	0.8708	
Construction cost	1.91	0.6725	
Housing supply	9.63	0.022	**
Gov. expenditure	9.22	0.0265	**
Disposable income	2.76	0.429	
Mortgage flow	8.53	0.0362	**
Money supply	10.83	0.0127	**
Total working population	0.74	0.8646	

The Granger Wald approach to examining causality tests the linear hypothesis that coefficients on all the lagged values of a variable are zero and that the variable in question does not have any short run causal impacts on the dependent variable. The results of the Wald test show that short-run changes in real house prices in the UK are explained by changes in interest rates, housing supply, government expenditure, mortgage flow and liquidity. Other factors such as unemployment, construction cost, disposable incomes and the term structure of interest rates, although appeared to be significant drivers of real house prices, in the long run, are not significant in the short run.

4.6.2. Robustness Checks and Implications

To check the robustness and reliability of the estimated VEC model, checks for residual autocorrelation, normality and stability were conducted. Using the Lagrange-multiplier test, the hypothesis of autocorrelation in the residuals is be rejected at the selected lag order (chi^2 = 147.881, prop = 0.3951). Jarque-Bera test was further used to examine the normality of the residuals of the model. Results confirmed that residuals to be normally distributed (chi^2 = 2.15, Prob = 0.339). Using the *vecstable* command in STATA, the stability of the model was evaluated using the max eigenvalue stability condition. Results indicated the VECM specification imposes 11-unit moduli and values fall within recommended eigenvalues. The model, therefore, satisfies all three assumptions of normality, stability and no autocorrelation and can be regarded as a reliable representation for the long and short run dynamics of house price drivers.

The analysis so far highlights the significant role played by finance and liquidity in the UK housing market between 1968 and 2018. Mortgage flow to the residential housing sector, mortgage interest rates and money supply in the economy as a whole are significant drivers of house prices in both the long and short term. It is therefore not surprising that following the liberalisation and removal of mortgage market constraints starting from the late 1980s, the UK has experienced very noticeable house prices appreciation. This coupled with the consistent fall in interest rates from the early 1990s significantly explain the large increases in house prices that followed until the onset of the 2008 Global Financial Crisis. These findings also suggest that post-GFC macro-prudential and regulatory tightening changes in the mortgage market in the form of

stricter lending requirements and affordability assessments should be expected to have significant effects on the future direction of house price growth.

4.7. Chapter summary

This chapter has presented results for the first part of the empirical work aspect of the study. A comprehensive quantitative analysis of house price determinants in the UK in the last five decades has been provided utilising different statistical and econometric techniques. The analysis has identified both long-run and short-run drivers of UK house prices using quarterly datasets from 1988q1 to 2018q3. The base model suggested up to 97.4% of the variations in house prices is adequately accounted for by the explanatory variables in the model. The identified key drivers of UK house prices are government expenditure, money supply in the economy, disposable incomes, size of the working population and mortgage credit supply which tend to drive house prices upwards in the long run. On the other hand, housing supply, the term structure of interest rates (future interest rate expectations), unemployment and mortgage interest rates tend to drive house prices down in the long run. The degree of importance of these factors varies over time.

Interestingly, the model showed a combination of these factors had been predominantly remarkable in shaping trends in house prices in the two decades leading up to the 2007/08 GFC.. Of particular prominence are the historically low-interest rates, increased mortgage availability and stagnating housing supply. The chapter further examined the short-run dynamics between residential house prices and the fundamental drivers using the vector error-correction model (VCM) which confirmed a strong causal effect on house prices from the fundamental drivers in both the long and short term. The analysis further established an important role for interest rates, mortgages flow and money supply as the key drivers of the quarterly changes in UK house prices. In the next chapter, the drivers of the residential mortgage finance expansion over the same period will be analysed and the role of regulatory and policy changes in facilitating this expansion will be examined.

CHAPTER FIVE

MACROECONOMIC DRIVERS OF UK RESIDENTIAL HOUSING FINANCE: 1968-2018

5.1. Introduction

In the previous chapter, the determinants of house prices and the significance of mortgage finance in shaping price dynamics within the UK housing market was established. The importance of the mortgage market in the UK residential property market cannot be overemphasised as one-third of all homebuyers in the UK resort to some form of mortgage finance for home purchase or refinance existing mortgages every year (FCA, 2018). The outstanding value of all residential mortgage loans stood at £1.513 trillion at the end of the second quarter of 2020 which was 3.2% higher than that of the year before (Bank of England, 2020). This chapter extends the discussion further by investigating what factors have influenced and shaped the development of the UK mortgage market between 1968 and 2018. The chapter addresses the fourth research objective which seeks to analyse and identify the key macroeconomic variables associated with the growth of the UK mortgage market. First, an overview of

recent trends in the mortgage market is presented before the drivers are modelled and examined using vector autoregressions (var) and Granger causality tests. The analysis is further corroborated with findings from semi-structured interviews conducted with experts and stakeholders in the UK housing and mortgage market, where their views and insights on the housing finance and house prices, perceived drivers and the role of regulatory changes are discussed.

5.2. Recent trends in the UK mortgage market

Changes witnessed in the UK mortgage market over the last five decades partly reflect transformations in the market's internal dynamics as well as external factors such as the Global Financial Crisis and the government's regulatory response to the crisis. Scanlon & Adamczuk (2016) note that the UK mortgage landscape today is very different from how it looked in the 1980s. While building societies dominated the market in the early 1980s, their dominance of the mortgage market has disappeared in recent times. Similarly, most mortgage products had fixed interest rates in the 1980s, but variable interest rates are now more common (at least in the short term), and consumers increasingly use the internet and brokers to shop for mortgages. Moreover, Mortgage tax relief has been completely wiped out since 2000 and interest-only mortgages have almost disappeared, save for BTL mortgages. Since the Global Financial Crisis, wholesale mortgage funding markets have remained very limited, except when supported by the government (Council of Mortgage Lenders, 2015). Tighter regulations have reinforced lenders' caution in the wake of the GFC, making access to mortgage finance more difficult for all but the lowest-risk borrowers – despite historically low-interest rates.

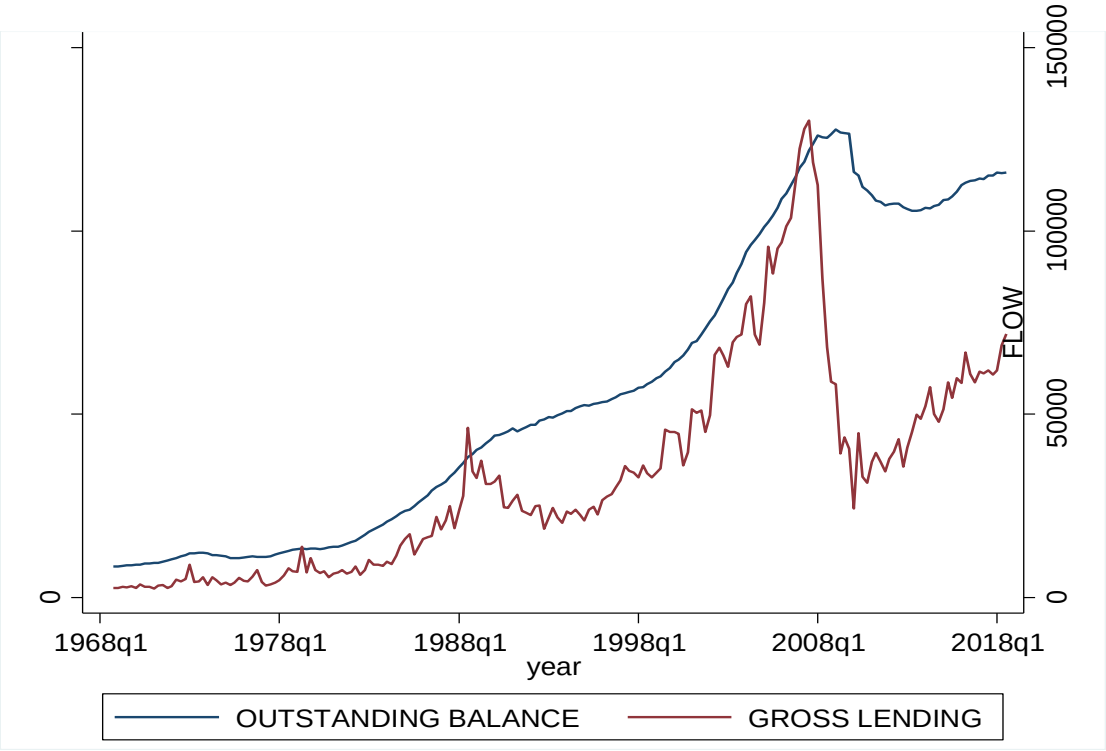
The mortgage market has assumed a significant role in the UK housing market for more than 200 years, dating from the 1770s when the first building society was formed in Birmingham. The regulated residential mortgage sector was worth over £1.5 trillion in 2019, with roughly £8 million active mortgage accounts and gross lending averaging around £300 billion annually (Bank of England, 2020). Mortgage lending supports over 70 per cent of housing transactions and has grown in recent decades supported by rising sales and house price growth (UK Finance, 2019). There are over 100 active lenders in the residential mortgage market, but the market is highly concentrated such that the 6

largest lenders account for 75% of the outstanding balance (FCA, 2018). The UK mortgage market is widely recognized as one of the most developed mortgage markets worldwide, in terms of the diversity of mortgage products, accessibility of mortgages, availability of information and advice on available mortgage products (Smith, 2012a).

Typically, borrowers take out a long-term contract (e.g. a 25-year mortgage) with initial interest rates fixed for in the short term (2-7 years initially) which then reverts to a standard variable rate (SVR). It is often the case that customers switch or remortgage to take advantage of better deals on the market. There is a relatively higher preference for variable rate loans in the UK by international benchmarks as SVR loans account for over half of all loans (European Central Bank, 2009). Besides, in contrast to other jurisdictions, the majority of fixed-rate mortgages in the UK are short-term, with less than 10% of mortgages fixed for up to 10 years virtually none for periods exceeding 10 years (UK Finance, 2019).

The mortgage market has significantly grown in the last three decades both in terms of volume and activity. Figure 5.1 depicts trends in outstanding residential mortgage balance and gross annual lending between 1968 and 2018.

Figure 5.1: Trends in outstanding mortgage balances

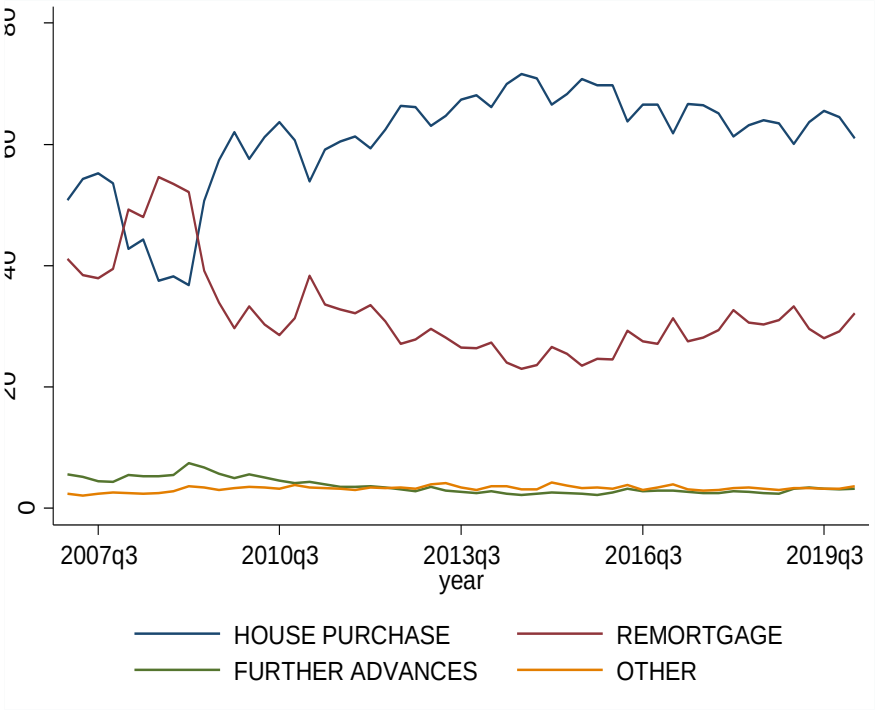


UK Finance, 2019

The upwards trend from the late 1990s persisted till the onset of the Global Financial Crises of 2007/08. Some authors have ascribed the growth in mortgage finance in the late 1990s to the early 2000s to the deregulation of the financial and mortgage markets in the 1980s and favourable macroeconomic indicators (Iacoviello & Minetti, 2003; Case, 2008; Duca et al., 2010; Buttimer, 2011). According to (Smith, 2012a) deregulation removed constraints that had characterised the era of credit rationing, increased competition among lenders, led to innovation in mortgage products and allowed loan-to-value ratios to rise. Importantly, the Council of Mortgage Lenders (2015) note that wholesale funding became a major aspect of the UK mortgage market following deregulation in the 1980s as it allowed banks and specialist lenders who had access to tap wholesale funding sources to participate in the market. This paved way for the introduction of residential mortgage-backed securities (RMBS) in in the UK late 1990s and covered bonds in 2003 (Council of Mortgage Lenders, 2015).

The market continued to expand through the 1990s and early 2000s. In the mid-1990s, outstanding mortgage debt in the UK stood at 60% of GDP, yet by 2007, this had climbed to over 80% and by 2009, stood at 88% (Smith, 2012b). The GFC led to the tightening of mortgage regulation and restricted access to mortgage finance. Gross mortgage lending fell from £115 billion in the fourth quarter of 2007 to just over £35 billion by the end of 2008. Since 2009 growth in gross mortgage lending has resumed but at a very slow pace. As at the time of writing, gross mortgage lending had still not returned to pre-crisis levels.

