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Bachelor's Thesis

An Investigation of the Relationship Between U.S. Housing Starts and Business Cycles

Metropolia University of Applied Sciences

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This thesis draws inspiration from Leamer's (2007) work on the connection between US housing and business cycles and undertakes qualitative analysis on the factors most likely to contribute significantly to US residential investment's ability to accurately and reliably predict business cycles.

We search for convincing causal stories and research results that explain the housing starts and residential investments ability to predict business cycles and GDP by collecting, evaluating and comparing existing literature, qualitatively analyzing the results and drawing conclusions.

With our analysis, we attempt to answer the research questions of whether US housing starts are significant in business cycle forecasting