Figure 5.2: Loan classification by purpose of loan



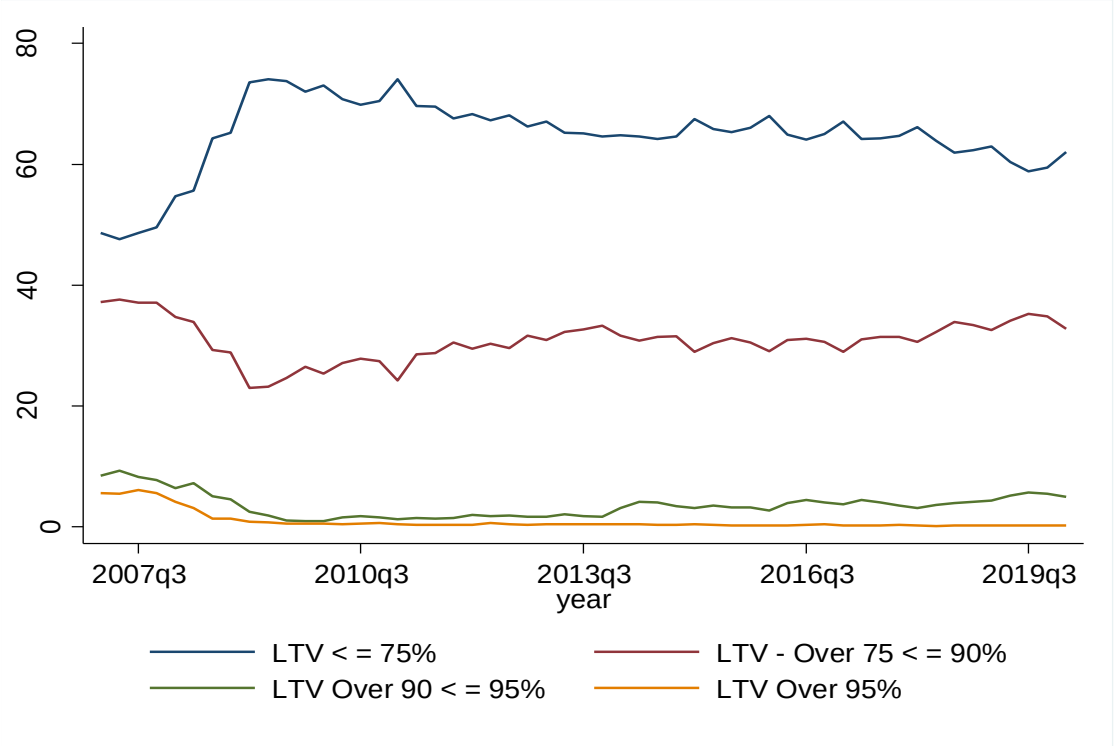
UK Finance, 2019

Data on the purposes for which residential mortgage loans are advanced in the UK is shown in Figure 5.2. There is a noticeably consistent pattern where house purchase is the dominant category with over 60% of all mortgage advances going to finance some form of house purchases. The next major purpose for which mortgages are advances in the UK is remortgaging whereby existing borrowers chose to refinance an already mortgaged property either to take advantage of more favourable deals available on the market or to release the equity accumulated in the property for other purposes. Further advances and other purposes account for a rather minute fraction of mortgage lending in the UK. Further analysis of the house purchase mortgages shows that the majority (about 30%) falls under the "other purposes" classification which essentially includes all forms of home purchases that are neither for first-time purchasers nor buy-to-let. This, generally, includes individuals moving houses or buying second homes. First-time buyer mortgages account for about 20% while BTL accounts for around 10%.

Figure 5.3 depicts data on the interest rates and loan-to-value (LTV) ratios. The most significant observation is the rise of fixed-rate mortgages. The proportion of mortgages with some form of fixed rate has climbed from 50% to 95%. This supports Scanlon & Adamczuk's (2016) observation that the majority of mortgage products now have

interest rates fixed in the short term. The term for which the initial interest rates are fixed however vary considerably and typically range from 2 to 10 years. The rise in demand for fixed-rate loans reflects borrowers' preference for some form of certainty and stability regarding monthly payments.

Figure 5.3: Interest rates and LTV



UK Finance, 2019

Following the 2008 financial crisis, higher LTV loans have generally disappeared from the UK mortgage market. Over 95% LTV loans are almost non-existent at present whilst over 90% LTV loans accounted for just about 5% of all loans by the third quarter of 2020. These reflect the tighter affordability assessment and stress test requirements introduced in the mortgage market review in 2014. The majority of mortgage loans advanced have a maximum LTV under 75% but since 2016, the percentage of loans with LTVs between 75% and 90% has seen a slight upward turn.

5.3. Macroeconomic determinants of housing finance

In this section, time-series modelling techniques are employed to investigate the impact of selected macroeconomic variables on the UK residential mortgage debt growth.

Given the overwhelming importance of housing finance in the residential property market and the far-reaching implications of household mortgage credit expansion, it is critical to understand what macroeconomic indicators drive this growth. The analysis here is committed to investigating the role and importance of macroeconomic indicators in driving growth aggregate mortgage debt expansion in the UK over the period from 1968 to 2018.

Theoretical insights from the works by Wolswijk (2006), McGreal et al., (2016); Said *et al.*, (2014) and Taltavull de La Paz et al., (2016) were used to determine the potential predictors to include. Mortgage debt growth was the dependent variable of interest and is modelled in terms of a number of predictor variables classified under property market variables; financial (monetary) variables; macroeconomic variables, demographic variables and mortgage market factors. The selected key variables include house price growth, long-term (permanent) income, GDP growth, employment, economic growth, retail price index (RPI), money supply (M4), Bank of England base rate, household preferences for homeownership (owner-occupation rate), housing supply, interest rates and LTV.

The determinants include structural factors (demographics, housing supply household preferences for homeownership and permanent incomes). These structural factors however do not change appreciably over shorter periods, but mortgage credit does show significant annual variations which are of considerable importance for policymakers in charge of active macroeconomic management when considering cooling down the housing and mortgage finance market where shorter-term growth rather than the long-term growth should be the main target variable. This section therefore empirically examines what drives annual variations in aggregate mortgage debt outstanding. The apriori expectation is that the year-on-year dynamics of mortgage debt outstanding is driven primarily by financial rather than structural variables.

5.4. A Multivariate OLS approach to modelling mortgage debt growth

The starting point of the analysis of mortgage finance determinants was a multivariate multiple linear regression model utilising a stepwise selection procedure. The backward stepwise regression technique was chosen as there was no apriori information on the precise drivers of housing finance. This approach begins the model development with all potential drivers of the dependent variable and then progressively drops predictors appearing insignificant until the model is reduced to a parsimonious one that includes only the relevant predictors of the dependent variable. The stepwise selection process eventually narrowed the dataset to 12 potential drivers: house price growth (hpxrl), real income growth (REALINC), unemployment rate (UNEMNT), GDP growth (GDP), Bank of England base rate (BOERATE), term spread of interest rates (SPREAD), retail price index (RPI), exchange rate (EXCHRT), growth in money supply (M4), growth in working population (WKPOP), and growth in owner-occupation (HOMEOWNERS). Table 5.1 presents descriptive statistics for these variables.

Table 5.1: Descriptive statistics

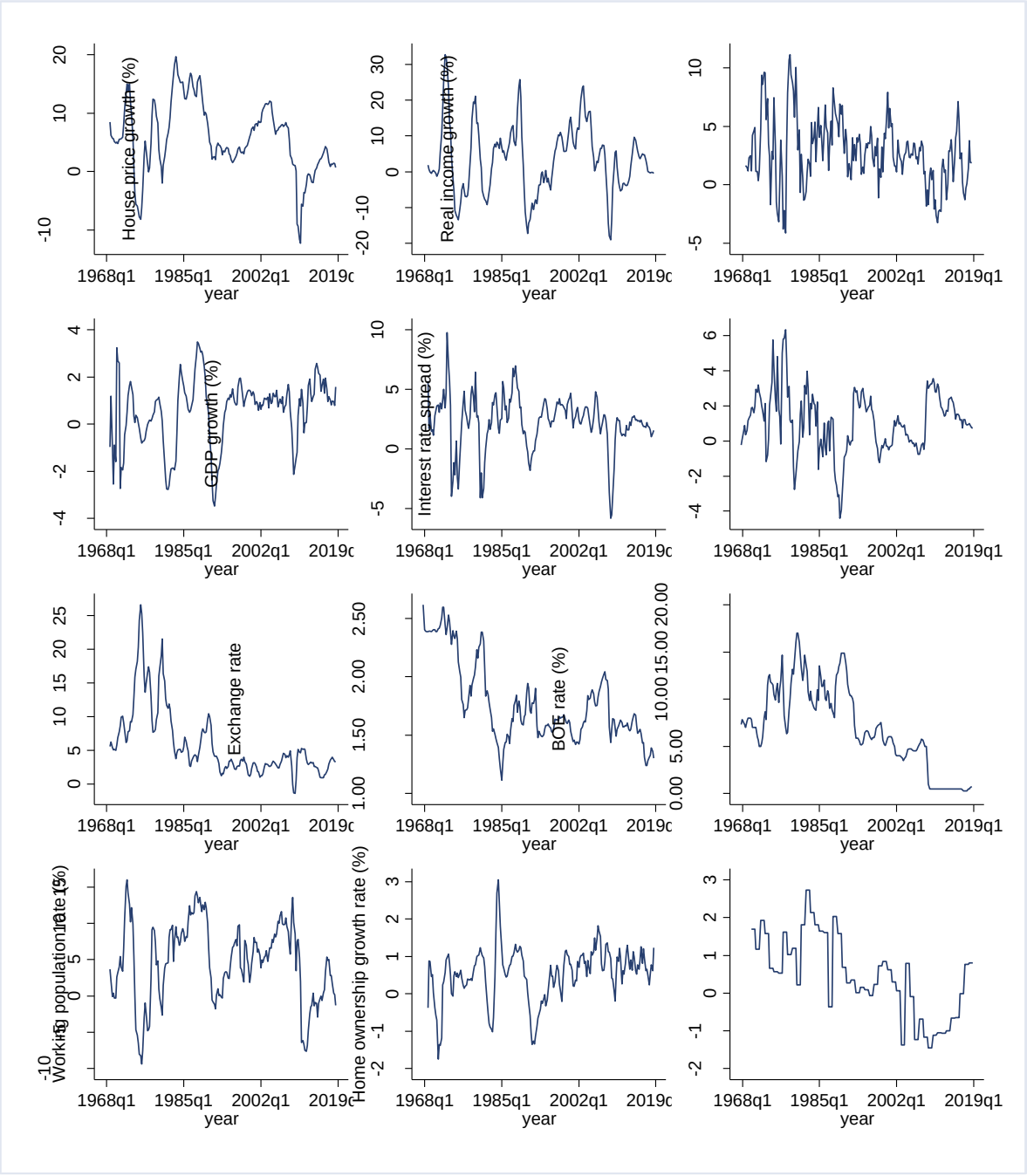
Variables	Obs	Mean	SD	Min	Max	Skew.	Kurt.
MORTGSTK	200	5.67	6.15	-12.27	19.70	-0.18	3.05
HPXRL	200	3.45	9.73	-18.97	32.68	0.35	3.23
REALINC	200	2.84	2.87	-4.13	11.12	0.29	3.33
UNEMNT	197	0.53	1.44	-3.48	3.49	-0.70	3.15
GDP	200	2.28	2.27	-5.81	9.76	-0.87	5.18
BOERATE	200	6.95	4.44	0.25	17.00	0.13	2.15
SPREAD	200	1.11	1.76	-4.41	6.33	-0.07	3.75
RPI	200	5.97	5.13	-1.38	26.57	1.77	6.04
EXCHRT	200	1.77	0.34	1.12	2.60	0.82	2.76
M4	200	4.62	5.50	-9.39	16.00	-0.37	2.58
WKPOP	200	0.54	0.72	-1.75	3.05	-0.50	4.49
HOMEOWNERS	195	0.45	1.06	-1.45	2.74	-0.03	2.17

Table 5.1 depicts descriptive statistics on outstanding residential mortgage debt along with 12 predictor variables. The unit of analysis for each of these variables was the year-on-year percentage change (growth rate) as the focus of the analysis is more on the dynamic response of housing finance to changes in the selected variables. The dataset covers a 50-year period from 1968q3 to 2018q3, thus 200 quarterly observations

are expected except where there was a variable that has missing observations for certain periods.

The data shows the mean year-on-year growth in the selected variables along with the measures of dispersion (standard deviation and range) and measures of shape (skewness and kurtosis). Over the 50-year period, from 1968q3 to 2018q3, residential mortgage debt in the UK grew by 5.6% per annum on the average with a standard deviation of 6.15 whilst house prices grew at 3.45% per annum on average with a standard deviation of 9.73 indicating growth in mortgage finance was relatively stronger and less volatile than growth in house prices. Growth in both mortgage debt and house prices were higher than growth in GDP (2.28%) and average incomes (2.84%). Over this same period, population growth was rather moderate (0.54%), as was growth in homeownership rates (0.45%). Average inflation during the same period (as measured by the consumer price inflation and retail price index) was moderate and less volatile. Figure 5.4. shows the trends in the variables.

Figure 5.4: Trends in selected variables



Growth in household mortgage credit was positive and high for most of the period considered. A significantly higher rate of growth is seen in the late 1980s and through the 1990s till a reversal occurred in 2007. Some variables exhibit similarities in their trends. To assess the relationship between them, correlations are examined in Table 5.2.

From Table 5.2, it is observed that mortgage growth has a strong positive correlation with house price growth (0.618), GDP growth (0.680), and housing completions

(0.446). There is also a moderate positive correlation between mortgage growth and growth in real incomes (0.291), working population (0.258) and homeownership growth (0.167). On the other hand, there is a negative correlation between mortgage growth and unemployment (-0.452) term spread (-0.185), rpi (-0.160), exchange rate (-0.190), the base rate (-0.070) and money supply (-0.025).

Table 5.2: Simple cross-correlations for variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
MORTGFLOW (1)	1												
HPXRL (2)	0.618	1											
REALINC (3)	0.291	0.321	1										
UNEMNT (4)	-0.452	0.594	0.246	1									
GDP (5)	0.680	0.658	0.314	0.640	1								
SPREAD (6)	-0.185	-0.354	-0.516	-0.317	-0.290	1							
RPI (7)	-0.160	-0.159	0.073	0.063	0.003	-0.542	1						
EXCHRT (8)	-0.190	-0.027	0.141	-0.084	-0.021	-0.342	0.377	1					
BOERATE (9)	-0.070	-0.038	0.484	-0.118	0.072	-0.690	0.646	0.432	1				
M4 (10)	-0.025	0.282	0.338	0.224	0.060	-0.488	0.136	0.280	0.430	1			
WKPOP (11)	0.258	0.400	0.029	0.743	0.240	-0.210	-0.051	0.062	-0.307	0.315	1		
HOMEOWNERS~T (12)	0.167	0.258	0.482	0.187	0.322	-0.604	0.327	-0.123	0.603	0.235	-0.180	1	
HCOMP (13)	0.446	0.357	0.205	0.306	0.456	-0.012	-0.177	-0.117	-0.215	-0.244	0.107	0.112	1

The standard multivariate OLS approach was used to outstanding residential mortgage debt was expressed in terms of the contemporaneous changes in the predictor variables. The results are depicted in Table 5.3 with an ANOVA table at the bottom of the table.

Table 5.3: Multivariate OLS model of mortgage finance determinants

	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
HPXRL	0.109	0.032	3.44	0.001	0.047	0.172	***
REALINC	0.041	0.098	0.42	0.678	-0.152	0.233	
UNEMNT	-1.088	0.238	-4.57	0.000	-1.558	-0.619	***
GDP	0.362	0.138	2.62	0.009	0.090	0.635	***
RPI	-0.465	0.088	-5.31	0.000	-0.637	-0.292	***
EXCHRT	-0.636	0.973	-0.65	0.514	-2.556	1.284	
BOERATE	0.369	0.106	3.49	0.001	0.160	0.578	***
M4	0.364	0.058	6.33	0.000	0.251	0.478	***
WKPOP	1.684	0.430	3.92	0.000	0.836	2.532	***
HOMEOWNERS	1.781	0.272	6.54	0.000	1.244	2.318	***
HCOMP	0.097	0.024	4.02	0.000	0.049	0.144	***
GFC	-2.149	0.852	-2.52	0.012	-3.829	-0.468	**
Mean dependent var	5.652		SD dependent var		6.223		
R-squared	0.816		Number of obs		200		
F-test	67.449		Prob > F		0.000		
Akaike crit. (AIC)	960.879		Bayesian crit. (BIC)		1003.428		

**** p<0.01, ** p<0.05, * p<0.1*

With respect to the ANOVA at the lower panel of Table 5.3 which assesses the overall fit of the model. The model has an F-test statistic of 67.45 with an associated p-value < 0.001 indicating that the overall model is statistically significant. This suggests the independent variables, taken together, reliably explain changes in outstanding residential mortgage debt. The R-squared is reasonably high (0.816) indicating the predictor variables together explain up to 81% of the variance in outstanding residential mortgage debt. This suggests a relatively impressive model especially as it is specified in percentage changes.

The p-values associated with the estimated parameters show that except for real income growth and exchange rate, all variables entered in the model significantly influence residential mortgage debt growth. The signs of the estimated coefficients associated

with the independent variables indicate that growth in outstanding residential mortgage debt has been driven positively by house price growth, GDP growth, interest rates, money supply, growth in working population, homeownership growth, and housing supply growth; and negatively by unemployment, inflation as well as the dummy variable capturing the impacts of the 2008 GFC.

5.5. A vector autoregressive model for housing finance drivers

A vector autoregression estimation approach was further employed to examine the dynamic relationship between mortgage debt growth and the identified drivers. As seen above the OLS regression is simplistic in modelling dynamic effects as it considers only the contemporaneous relationship between the variables. The model assumes mortgage debt is only influenced by the current values of the selected determinant but, as is the case with most time-series macroeconomic variables, static relationships are unrealistic. This simplification in estimation is however common in the literature as data limitations and the unknown lag structure estimates more complex models subject to criticisms of being ad hoc (Spencer & Huston, 2013).

It is nevertheless important to allow for the possibility that the variables may be jointly determined. House price growth, for instance, does influence demand for mortgages as overall growth in house prices do tend to boost the amount of housing equity against which households can borrow but at the same time increasing mortgage supply influences residential house prices. Thus, the variables do interact and influence the future paths of each other and as such, it is preferable to specify the relationship between mortgage finance and its determinants to account for this possibility of interactions and joint determination.

This is achieved by the use of a vector autoregressive estimation to examine the relationship between the key variables highlighted in the OLS model. The use of VAR estimation circumvents any arbitrary specification of a structural model (Brooks, 2014). A VAR model is a general framework to describe the dynamic interrelationship between stationary time series. It simply describes a system in which each variable is a function of its own lagged values and the lagged values of the other variable in the system. In the simplest case of a two-variable VAR model, the first equation y_t is a function of its own lag y_{t-1} and the lag of the other variable in the system x_{t-1}. In the

second equation x_t is a function of its own lag x_{t-1} and the lag of the other variable in the system y_{t-1}. Together the equations constitute the system known as a vector autoregression (VAR). In this example, since the maximum lag is of order 1, we have a VAR (1). If the variables in the VAR system are stationary I(0) variables, the system can be estimated using least squares applied to each equation.

5.5.1. Model development

The VAR specification utilized in the study to examine the relationship between mortgage debt growth and selected variables follows the approach used in previous studies such as (Brooks & Tsolacos, 1999) and allows for interactions between all the specified variables. Typically, the VAR model with *p* equations and *k* lags can be expressed as:

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \ldots + \beta_k X_{t-k} + u_t$$

where Y is the matrix (p x 1 vector) of variables that affect the mortgage debt growth including changes in house prices, disposable income, unemployment, GDP, etc., βs are the matrix of coefficients (β_0 is a p x 1 vector of constants, β_1, …, β_k are p x p matrices of coefficients on the lagged variables) in each equation, and u_t is set of mutually uncorrelated error terms.

The vector of variables in the VAR system proposed in this study is essentially the same variables used in the OLS Modelling in Section 5.4 and comprises the following variables: mortgage debt growth (MORTGSTK), house price growth (HPXRL), income growth (REALINC), unemployment rate (UNEMNT), GDP growth (GDP), retail price index (RPI), exchange rate (EXCHRT), money supply growth (M4), working population (WKPOP), homeownership rate (HOMEOWNS) and housing completions (HCOMP). The sources of the data series included the Bank of England (BOE), Office of National Statistics (ONS) and the Department for Communities and Local Government (DCLG) as previously detailed in chapters Three and Four.

A standard requirement of VAR modelling is that all variables included must be stationary in order to carry out joint significance tests on the lags of the variables. To proceed with the analysis, the stationarity of data was examined. In a stationary process,

the probability distribution of the time series variable does not change over time (Stock and Watson, 2015). Hence all the variables were subjected to augmented Dickey-Fuller (ADF) tests for stationarity.

Table 5.4: Augmented Dickey-Fuller tests for unit roots

Variable	Test statistic (Zt)	p-value for Z>(t)
MORTGSTK	-3.21	0.019*
HPXRL	-5.589	0.000*
REALINC	-4.921	0.000*
UNEMNT	-3.936	0.002*
GDP	-4.632	0.000*
RPI	-3.175	0.022*
EXCHRT	-2.148	0.226
BOERATE	-1.585	0.491
M4	-3.608	0.006*
WKPOP	-4.493	0.000*
HOMEOWNS	-2.819	0.056
HCOMP	-4.97	0.000*

** Indicates variable is stationary as test statistic is greater than 5% critical value (-2.883)*

Results from the augmented Dickey-Fuller Test suggest all variables other than exchange rate and the bank rate are stationary. There is strong evidence that the exchange rate and bank rate both contain a unit root (they are non-stationary). Therefore, the first differences of these variables are used in subsequent analysis. Homeownership growth only falls just short of statistical significance at the 5% level but is significantly stationary at 10% hence we do not subject this to first differencing. All other variables led to the rejection of the null hypothesis of unit root and hence no further differencing was required.

The next step in the VAR model development was the identification of the appropriate number of lags to include. For a VAR to be unrestricted, it is required that the same number of lags is used for all of the variables (Brooks, 2014). Stata's *varsoc* command was used to estimate the appropriate lag length and the results are shown in Table 5.5. This command estimates multiple VAR models of varying lengths and reports a table of a variety of test statistics for determining the appropriate lag length.

Table 5.5 Lag order selection criteria

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-5028.20					53.917	54.008	54.141
1	-2925.92	4204.60	169	<0.001	0.026	33.240	34.514	36.385
2	-2589.46	672.92	169	<0.001	0.004	31.449	33.90*	34.514*
3	-2442.22	294.46	169	<0.001	0.006	31.682	35.322	40.666
4	-2226.89	430.67	169	<0.001	0.004	31.186	36.010	43.091
5	-1982.04	489.70	169	<0.001	0.002	30.375	36.382	45.200
6	-1771.28	421.51	169	<0.001	0.002	29.928	37.118	47.673
7	-1539.38	463.80	169	<0.001	.001*	29.255	37.629	49.921
8	-1321.32	436.13	169	<0.001	0.002	28.73*	38.288	52.316

Endogenous: mortgstk hpxrl realinc unemnt gdp spread rpi exchrt boerate m4 wkpop homeowners hcomp
Exogenous: _cons

The appropriate lag length for a VAR must be dictated by the minimization of the value of the selected information criterion. Table 5.5 reports the Lag order selection criteria results. At each of the given lag lengths, t reports a Log-Likelihood function (LL): a Likelihood-ratio test statistic (LR) followed by the degrees of freedom (df) and associated p-value (p); and four information criteria: Akaike's final prediction error (FPE); Akaike's information criterion (AIC), Hannan and Quinn's Information criterion (HQIC), and Schwarz's Bayesian information criterion (SBIC).

The AIC criteria and FPE suggested an unusually large optimal lag length (7 and 8 respectively) while the HQIC and SBIC both suggested more parsimonious models with 2 lags. Given the large number of variables in the model, an increased number of lags poses the challenge of consuming degrees of freedom. Stock & Watson (2015) recommend that choosing the appropriate lag length of an autoregressive model should practically be guided by a balance between the marginal benefit of including more lags against the marginal cost of additional estimation uncertainty. The HQIC and SBIC criteria were therefore preferred, and 2 lags were used in the model estimation which is consistent with that used in the works of (Brooks & Tsolacos, 1999; Tsatsaronis & Zhu, 2004).

The final aspect of the data examination process was a check for structural stability which was necessitated by the fact that the dataset spans a considerable period. A Chow test was carried out to examine the existence of structural breaks in the model and 3 significant break dates were confirmed: 1991q3, 2000q4 and 2008q4. These conform to the key structural changes that impacted the housing and mortgage markets. The 1991

break for example corresponds with impacts the liberalisation and subsequent expansion of the mortgage markets in the 1980s whilst the 2008 break corresponds to the impacts of the housing market meltdown and subsequent Global Financial Crisis that ensued. White, (2015) identified structural breaks around the same period in their analysing of cyclical and structural changes in the UK housing market. The identified structural breaks were subsequently controlled for in the model by including a binary dummy variable for each break.

5.5.2. Empirical results

The VAR model was estimated with an unrestricted constant as in Brooks & Tsolacos (1999). The model diagnostics show the VAR to be reasonably well specified. The roots of the companion matrix indicate that all the eigenvalues lie inside the unit circle suggesting that there is no explosive root present, and the model satisfied stability condition. Using the Lagrange-multiplier test, there was no evidence of residual autocorrelation at the specified lag order. A summary of the estimated model results is shown in Table 5.6.

Table 5.6: Vector autoregression model summary

Sample: 1968q1 - 2018q3	No of obs	=	200
Log-likelihood = -909.572	AIC	=	20.414
FPE = 2.20e-11	HQIC	=	27.587
Det(Sigma_ml) = 2.61e-16	SBIC	=	38.123

Equation	**Parms**	**RMSE**	**R-sq**	**chi2**	**P>chi2**
MORTGSTK	65	1.089	0.980	9409.609	0.000
HPXRL	65	2.035	0.972	6665.426	0.000
REALINC	65	1.768	0.756	592.797	0.000
UNEMNT	65	0.417	0.941	3020.535	0.000
GDP	65	1.023	0.869	1269.847	0.000
RPI	65	0.803	0.985	12104.400	0.000
EXCHRT	65	0.063	0.974	7094.186	0.000
BOERATE	65	0.816	0.979	8725.533	0.000
M4	65	1.814	0.930	2532.393	0.000
WKPOP	65	0.262	0.913	2003.089	0.000
HOMEOWNERS	65	0.371	0.918	2127.590	0.000
HCOMP	65	7.203	0.646	348.990	0.000
sb4_2008q4	65	0.074	0.978	8456.456	0.000
sb3_2000q4	65	0.079	0.982	10579.450	0.000
sb1_1980q2	65	0.062	0.984	11562.880	0.000
sb2_1991q3	65	0.069	0.987	14590.830	0.000

The results of a VAR model was analysed to investigate how significant the information contained by the lagged values of the specified variables in explaining the variations in mortgage credit growth in the VAR framework. The standard approach is not to interpret individual coefficients since several lags of the variables are included in the system equations and the coefficients on individual lags may not appear significant for all lags (Brooks, 2014: Said *et al.*, 2014). In practice, F-tests is conducted for the null hypothesis that all of the lags of each specified variables variable are jointly insignificant in a given equation. This is achieved by way of Granger causality tests. The Granger causality statistic is the F-statistic that tests the hypothesis that the coefficients on all the values of one of the variables are zero (Stock & Watson, 2015). This null hypothesis implies that these regressors have no predictive power for Y_t beyond that contained in the other regressors.

Granger causality means that if X Granger causes Y, then X is a useful predictor of Y, given the other variables in the regression. Granger-causality statistics examine whether lagged values of one variable help to predict another variable. For example, if the real house price growth rate (hpxrl) does not help predict mortgage debt growth, then the coefficients on the lags of real house price growth will all be zero in the reduced-form mortgage debt equation. Table 5.7 summarizes the Granger causality results for the variables in the mortgage debt growth model, which was the equation of interest. It shows for each variable, the p-values associated with the F-statistics for testing whether the relevant coefficients on the lags of the specified variables variable are jointly insignificant in the given model.

Table 5.7: VAR Granger-Wald causality tests

Excluded variable	chi2	df	Prob
HPXRL	23.284	4	0.000
REALINC	4.449	4	0.349
UNEMNT	10.844	4	0.028
GDP	28.552	4	0.000
RPI	26.854	4	0.000
EXCHRT	32.061	4	0.000
BOERATE	51.224	4	0.000
M4	30.898	4	0.000
WKPOP	5.423	4	0.247
HOMEOWNERS	9.532	4	0.049
HCOMP	7.701	4	0.103
sb4_2008q4	35.482	4	0.000
sb3_2000q4	18.184	4	0.001
sb1_1980q2	34.844	4	0.000
sb2_1991q3	39.920	4	0.000
ALL	314.550	60	0.000

The Granger causality results in Table 5.7 support the results of the multivariate OLS model for all the variables in the model except for exchange rate and working population and housing completions where the results are conflicting. The dummy variables representing the three structural breaks identified all appear significant. Growth in real disposable incomes (REALINC), working population (WKPOP) and housing completions (HCOMP) are the only variables whose past occurrences or lagged values can be excluded from mortgaged debt growth equation. Exclusions of past values of house price growth, unemployment, GDP growth, RPI, exchange rate, interest rate, money supply and homeownership rates are not accepted in determining the present value of mortgage debt growth.

The finding that disposable income growth does not predict growth in mortgage finance, which may seem counterintuitive, is confirmed in both the OLS and VAR models. A possible reason could be that as the data set is based on actual mortgages which have been taken out and hence successful events in that respect, any variation in disposable income is not particularly relevant. A more plausible explanation for this however is that UK mortgage debt growth over the past 50 years has been more supply-driven rather than demand-pushed. This is buttressed by the fact that besides house price

growth, the variables identified as strongly significant determinants (P<0.001) such as GDP growth (GDP), exchange rate (EXCHRT), bank of England base rate (BOERATE) and money supply (M4) are all relevant to the supply of mortgage credit whereas demand-related factors like homeownership rate (HOMEOWNS) and unemployment (UNEMNT) appear only marginally significant.

5.6. Industry experts' views on the current and future direction of UK housing finance development

As detailed in Chapter Three, the study adopted a mixed-methods research approach, drawing from positivist and constructionist epistemologies. Following the explanatory sequential mixed methods research design explicated in Section 3.5, the quantitative phase of the research presented in Chapter Four and Sections 5.3-5.5 of this chapter were followed up with semi-structured interviews with selected experts in the UK housing market. The objective was to validate the findings from the quantitative analysis and check their applicability and consistency with industry practices. Moreover, there are some regulatory and political influences in the housing finance and the housing markets that could not be fully explained by purely positivist analysis. By exploiting mixed research methods and supplementing the rigorous quantitative analysis with in-depth interviews with industry experts, more insight could be gleaned into the political and regulatory context in which the housing and housing finance markets have evolved over the decades to enhance our understanding of key drivers of the changes and performance of these markets.

Consequently, after the results from the quantitative data analysis had been obtained, the researchers proceeded to design and conduct semi-structured key-informant interviews with purposively selected industry experts who had considerable experience and in-depth knowledge of the UK housing and housing finance market. Interviews with representatives of mortgage lenders, a government regulatory body that oversees the UK's financial services, academic institutions, an independent research consultancy firm, a global property services company and a leading Industry professional body (Table 5.8 for details on this). The selected interviewees from these institutions were highly ranked staff in their respective organisations who were very familiar with past and present trends in the housing market. The discussions focussed on three core areas:

the nature of UK house price determinants over time, the role of housing finance in house prices and policy and regulatory changes that have shaped the UK mortgage and housing markets. A summary of the interviews' background information is given in Table 5.8.

Table 5.8: Background information on interview participant

Interviewee profile	Nature of Institution	Experience
Senior global macroeconomist: has over 20 years of expertise in government policy analysis	A leading industry professional regulatory body	20+
Housing economist: consultant at world-leading macroeconomic consultancy	Independent research and consultancy	10+
Director of research: at a leading global property services company	Global Property Services Company	20+
Chief building society economist: and director of mortgage lending, over 30 years expertise in building society mortgage lending	Major Building Society	30+
Director of mortgage lending: Economist and director or mortgage lending, over 20 years expertise in Mortgage lending	Leading Commercial Bank	20+
Professor of Real Estate: Head at Real Estate Institute, over 30 years research experience in UK residential market analysis	Academic Institution	30+

5.6.1. The long- and short-run behaviour of UK house price determinants

The identified financial and macroeconomic drivers were largely consistent with what the experts had observed and used in their modelling of house prices although approaches to modelling house price drivers vary widely depending on the nature and purpose of the analysis for which it was conducted and the background of the analyst. Interviewees generally agreed that the variables selected in our analysis were all relevant in UK house price dynamics but an important view that has shared by most of the respondents was that the relationship between house prices and any of these variables was more complex, making a strong case for looking more at

interrelationships between the drivers which validate our use of the dynamic vector error correction and vector autoregression models to capture these complex interdependencies. On this, a senior economist with over 10 years experience in modelling and analysing the UK residential housing market remarked:

> "…*I think you got a comprehensive list of the core variables although there are some that I am not sure I would have selected as being important in UK house prices because of the approach I use. More importantly, we also find the interrelationship between variables more important. For instance, we have found in our experience that the loan-to-income ratio is a more significant driver of house prices than say interest rates"* (Senior global macroeconomist).

The significance of the interrelationships between the variables was incorporated into our analysis in the multivariate regression modelling framework in Section 5.5. Moreover, the use of systems of equations in the vector autoregression and error-correction models in Section 5.6 and Section 6.5 enables these interrelationships to be captured (Sims *et al.*, 1990).

The limitations of the positivist approach inadequately addressing all the questions posed by the study were pointed out in the interviews. A leading academic at a Real Estate Institute with considerable expertise in UK Residential Real Estate market analysis noted that:

> *"… there are some important variables that there is just no data for. One of such is rents which are important in capturing relationships between demand and supply. Unfortunately, there is no long-run series for rents that adequately reflect the market. Another component of house price values would be Land. The Land Price Index (LPI) is helpful but doesn't tell the whole story. These should be included in an ideal world, but they don't exist"* (Professor of Real Estate).

The interviewees partly support the proposition by Abraham and Hendershott who find submitted that an accurate land index, together with construction cost should sufficiently explain house prices (Abraham & Hendershott, 1992). However, virtually none of the extant studies on house prices was found to incorporate this data due to the paucity of long-term data series. Incorporating land price indices in house price models also poses additional identification problems due to the possible bi-directional causality (Jowsey, 2011).

One of the key findings from the analysis in Chapter 4 was how house price drivers have changed in recent years, shifting more in favour of the capital market quadrant as opposed to the demand and supply sides. On this, one of the experts commented that it is indeed the case that "some of the key drivers do kick in and out at different times, depending on what is going on in the economy; sometimes it is demand, sometimes supply and sometimes financial." (Professor of Real Estate). This validates the results in Section 5.2.2 which shows that house price drivers have varied over the decades based on prevailing economic conditions.

Commenting on the effects of policy and regulatory changes on housing finance, one housing economist was of the view that the changes observed may be more regulatory-driven, similarly to what has been opined in studies Thus, the drivers themselves may not have changed much but the regulatory changes may have influenced the behaviours of lenders and other market players. The housing economist opined that:

> *" ... it is similar factors driving house prices, but things happened that changed those factors: specifically, the regulatory approach towards the mortgage sector. There is more regulation post-crisis with some tightening by the FCA, with the introduction of the LTI caps. So those things might have changed it. They have had some effects on limiting the role of LTIs. LTI's have fallen and lenders themselves are more cautious. There was a big change in the availability of self-certification loans before the crisis compared to afterwards that has affected the ability for people to take out mortgages*" (Housing Economist).

A similar assertion was made in (Scanlon & Whitehead, 2011) who remarked that developments in the UK housing finance have taken place in the context of a relatively volatile housing market where market fundamentals have changed rapidly in response to economic growth and policy changes.

6.1.1. The macroeconomic drivers of mortgage finance

The macroeconomic drivers of mortgage finance were discussed in the second part of the interview. Results of the VAR modelling presented in Section 5.5 in this Chapter indicated capital-related variables, particularly money supply were the most significant drivers of UK housing finance growth in recent decades. This was discussed with interviews and their reflections were sought as to whether this had been observed in

practice. It was observed that this was largely consistent with what they would expect. A senior housing Economist at a Research & Consultancy Company stated that "…basically all of these results are intuitively consistent with what I would expect although I would have expected bigger effects in nominal income as well" (Housing Economist). Another interviewee, a chief economist and director of mortgage lending at a major building society, remarked that:

> *"…the results are not surprising, but it would be interesting to take into account the quality of lending in addition to the quantity of lending. LTIs and LTVs might control for policy changes. A good credit condition index that captures the quality of the lending would help strengthen the model"* (Chief building society economist).

Commenting on the increased role of credit availability in driving house prices, the Director of Research of a Global Property Services Company pointed out that:

> *"… the reality is you see the availability of money, lots of cheap money out there, the same as the buy to let explosions in the late 90s and early noughties, there were lots of mortgaging and re-mortgaging. I think the availability of mortgages coupled with the onset buy-to-let contributed to the pace of house price growths, much of which was fuelled by the sentiments and perceptions associated with bricks and mortar in the UK"* (Director of Research, Global Property Company).

The interviews also sought to obtain the views of the experts on how the identified drivers of housing finance have influenced the property market. There was the consensus that these drivers are expected to feed directly into house prices. According to the chief economist of a major mortgage lender, the increased availability of finance has also brought about intensified competition within the lending industry which further helped to control rate spikes and keep lenders margins down. The interviewee further explained that.

> *"… a big change from our perspective is the competition we have seen in the mortgage market which has changed the relationship between interest rates and mortgage rates. Due to intense competition in the market, not much of recent interest rate hikes could be passed on to borrowers as it tends to be competed away"* (Chief building society economist).

Previous studies by King (2012) and Gibb et al. (2016) reaffirm the role of competition in mortgage lending which is a natural consequence of the removal of previous entry constraints. It was further noted that competition in the market is driving down margins in the industry and this has made it harder for banks to expand mortgage lending especially in the light of the introduction of MMR rules discussed in Section 2.1.12. This aligns with the findings of Wilcox (2013) and White (2015) who find evidence that market activity was slightly subdued. The impacts of these on house prices cannot be assessed at the moment due to the lack of a longer dataset.

5.6.2. Regulatory policy changes in housing finance

The last part of the interviews discussed the extent to which regulatory and policy changes have contributed to the situation in the housing and housing finance market. The Help to Buy scheme was frequently cited as one that had led to increased house prices although interviewees generally lauded the positive impacts of the Scheme in helping a lot of people attain homeownership status. One interviewee noted that:

> *"… the HTB scheme has been an important part of the mortgage market is particularly boosting demand and also in terms of new construction and share of newly built properties"* (Chief building society economist).

It was further explained that the scheme had been particularly helpful in boosting demand because:

> *"… since interest rates were so low, servicing mortgages was not the problem for most people, but raising the required deposit was the main constraint. Therefore, HTB has increased activity as it makes it easier to overcome the deposit challenge. It brought in additional demand from people who would otherwise not be able to buy, but at the same time, it has also helped people who would have bought their houses regardless by getting even bigger houses than they would have gotten otherwise"* (Chief building society economist).

Another opinion among the experts was that HTB schemes distorted the fundamental forces in the mortgage market as much as has increased mortgage flows to certain types of buyers, particularly, new-build buyers and therefore increased supply of housing stock. More importantly, the argument was made as to who the real beneficiaries of the

scheme had been with developers being accused of taking advantage of the scheme to overprice newly built properties. One of the experts remarked that the "… HTB has had a positive impact on First Time Buyers, but reports indicate builders are the main beneficiaries, taking advantage of the scheme to increase their margins" (Director of mortgage lending).

The interviews also confirmed the observation from previous studies by the London School of Economics that the HTB programme led to an increase in the prices of newly built houses (Carozzi *et al.*, 2018). Reinforcing this with evidence from previous research, the director of research of a leading global property services company stated remarked:

> *"… we found from previous research that people using HTB are overpaying by around 4%. So, while it has contributed to increased prices, there is a sort of nuance as to where the impacts fall as developers are getting a premium…, but of course, just like any market intervention policy, there are always unintended consequences"* (Director of Research, Global Property Company).

This is consistent with the findings of (Carozzi *et al.*, 2018) who estimated that prices of the newly built house had increased by 3.2% and 3.9% as a direct result of the scheme. The other policy intervention in the housing finance market that was discussed with the experts included the Funding for Lending Scheme (FLS) and the Mortgage Market Review (MMR). Generally, the experts' opinion regarding the FLS was that it contributed favourably to mortgage pricing by helping lower interest rates. This view is consistent with what we identified in section 2.11.1. However, it was explained that the FLS scheme in itself did not contribute to mortgage availability but *"…the bigger effects were on mortgage pricing as opposed to availability"* (Housing Economist).

Viewing the impacts of the Mortgage Market Review, through the affordability lens, a director of mortgage Lending at a major Commercial Bank noted that

> *"… recent policy changes have made it harder for borrowers to access mortgages. It has had the effect of squeezing the market for some buyers. LTI, for example, has been capped at 4.5 times income and is not going to change anytime soon. In terms of LTV, there is some evidence banks are doing higher LTVs which means banks are*

> *willing to take on more risk to bring in more business"* (Director of mortgage lending).

One interviewee added that MMR has certainly cut the availability of lending to the low-income sector. It was reasoned that

> *(… policies appear to be conflicting as on the one hand, you have the FLS seeking to increase mortgage supply by reducing interest rates while on the other hand, the MMR has introduced tighter assessment criteria and stringent LTI and LTV requirements, thereby limiting the mortgage accessibility, particularly to the low-income sector).* (Housing Economist).

On the other hand, some experts were of the view that different policies were complementary rather than conflicting. In defence of the complementarity of these policies, a senior global macroeconomist and residential market analyst opined that:

> *"They [the MMR and FLS] targeted very different parts of the market with specific objectives. The FLS was more about mortgage pricing and the supply side whereas the mortgage market review was more of a prudential approach to preventing the kind of lending that could get borrowers in trouble such as the sort of lending that led to the problems of the GFC. So, on the one hand, you got the MPC trying to lessen monetary policy and on the other hand, was the financial policy committee trying to prevent that from doing damage in the future by protecting consumers and lenders. So essentially these policies complement each other."* (Senior global macroeconomist).

5.6.3. Future direction of the mortgage and housing market

The final part of the interview sought these stakeholders' assessment of the current and future directions of the UK housing finance market. Generally, it was perceived that house prices are high at the moment although they have not climbed up to pre-crisis levels. One interviewee noted that house prices are high because

> "... they have been driven mainly by mortgage interest rates. In addition to this, both economic and *regulatory* factors have played important roles in the sense that lenders have expanded the availability of credit in the last 30 years. One of the drivers of this I would say is changes in mortgage regulation specifically banks capital changes" (Housing Economist).

On the other hand, concerning the current state of the market and the possibility of the pre-crisis lending trends returning. A Chief Economist at a Building Society noted that the mortgage market is very subdued at the moment in terms of mortgage approvals compared to about 10 years before the financial crisis. Further to this, the current anticipation within the industry is that there is not much indication that house prices are going to go back to where it was before the crisis.

5.7. Chapter summary

The UK mortgage market has experienced significant growth and important structural changes over the 50 years between 1968 and 2018. The chapter first investigated the drivers of these changes by examining selected macroeconomic, financial and housing market variables. An overview of recent trends in the mortgage market was presented and the drivers were first examined using a multivariate OLS model before a more robust VAR estimation was undertaken. The OLS model indicated that growth in outstanding residential mortgage debt has been driven positively by house price growth, GDP growth, interest rates, money supply, growth in working population, homeownership growth, and housing supply growth; and negatively by unemployment, inflation as well as the dummy variable capturing the impacts of the 2008 GFC. It is found that macroeconomic variables associated with the supply side of the mortgage market are more significant drivers of the expansion in mortgage credit than demand-side variables. A VAR model and Granger causality test generally support the OLS results and confirm a dynamic interdependence between mortgage debt growth and the selected variable.

In the second part of the chapter, findings from in-depth interviews conducted with industry experts on the research outputs, current conditions and future directions of the mortgage and housing markets were presented. The interviews provided another perspective of insights into the past and recent trends in the UK housing and mortgage markets. First, much of the insights gleaned from talking to the experts substantiate the findings regarding the drivers of house prices and mortgage finance. In sum, it is gathered that much of the increase in house prices in the 1990s and early 2000s was driven by the availability of cheap mortgage finance, aided by favourable macroeconomic indicators and more importantly by regulatory policy changes.

Following the 2008 global financial crisis, however, the housing finance landscape has been dampened. Different policies were initiated to reinvigorate the market, but the impacts have been mixed. As it is unlikely for the trends experienced in the build-up to the 2008 crisis to recur amid tighter prudential oversights introduced in the mortgage market review, the housing finance market could be expected to operate reasonably well to support the housing market.

Unquestionably, the global macroeconomic landscape has seen the cataclysmic impacts of the Covid-19 pandemic distressing all nations of the world over the last year and with no signs of immediate reversal. The impacts of the pandemic and particularly of the national "lockdowns" on businesses, households and the government have been tragic, and the housing and mortgage market has been impacted. In particular, lenders have assumed a precautionary approach following the pandemic, limiting the availability of high LTV loans. The government in an attempt to stimulate housing demand and bolster the mortgage lenders' continual support for the housing market introduced new mortgage guarantee scheme in its 2020 budget.

Unlike the HTB, the scheme would support both new build and existing properties and would ensure prospective homebuyers can access mortgage loans for the purchase of properties worth up to £600,000 with as little as 5% deposit with the government guaranteeing to compensate lenders of losses they might in the event of repossession of these mortgages. While the scheme is expected to impact positively on the market by helping credible borrowers who would otherwise find it a challenge to save the needed deposit, its impacts would still be limited due to the stringent affordability and stress test requirements imposed by the mortgage market review. With the prevailing LTI caps, however, the scheme may only favour high-income earners or joint purchasers who would pass the affordability and stress tests requirements in light of the current house prices.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1. Introduction

The 2007/2008 financial crisis made evident the potentially devastating impacts and financial stability implications of house-price bubbles. A key reason for this manifestation was the substantial reliance of the housing market on debt finance (the residential mortgage market). Whereas availability and access to affordable long-term borrowed funds are indispensable to the efficient functioning of the housing market, increased availability of housing finance comes with a heightened probability of precarious house-price boom eventually resulting in a bust which can substantially damage national economic and financial stability.

Notwithstanding, the link between house-price booms and housing finance is not entirely understood with uncertainty still surrounding the future direction of house prices, mortgage availability, investment in new housing and the impact of the series of policies introduced by the government and by regulators. Given the recognized importance of housing finance, the crucial role it plays in the housing market and the potentially catastrophic impacts of unregulated housing credit expansion, understanding the factors which drive housing finance growth and their impacts on

house prices are critical in the articulation of policy measures and strategies for managing the macroeconomy to support a sustainable housing finance market

This study sought to contribute to and extend current knowledge on housing prices and housing finance in two main dimensions. First, it empirically assessed the relationship between house prices and housing finance using data from the United Kingdom over a 50-year period between 1968 and 2018 and explored the key drivers of both house-price growth and mortgage credit expansion and the extent to which they are interlinked and influenced by macroeconomic indicators. Second, the study examined the role of macroeconomic indicators and regulatory policy changes in the expansion of the residential mortgage market seen within the last 5 decades. To achieve these aims, defined research objectives needed to be pursued. The objectives of the study as stated in the first chapter were:

i. To examine the performance of the UK housing market between 1968 and 2018 and establish the key drivers.
ii. To assess how the drivers of UK house prices have evolved in the light of the changing economic, financial and regulatory landscape.
iii. To assess the interlinkages between house price growth and developments in housing finance and the extent to which mortgage credit expansion has contributed to the performance of the UK housing market.
iv. To analyse and identify the key macroeconomic variables associated with the growth of the UK mortgage market.
v. To evaluate the major policy and regulatory changes in UK housing finance and their impacts on present and future trends in the housing market.

Having provided the background, motivation and objectives of the research in Chapter One, Chapter Two provides the conceptual underpinnings for addressing the first four research objectives relating to the drivers of the residential property market and housing finance. It also considered the role of macroeconomic indicators and the influence of government policy and regulations on the housing and property finance markets which provide expressly relates to research Objective 5. Chapter Three established the methodological framework for the study, setting and justifying the philosophical and

epistemological positions of the study. The results of the empirical works were presented in Chapters Four and Five. The subsequent sections of this chapter shall summarise and evaluate the analyses conducted and principal findings presented in the previous chapters, provide answers to the research questions, concluding remarks and recommendations and directions for future research.

6.2. Summary of findings and conclusions

The section presents a summary of the principal findings of the study and provides conclusions to the research objectives, drawing from the results of the empirical analysis presented in earlier chapters. The two main dimensions of the study, i.e. "the determinants and interlinkages between house prices and housing finance" and "the role of macroeconomic and regulatory policy on housing finance" are addressed.

6.2.1. Macroeconomic determinants of housing price performance and interlinkages between UK house price movements and housing finance

The pursuit of the first research objective relating to the performance of the UK housing market over the last 50 years and the key drivers thereof began with a review of related literature Chapter 2. To understand the drivers of performance in the property market, it was imperative to first deconstruct the property market's structure. Drivers of performance in the property (asset) market come from both the demand side (space market drivers) and capital side (financial drivers), both of which are highly influenced by government regulatory policies, be they specifically targeted at these markets or affecting the general macroeconomy.

The study identified both long-run and short-run drivers of UK house prices from the analysis of the quarterly datasets from 1988 to 2018 using a series of multivariate regression model specifications. The base model suggested up to 97.4% of the variations in house prices is adequately accounted for by the explanatory variables in the model. The identified key drivers of UK house prices in the long-term were government expenditure, money supply in the economy, disposable incomes, size of the working population and mortgage credit supply which tend to drive house prices

upwards in the long run. On the other hand, housing supply, the term structure of interest rates (future interest rate expectations), unemployment and mortgage interest rates tend to drive house prices down in the long run.

Interestingly, the model showed a combination of these factors had been predominantly remarkable in shaping trends in house prices in the last two decades. Of particular prominence were the historically low interest rates, increased mortgage availability and stagnating housing supply. These findings are robust across a range of alternative model specifications including logarithmic specifications and the inclusion of leads and lags. It is important to note that the research did not find any evidence in support of several variables which some previous studies suggest may affect real house prices including inflation, exchange rate, GDP and savings. Other researchers might have found these significant at certain periods, but over the long term, the analysis presented shows no evidence that their impacts are significant.

In pursuit of research objective three, further analysis of the drivers of house prices over the decades showed that some variables have played a more consistent role in house price determination over the decades, other variables have diminished in their relevance, and yet other variables have more recently become more important in the house price determination. For instance, key house prices drivers in the 1970s included the size of the working population, disposable incomes, money supply and housing supply. In the 1980s, money supply and housing supply were not significant in house-price determination. Mortgage supply becomes a significant driver of house prices from the 1980s coinciding with the liberalisation and expansion of the mortgage market and the removal of mortgage market constraints. From this point onwards mortgage supply remains one of the significant drivers of house prices in every decade. The research also found the term spread of interest rates was more significant in the 1990s and 2000s whilst construction cost was only significant in the 1990s.

Taking the 2008 Global Financial Crisis as a reference point as it designates an important turning point in the housing and housing finance markets and was the precursor of several policy and regulatory changes later introduced, we examined and compared the past drivers (pre-crisis) and the recent drivers (post-crisis). The research found housing supply constraints, increased money supply, higher mortgage flows, favourable exchange rates and increased government expenditure as the main drivers

of house prices before the crisis. These have, however, changed substantially in recent years. Results from the data analysed suggested that exchange rate, housing supply, construction cost, government expenditure and disposable incomes are no longer significant house price drivers. Money supply, mortgage flow and the term spread of interest rates were identified as the only significant positive determinants of house prices both before and after 2008 while unemployment and mortgage interest rate appeared as new drivers. Excepting unemployment, it is submitted that the constant and more recent house price determinants tend to be more on the capital market side as opposed to the traditional demand and supply-side variables which used to be the key property price drivers.

The study further examined the short-run (quarterly changes) dynamics between residential house prices and the fundamental drivers using the vector error correction model (VCM) which confirmed a strong causal effect on house prices from the fundamental drivers in both the long and short-term. This analysis further established an important role for interest rates, mortgages flow and money supply as the statistically significant drivers of the quarterly changes in UK house prices. Other factors such as unemployment, construction cost, disposable incomes and the term structure of interest rates, although significant in the long run, were not found to be significant in the short-run dynamics.

The implication from the findings stresses the significant role played by liquidity, in general, and housing credit, in particular, in shaping UK house prices over the last 50 years and provides the answer to our second research objective three relating to "…the interlinkages between house price growth and housing finance and the extent to which mortgage credit expansion has contributed to the performance of the UK housing market." An important observation from the discussions to this point that that liquidity has been the most dominant driver of UK house prices over the 50 years from 1968 to 2018. Mortgage flows to the residential housing sector, mortgage interest rates and money supply in the wider economy are significant drivers of house prices in both the long and short term with particularly stronger effects in short-run price house price dynamics. In the 1990s and early 2000s that saw a rapid and consistent rise in property prices, mortgage credit had been: (i) readily available due to liberalisation of the financial and mortgage markets and increased money supply; (ii) inexpensive due to

historically low interest rates; and (ii) affordable in the light of higher incomes and favourable macroeconomic indicators. It is thus unsurprising that following the financial liberalisation and removal of mortgage market constraints in the 1980s, the UK experienced the strongest house price growth. This, coupled with the consistent fall in interest rates from the early 1990s, explains the large increases in house prices that followed up until the onset of the 2007/2008 financial crises.

6.2.2. Influence of macroeconomic indicators on housing finance

Pursuant to research objective four, the study proceeded to ascertain what had been the key driving factors behind the expansion in housing finance seen in the decades leading up to the 2008 financial crisis and the trends afterwards. The role of macroeconomic factors, as well as the regulatory and policy, were considered to establish the effects on housing finance and, hence, the housing market.

Drawing on theoretical insights, quarterly time-series data on potential macroeconomic variables correlating with housing finance growth were carefully collected and subjected to statistical and econometric modelling. Results from the OLS regression model identified house price growth, GDP growth, interest rates, money supply, the size of the working population, homeownership rate, housing supply, unemployment and inflation as the key macroeconomic determinants of UK residential mortgage debt growth over the past 50 years. The model also highlighted that the 2008 Global Financial Crisis had negatively impacted the mortgage market by way of a significant coefficient of the dummy variable capturing the impacts of the crisis.

To reinforce these results and deal with the problems of autocorrelation within the predictor variables and bidirectional causality between mortgage flow and the identified drivers, a more robust vector autoregression (VAR) model capable of depicting the dynamic relationship and interactions between mortgage finance growth and these determinants was developed. This allowed both the contemporaneous and lagged impacts of the variables to be captured in a system that depicts the dynamic relationship between the macroeconomic variables and mortgage finance. The VAR model was estimated, and the Granger-Wald causality test was used to assess the results. Findings indicated that macroeconomic variables associated with the supply side of the mortgage market are more significant drivers of the expansion in mortgage credit than demand-

side variables. In particular, exchange rate, the Bank of England base rate and money supply in the economy significantly explain the growth in mortgage debt over the period considered as opposed to demand-side variables such as household disposable incomes and the size of the working population. Granger causality test and impulse functions show mortgage debt growth responds to changes in these macroeconomic drivers.

6.2.3. Impacts of regulatory policy changes on housing finance

The fifth research objective of the study was to evaluate the major policy and regulatory changes in UK housing finance and their impacts on present and future trends in the housing market. This was addressed in Chapter 2 where the major policies and regulatory changes were identified and assessed. While the introduction of these policies could be captured by way of dummy variables in the empirical models, their exact impacts and implications could only fully be appreciated from a qualitative perspective hence the use of semi-structured interviews with experts in the housing market was adopted to discuss these further.

The onset of the crisis in 2008 following the failure and subsequent nationalisation of Northern Rock was the key turning point as the UK financial industry underwent significant distress in 2008 and 2009 with a series of mergers and government takeovers which limited the sources of funds to lenders and dwindling their capacity to operate. This precipitated a series of government policies to be introduced. The Funding Lending Scheme (FLS) was introduced in 2012 aimed at boosting lenders capacity to lend by permitting them to borrow treasury funds at a below-market rate with an even lower rate for banks that increased their lending. The scheme impacted banks' overall costs and reduced the cost of loans to consumers.

The implementation of the Mortgage Market Review (MMR) rules also led to a decline in the amount of high LTV loans available on the market. With interest rates are at historically low levels, the MMR is expected to have a stronger effect on the housing market in the future when interest rates rise and affordability is stressed. On the other hand, the government's Help-to-Buy Schemes helped overcome the difficulties faced by potential borrowers with limited down-payments and are confronted with significant credit constraints. Evidence, also suggest that the programme led to a substantial increase in new-built house prices, especially in supply-constrained regions**.** Even in

the light of the HTB interventions, the FCA notes that access to mortgages is still limited due to issues with credit quality reflecting the consequences of the Mortgage Market Review.

It is a generally held belief among experts and stakeholders in the housing market that new regulatory changes have supported the mortgage market since the 2008 crisis, helped the market's recovery and continue to provide support to the housing market. While the government has touted these policies as a huge success, the exact magnitude of their impacts remain unclear due to the limited period of their implementation, Concerns however exist within the industry on possible unintended consequences such as the HTB disproportionately favouring developers and landowners and not the intended credit-constrained population.

6.3. Recommendations

The study finds that a combination of factors has been spectacular in shaping trends in house prices over the past five decades, particularly, historically low interest rates, increased mortgage availability and stagnating housing supply. This suggests that multilayers of factors impact house prices and dynamic modelling parameters are imperative now and into the future.

The study also found that house price determinants change in importance and, sometimes, in direction of their effect over time depending on the prevailing macroeconomic situation. The most significant house price determinants currently tend to be more on the capital market side as opposed to the demand and supply-side drivers. This implies that policymakers and regulators ought to monitor housing market trends and underlying drivers within the context of prevailing wider economic conditions. It is also important that established housing market determinants and relationships are examined carefully and constantly assessed with new data to understand their relevance to the housing market. House price models and selected determinants should be based on structured market research to identify contemporary factors and relevant conditions influencing the price dynamics.

Similarly, short term volatility in quarterly house prices is driven primarily by changes in interest rates, mortgages flow and liquidity. These findings underscore the significant

role played by the capital market in general and housing finance in particular in shaping UK house prices. Financial liquidity has been the single most dominant driver of UK house prices over the last five decades. Mortgage flows to the residential housing sector, mortgage interest rates and money supply in the wider economy are significant drivers of house prices in both the long and short term with particularly stronger effects in short-run price house price dynamics. The findings suggest that post-gfc macro-prudential and regulatory tightening in the mortgage market in the form of stricter lending requirements and affordability assessments could be expected to have significant repressive effects on the future direction of house price growth. These must be monitored carefully and with the development of new data, examined to understand the implications for future house-price directions. It is also important to observe the effects on intergenerational equity and wealth distribution as younger households tend to face more constraints in accessing credit due to limited savings and shorter periods of employment.

In acknowledging the strong role played by mortgage finance in UK house price dynamics and its contribution to house prices growth, the underlying drivers of the substantial mortgage finance expansion have been examined. The evidence points in the direction of favourable macroeconomic indicators as well as regulatory changes over the last three decades. Government has an important role in managing the identified indicators to support the operation of a vibrant and efficient housing finance market.

Regulatory changes have played an important role in shaping the UK housing and mortgage markets and recent policies have helped the market's recovery after the crisis and continue to provide support to the housing market. Concerns however exist on possible unintended impacts such as the HTB schemes unduly favouring developers and lenders not passing rate savings from the FLS unto consumers. These are issues that should be monitored and examined to assess their implications and understand how policymakers could develop future policy interventions to positively influence developments within the housing finance market with minimum distortion.

6.4. Implications for further research

Research is a cyclical process; a successful research journey begins with what is known, sheds light on what was previously unknown as the research questions are answered and may yet finish by raising more questions. This study has provided new insights into house price determinants and shed more light on the important role played by housing finance in price dynamics. Insights from the study and the limitations encountered in the process of writing the thesis point to several directions for further research which are presented below.

First, the study adopted a longitudinal approach, using predominantly time-series data, and focussing primarily on trends within the UK over time which is useful in understanding how the internal dynamics of the UK housing market has evolved and developed. This could be complemented by a similar study that takes a cross-sectional approach, extending the analysis to include other countries. It would be interesting to extend and/or replicate the analysis in other countries with similar or remarkably different institutional and economic environments to see if consistent trends exist. Alternatively, a panel study of several countries over a defined period could yield useful insights and enable international comparability. Another area in which the scope and generalizability of findings could be enhanced would be carrying out a similar analysis within the context of emerging and rapidly developing economies currently undergoing financialization.

Further to this, the study approached the research questions at the macro level with a national perspective. However, it is admitted that important variations exist across the various regions in the United Kingdom. A valuable continuation of the line of research started in this study would be a micro-level analysis, focussing on regional dynamics or looking at trends within specific cities for which there is sufficient data, particularly cities regarded as international financial capitals where financial inflows tend to be paramount. It would be expected that the impact of financial variables on house prices will be even more pronounced in such cities than has been found in the national context.

It would also be of added value to expressly account for the quality of mortgage lending in house price models from the point of view of the cyclicality in the housing market. Due to the length of the period covered by the thesis, no data or indicators could be

found. To go beyond the volume of lending and consider lending quality, future research may look at the defined periods with remarkable house price growth, for instance, the early late 1990s to early 2000s and investigate how lending quality changed. Possible indicators that may be used in deriving an index of lending quality could include changing trends in LTV, mortgage risk pricing and trends in securitised and non-securitised mortgages.

Yet another interesting way in which the study could be extended would be considering and integrating the dynamics of the rental housing market into the analysis. The buy-to-let mortgage has proven to be an important component of the UK mortgage market since its introduction in 1996 and has led to expansion in the rental sector which caters for the housing needs of credit-constrained households. Further research could examine the specific ways in which BTL mortgage have impacted the rental market conditions and how leverage with BTL mortgage loans impact rental yields.

On the supply side, further research is needed to understand and quantify the impact of recent policy and regulatory changes on the new housing supply as more data becomes available. For instance, HTB schemes are thought to have been rather attractive to housing developers yet its impact on new housing supply across the range of housing types is still unknown.

Finally, as the study has shown house prices increased in response to increased lending, there are potential intergenerational equity and wealth distribution implications across different age groups. Younger households tend to be more credit constrained than older households because of the shorter period of employment and difficulty in raising a deposit. Hence, generally, older households are more on the ownership aide whilst younger households tend to rent. The intergenerational wealth redistribution of credit-induced house price booms, therefore, warrants investigation as younger households' consumption could potentially decrease whilst older households' savings increase.

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APPENDICES

Appendix 1 – Sample Semi-Structured Interview Questionnaire

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Guide for Semi-Structured Interviews

Questionnaire for Experts and Stakeholder in the UK Housing and Mortgage Market

Macroeconomic Determinants of Housing Finance and the Impact on House Prices in the United Kingdom

Introductory questions

1. Can you briefly introduce yourself, your organisation and its connection to the UK housing and/or mortgage market?

The long-run behaviour of house price determinants

2. Considering the increases and volatility in house prices in recent years, what is your view on the long run behaviour of house price drivers: are they persistent or have changed over time?
3. If the drivers have changed, what would you consider as the old and new drivers?
4. What are some of the sources of changes in the long-run behaviour of property market drivers?
5. Have house price drivers after the GFC been different from the pre-GFC drivers?

Role of property finance in the performance of the housing market

6. How important is property finance (residential mortgages) in the performance of the UK housing market? Does this important vary from the short- to long-run?
7. Relative to other drivers (e.g. demographics, disposable incomes, etc) where would you place developments in mortgage finance in the dynamics experienced in the UK housing market in recent years?
8. What would you consider as the key drivers of housing finance in the UK: Could you rank these (factors) in order of importance?

Policy and regulatory changes in UK housing finance and the implications for the housing market

9. Are there any regulatory changes you can recall that have contributed to the relevance of mortgage finance in the UK property market?
10. Do you think that in the making of macroeconomic and Monetary policy in the UK explicit consideration is given to the housing market effects (direct and indirect)?
11. What monetary policy instruments are targeted at the housing market and how effective are the use of monetary policy tools to influence the housing market?
12. Has the importance of mortgage finance in the housing market changed significantly after the GFC?

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BIRMINGHAM CITY University
Bismark Aha, bismark.aha@mail.bcu.c.uk
School of Engineering and Built Environment

13. To what extent has the regulation of the mortgage market following the GFC affected supply of housing finance and has this had any impacts on house price growth?
14. What does the future of the UK mortgage market look like in your professional opinion?
15. What key principles should policymakers and regulators keep in mind when making policies targeted as the mortgage and housing markets?

Appendix 2 –Thesis related publications

UNITED KINGDOM GENERAL ELECTIONS AND THE IMPACT ON HOUSE PRICES

Bismark Aha*, David M. Higgins and Timothy Lee

Appears as:

Aha, B., Higgins D, M. & Lee *UK Political Cycle and the Effect on National House Prices*. Paper Presented at the 2018 European Real Estate Society's Annual Conference in Reading.

Final version published as:
Aha, B., Higgins, D., & Lee, T. (2022). United Kingdom general elections and the impact on house prices. *International Journal of Housing Markets and Analysis*.

ABSTRACT

Over the last two decades, many developed countries have experienced notable changes in house prices. This explanatory study considers if house price movements in the UK can be linked to the political cycle as governments realize homeowners represent a large portion of the voter base and their voting decisions could be influenced by the magnitude and direction of house price changes. Specifically, the paper investigates whether house prices behave differently before and after elections and under different political regimes. To examine this relationship, the study analyzed quarterly UK national house price data since 1960, along with data on the results of UK parliamentary elections over the same period. It was observed that, over this period, real annual UK house prices increased by an average of 2.84%. While we found no evidence that house prices in the UK performed significantly differently under different political parties, we observed that house prices performed much better in the last year before an election, compared to the first year after an election. On average house prices increased by 5.3% per annum in the last year before an election compared to 1.3% per annum in the first year following an election. The study, thus, highlights significant variations in the performance of UK house prices around election times. It is imperative, therefore, that the political cycle is given adequate consideration when making residential property investment decisions.

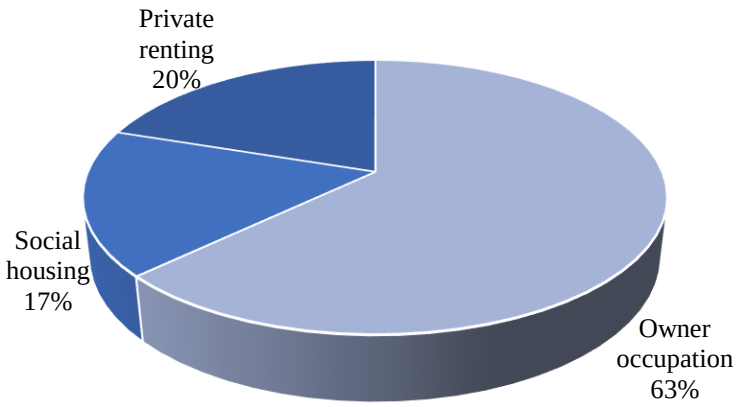
Keywords: *Housing markets, residential house prices, political business cycle, government policies, homeownership characteristics, United Kingdom*

1. INTRODUCTION

Housing is a vital and unique asset class with investment, asset and consumption dimensions. The housing sector is also a very integral and sensitive part of the national and global macroeconomies (Baffoe-Bonnie, 1998; Levitin & Wachter, 2013; Pintér, 2019). It is a key component of social wellbeing in providing shelter and as a source of economic activity with new residential supply and ongoing housing alternations and maintenance requirements. Importantly, for most individuals and families in the UK, housing represents their main investment. Therefore, a vibrant and sound housing market is an important component of the UK's prosperity and, as such, prospective governments controlling the various aspects of housing is a core long-term government mandate. Consequently, the type and timing of policies across various levels of government – local, regional and central – can have far-reaching effects on house prices.

House price movements create a lot of interest and media coverage in the UK, in part, this is due to the residential ownership profile, see Figure 1.

Figure 5: **UK Home Ownership Profile**



Source: Department for Communities and Local Government 2016

Figure 1 shows the extent of private homeownership across the UK. There are approximately 28 million residential properties of which 63% are owner-occupied with the owners either owning outright or are paying off a mortgage on the property (ONS, 2016).

Although neo-classical economic theory suggests that house prices are determined by supply and demand forces, the housing market also operates within a dynamic open system, indicating that factors external to the housing system can impact house prices. As housing is important to social wellbeing, governments often feel the need to regulate the housing market and since homeowners represent a large percentage of the voter base, housing-related policies implemented close to an election may influence their voting behaviour.

A growing body of literature finds evidence to the effect that governments sometimes attempt to manage the economy in line with their political motives by the use of both fiscal and monetary policy (see for example Brander and Drazen 2005, Heckelman and Wood 2005, Wood and Stockhammer 2020). As monetary and fiscal policies are of fundamental importance to the housing and housing finance market, the impact and consequences of politically-motivated decisions on the housing market can be considerable yet because of the complexities of housing systems, not all eventualities are predictable or taken into account. If a link between house prices and the political cycle could be defined, research on residential house price dynamics and property cycles may be enriched by taking into account political variables.

The purpose of this research, therefore, is to investigate the relationship between UK housing market performance and political climate. This is achieved by examining real price movements over a defined period for the UK residential housing market. For this research, we utilised a long-run series of house price data with coverage from 1960 to 2017. We examined house price movements before and after all elections held within this period and compared the performances thereof to the long-term real average returns.

The intent of this research is not to recommend particular political parties in any way but to highlight a unique approach for examining the impact of the political and voting cycles on residential property performance. Moreover, it is not within the scope of the present research to examine specific political factors which impacted house price movements during the political regimes examined.

The remainder of the paper is structured as follows: following this introduction, we provide an overview of the current literature relating to the housing market and political cycles in Section Two. Section Three details our data sources and research methodology. We present our empirical analysis, findings and implications in Section Five. Conclusions and suggested recommendations and contained in section Six.

2. LITERATURE REVIEW

A vast amount of literature exists attempting to model national and regional house price movements. Single country time series, as well as multi-country studies, abound explaining house price movements. Among the leading research looking at the UK Housing Market are the works of Meen (2001), Muellbauer and Murphy (1997), Taltavull de la Paz and White (2012), White (2015), and Whitehead and Williams (2011). The basic neoclassical theory of house price determination is that house prices are determined by supply and demand functions, and a dynamic price adjustment process in which a price mechanism operates to bring supply and demand into balance (Muellbauer, 2012). Many studies have therefore modelled house prices along demand and supply analysis and have linked price movements to a host of demographic, macroeconomic, financial, fiscal and regulatory policy variables.

In the long term, demand for housing is driven by such factors as growth in household disposable income, shifts in demographics, including population size and structure, family size and composition, migration, housing taxation, average levels of interest rates, etc. (Al-Masum and Lee, 2019, Meen, 2012; Tsatsaronis & Zhu, 2004). Similarly, the supply of residential housing is driven in the long term by availability and cost of land, cost of construction, new housing investments and improvements in the quality of existing housing stock. On the other hand, housing markets are intrinsically local and

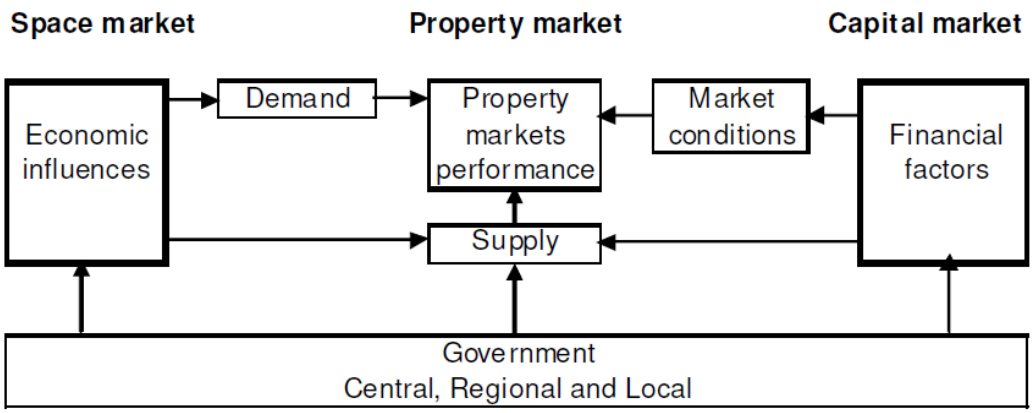
as such growth in housing stock and house prices can be constrained in the short run by factors such as length of planning and construction phases, the inertia of the existing planning schemes, etc. It is important to note that almost the entire literature on house price determination agree as to the imperfection and inefficiency of the housing market and as such systemic mispricing can persist (Muellbauer 2012).

Economic thinking has progressed over time and new ways of conceptualising the theory and practice of managing market economies have evolved. Authors such as Marx (1867), Keynes (1936) and Friedman (1962) made immense contributions with the introduction of new theories that shaped economic policies in many jurisdictions. Keynes (1936), in particular, advanced the use of all available powers at the disposal of governments to influence aggregated demand. Importantly, governments have at their disposal fiscal, regulatory and monetary powers including changes in taxation, public expenditure, planning policies and regulating money supply in the economy.

Neo-classical economic analysis of the housing market links the housing market to the macroeconomy mainly via changes in interest rates and availability of credit to households. However, as monetary and fiscal policies are of fundamental significance to the housing and housing finance market, the impact and consequences of politically-motivated decisions on the housing market can be considerable (King, 2009).

As Higgins and Reddy (2013) illustrated, the extent to which government policies do impact the housing market can be examined by considering the structure of the property market, using the three-market model of the property market proposed by Ling & Archer, (2012). This simplified model is shown in Figure 2.

Figure 6 **Property Market Structure Model**



Adapted: Ling & Archer 2012

Figure 2 indicates that the performance of the real estate market is influenced by a host of forces impacting the space, capital and property market. Within this framework, it can easily be appreciated that several policy-influenced decisions may impact house prices. Many key government policies that may influence UK house prices, for example, population policies such as migration quotas and first-time buyer incentives could be used to boost demand in the space market. Relevant policies in the capital market include base rates and reserve requirements, changes in property taxation such as stamp duty and regulations that impact alternative investment assets. Finally, in the property market, government policies such as rent controls, planning and land-use restrictions and changes in building regulations can constrain housing supply and thereby affect prices.

Government policy, therefore, has an important role to play in house price determination as it has both direct and indirect influences on housing demand and supply variables. If the supply of housing is constrained or demand stimulated by government policy, then all things being equal, prices will rise, and vice versa (Adams et al 2005, Wouter van Gent and Hochstenbach 2020). In the United Kingdom, it is often argued that complex and inefficient zoning regulations and a slow authorisation process are among the reasons for the stiffness of housing supply, contributing to both the rise of house prices and their high variability (Girouard et al., 2006).

In providing the tools to manage the economy, government actions may be politically motivated to enhance its chances of (re)election. Nordhuas (1975) introduced this in his *Political Business Cycle* theory which argues that governments could, by their use of these economic management strategies, manipulate the economy for electoral gains." These have been identified in three key areas:

i) Macroeconomic outcomes: economic growth, lower inflation and lower unemployment etc.
ii) Beneficial rewards: voter tax breaks etc.
iii) Monetary policy: money supply and interest rates (in some countries interest rates are set independently by an appointed organisation, for example, Bank of England).

Source: Ladewig 2008

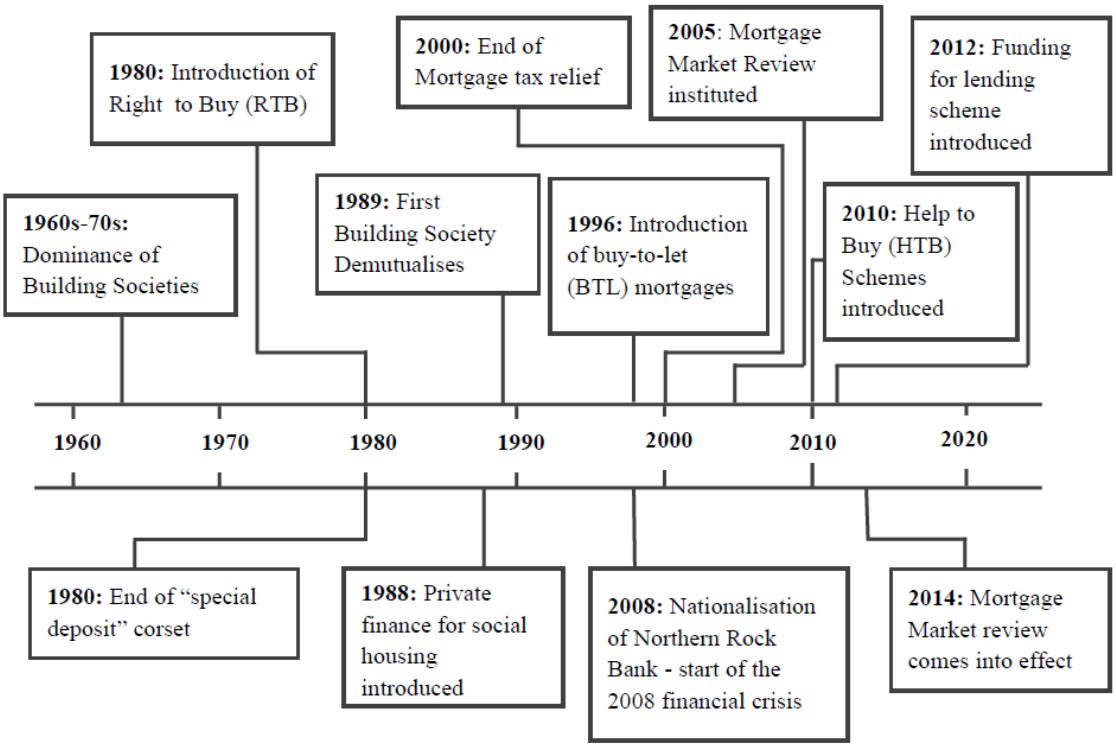
A common criticism of the literature analysing government strategies and the political business cycle is that of weak conceptual and empirical underpinning (Aidt et al 2019, Drazen 2000 and Keech 1995). Contrary to these debates, studies in the US have found a link between the political business cycle and investment assets. The political business cycle has been linked to the performance of the assets in the equity and bond markets with particular regards to which political parties were in power. Existing studies however provide inconclusive evidence as to which political party provided better returns overall (Ramchander *et al* 2009, Santa Clara and Valkanov 2003).

In relation to the Housing market, Berry and Dalton (2004) noted the role of past and present government social and housing policies in continuing to fuel belief in the security of homeownership (bricks-and-mortar) as an investment asset class. The impacts of these government policy interventions on the housing market are persistent long-lasting implications on a range of housing market outcomes and with a range of effects, some unanticipated and some conflicting.

Furthermore, Ansell (2019) detailed how housing wealth has an increasing role in shaping individuals contemporary political preferences. Patterns of variation are evident in welfare spending, community identity and voter preferences being increasingly dependent on house values.

In recognising that housing provision cannot be safely left to market forces, successive governments have over the years found it expedient to exercise some form of regulatory control in the housing market particularly housing finance, see Figure 3.

Figure 3 **Mapping the Key UK Housing Finance Policies: 1960-2017**



Source: Aha 2021

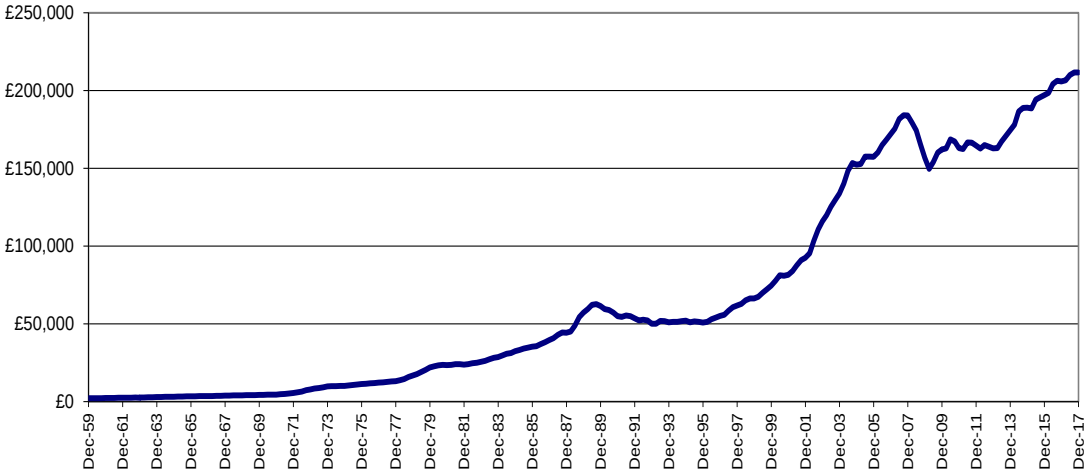
Figure 3 shows the level of regulatory changes that have shaped the UK housing market. The transformations over time can provide a clear argument about the permanence and inevitability of certain housing market structures can be somewhat misplaced (Williams 2013).

To sum up the foregoing discussion, house price drivers have inextricable interlinkages with governments' macroeconomic, monetary and regulatory policies, which are made in a political environment. As homeowners represent a large part of the voter base, the timing and implementation of these policy interventions could influence housing outcomes and, although difficult to validate, could win the government in power important election votes. Residential property investment decisions therefore ought to take into consideration the political and voting cycles as these could have important implications for housing market performance.

3. METHODOLOGY

Across the UK, the performance of the housing market can exhibit significant geographical variations due to local influences. However, according to Nationwide (2017), there is historically a limited divergence of long-term regional performance from that of the overall UK housing market performance. Figure 4 illustrates the long-term UK nominal house price movement since 1960.

Figure 4 **UK Nominal House Prices: 1960-2017**



Source: Nationwide 2018

Figure 3 depicts the movement in nominal UK residential house prices. The quarter-on-quarter house price growth averages 2.03% (annualised 8.63%). There is significant variation in the level of movement at different episodes of the house market cycle with notable growth occurring from the mid-1990s till the onset of the GFC of 2007/08, leading to a correction which lasted close to two years, but rapid appreciation kicked in again with house prices exceeding pre-crisis levels by the last quarter of 2014.

In detailing UK house price movement, annualised UK inflation ranged -1.6% to 26.6% over the same period (ONS, 2017). To account for the effect of changes in inflation on a comparison of house prices across different periods, we used real house price data by deflating the nominal prices with the consumer price index (all items) obtained from the ONS databases. With this approach, we were able to consider the movement in house prices independent from external factors.

The parliamentary democratic political system in the UK has been in operation since 1707 with the union of England and Scotland. Key political decisions are made at a national level under the UK parliamentary democracy system with the House of Commons and House of Lords. The central government elections are held every five years under non-mandatory universal adult suffrage for all those of voting age.

Since 1918, the UK political system has been dominated by two parties; Conservatives (Republicans) and Labour (Democrats). Table 1 shows the governments in power and the election dates since 1960. To ensure consistency with the quarterly house price data, the election dates are shown after the election on a quarterly basis.

Table 9 **UK Government and Election Details**

Prime Minister	Party in government	Election Date	Assumed Office	Retired from Office	Period of service (Quarters)
Harold Macmillan	Conservative	08-Oct-59	Dec-59	Dec-64	20
Harold Wilson	Labour	15-Oct-64	Dec-64	Jun-70	30
	Election	31-Mar-66	Mar-66		
Edward Heath	Conservative	18-Jun-70	Jun-70	Mar-74	15
Harold Wilson	Labour	28-Feb-74#	Mar-74	Jun-79	21
	Election	10-Oct-74	Dec-74		
Margaret Thatcher	Conservative	03-May-79	Jun-79	Jun-97	76
	Election	09-Jun-83	Jun-83		
John Major	Election	11-Jun-87	Jun-87		
	Election	09-Apr-92	Jun-92		
Tony Blair	Labour	01-May-97	Jun-97	Jun-10	52
	Election	07-Jun-01	Jun-01		
Gordon Brown	Election	05-May-05	Jun-05		
David Cameron	Conservative	06-May-10*	Jun-10	Sept-16	27
	Election	07-May-15	Jun-15		
Theresa May	Election	08-Jun-17#	Jun-17		
* Coalition government # Minority government					

Source: House of Commons Library: UK Election Statistics: 1918-2017

Table 1 details the elected UK Prime Ministers for the past 58 years. There have been 16 UK general elections since 1959 leading to six changes of government. On eight occasions the Conservatives won the most seats while Labour won the most seats on seven occasions. In 2010, the Conservatives won the most seats and entered government in a coalition with the Liberal Democrats. The shortest period of government was the Edward Heath, Conservative-led government (47 months), compared to Margaret Thatcher/ John Major lead governments of over 15 years, having been re-elected three consecutive times.

In analysing the relationship between UK house price movements and the political cycle, we initially examined the data on a decade-by-decade basis using descriptive statistics beginning from 1960. In addition to this, the average house price performance (quarterly growth rate) for the periods during which each elected political party was in office was examined over the periods defined in Table 1.

Besides the performance of the political parties, the impact of the political cycle on house prices was examined by analysing the average quarterly performance of the UK house prices in all the years just before and election and comparing same with the average quarterly performance in the year following an election. This can also be compared to the long-term average house price performance to see if the political cycle

does cause deviations from the long-term trend. An important consideration while interpreting the results is that we only take into accounts governments did serve more than an 18-month (six quarters) after their election period. This was to minimise noise in the data and highlight only significant differences.

4. RESULTS

The first step was to review the descriptive statistics for the UK residential property market over a 10-year interval. This is shown in Table 2.

Table 10 **Changes UK Real House Prices Descriptive Statistics: 1960-2017**

	1960's	1970's	1980's	1990's	2000's	2010-17	Total
Mean	3.34%	4.35%	3.77%	-1.36%	5.40%	1.31%	2.84%
Median	2.52%	1.44%	5.31%	-0.46%	8.28%	1.79%	2.51%
Standard Deviation	4.43%	15.77%	10.70%	9.88%	11.79%	6.48%	10.70%
Range	18.26%	78.90%	59.79%	36.04%	59.94%	32.10%	78.90%
Minimum	-4.23%	-27.99%	-17.42%	-22.33%	-26.42%	-15.14%	-27.99%
Maximum	14.03%	50.91%	42.36%	13.71%	33.52%	16.96%	50.91%

Table 2 shows that over the last five decades, the average annual percentage change in real UK house prices ranged from 18.26% in the 1960s to 78.90% in the 1970s. The 2000's provided strong returns (5.40%), being 90% above the long-term trend (2.84%). The volatility in house price movement, especially from the 1970s to the last decade, was very close to the long-term average of 10.70%.

Besides the measures of central tendency (mean) and variation (standard deviation), the shape of the data can provide valuable information. The skewness shows the symmetry of the data around the mean (low figure preferred) and the kurtosis illustrates the "peakedness" of the data. A high kurtosis reading (above zero) means the data are grouped close to the mean. In each decade, the low skewness and low kurtosis readings demonstrate a flat bell curve as illustrated by high standard deviation readings above 8% (except for the 1960s and 2010s which had relatively stable house price growth), with a narrow data range of 18.26% and 32.10% respectively.

Next, we examined whether the performance of house prices vary under different political regimes. The results are displayed in Table 3.

Table 11 **Changes in UK House Prices under Different Political Parties**

	Labour	Conservative	Overall
Mean	2.89%	2.80%	2.84%
Median	3.56%	2.09%	2.51%
Standard Deviation	10.82%	10.65%	10.70%
Range	60.0%	70.0%	74.0%
Minimum	-23.1%	-19.1%	-23.1%
Maximum	36.9%	50.9%	50.9%
Count	86	112	198

Table 3 indicates a moderately narrow house price range, 2.80% to 2.89%, between the political parties. This represents a relatively small difference of ± 2% from the overall average of 2.84%. The standard deviation difference would suggest that Labour governments have slightly more volatile returns than the Conservative governments.

A t-statistic was used to examine if the performance of house prices varied significantly under different political regimes. The results are displayed in Table 4.

Table 12 **T-Test for Equality of Means**

	Mean Difference	Std. Error Difference	T-test	df	Sig. (2-tailed)
Equal variances assumed	.090	1.538	.059	196.000	.953
Equal variances not assumed	.090	1.541	.058	181.563	.953

As evidenced from the results shown in Table 4, the t-test illustrated that there is no statistically significant difference (t-values significantly less than 2), at 95% confidence level, in the UK house price performance either under the Labour Party or Conservative Party led House of Commons. The minor difference between the two parties may be attributable to sampling variation, given that the labour party has been in power for 86 quarters compared to 112 quarters of the Conservative government during the period observed in this study.

Table 5 compares the UK house price performance during the first and last years of government by the Labour Party and the Conservative Party. In other words, we examine the behaviour of house prices just before and immediately after elections to see if the elections have any impacts on house prices.

Table 13 **Governments First Year and Last Year House Price Performance**

	Conservative Government		Labour Government		Combined Cons. & Lab. Governments	
	First Year	Last Year	First Year	Last Year	First Year	Last Year
Mean	1.06%	4.43%	1.73%	6.70%	1.32%	5.25%
Median	0.98%	4.95%	4.57%	5.22%	2.28%	4.87%
S.D	4.13%	3.61%	5.51%	4.61%	4.66%	3.99%
Range	37.48%	35.89%	47.13%	45.17%	50.80%	55.03%
Minimum	-14.47%	-13.00%	-23.13%	-6.26%	-23.13%	-13.00%
Maximum	19.03%	19.46%	15.96%	36.86%	19.03%	36.86%

Table 5 reveals marginal differences in UK house price performance during the first years for both Labour and Conservative governments. The average annualised growth in UK house price during the first term of Labour governments was 1.73%, slightly above the 1.06% recorded by the Conservative governments. A t-test shows that this difference is not statistically significant at a 95% confidence level. In their last years in power, labour governments recorded an average annualised growth rate of 6.70% compared to 4.33% under the Conservative government. This difference, once again, is not statistically significant at a 95% confidence level. The difference in performance may be related to differences in expenditure policies as Anderson *et al* (2008) argued that left-of-centre governments are more concerned with controlling unemployment than right-of-centre governments.

Nonetheless, Table 5 illustrates a more remarkable observation; It is perceived that average UK house price performance is much better in the year just before an election relative to the first-year post- election. This was observed to be true irrespective of the party in office. Average annualised house price growth was by 5.25% in the last years post-election compared to 1.32% in the first years following an election. This means average house price performance in the years before an election is about 85% above the long-term average (2.84%) and about four times the performance in the first year after an election. On the other hand, the average house price performance one year after an election is about 53% below the long-term average.

The findings give a strong indication of the possibility that political parties could be seeing house price movements as an important consideration before an election and that elections are usually held during periods of booms in the housing market (and perhaps the economy as a whole). This could be so since Prime Ministers are at liberty, to call for elections at any time and would mostly do so only if they deem there to be a high chance of victory for their party. A strong housing market could be connected with a flourishing economy and serve as an indicator that the party in power may win the election. This is an area that could benefit from an in-depth examination in future research.

While it may be the case that house prices fare well in periods of general economic growth, it is also plausible that given the significant proportion of homeowners in the UK voter base, political parties could use strong house price growth as a tool to secure more votes during elections. In such cases, pre-emptive governments policies to support or stabilise house prices in the short term could reverberate at a later stage with

significant consequences on house prices. The long term effect on economic growth could be acutely suppressed by affordability issues across the residential property markets.

5. CONCLUSION

This research is a preliminary systematic examination of the influence of elections and the political cycle on residential property prices in the UK. We have examined how house prices react to central government elections through the lens of long-term real house price performance in the UK, under different political parties and before and after elections. Over the last five decades, real UK house prices increased at an annualised growth rate of 2.84%. We find only a narrow difference in UK house price performance between Labour and Conservative governments terms in office. However, the most striking finding of this preliminary analysis is that there is significant variation in house price movements one year before, compared to one year after the House of Commons elections. UK house price performance is appreciably better in the year before the elections compared to the year immediately after the election. To quantify, this represents a ratio of about 1:4 and this finding holds irrespective of the political party in power.

In recognising the active role of policymakers in the housing market and the possibility of manipulating house prices for political gains, it must be recognised that such short-term measures may seem appealing to a large number of voters but could mask fundamental failings in the housing market in the long-term. Leaving these issues unresolved could be more complicated than often perceived.

This study identifies important areas of further research. The political cycle should be recognised as a significant part of the housing market research agenda so that actors in the residential property market could include the election timings as part of the decision-making process. Further research in this area will shed more light on the connections between house prices and political cycles. This can include the performance of the housing market under regime change compared to elections that keep the same party in power. Political studies research may also benefit from enriched models predicting electoral victories if housing market performance variables are considered.

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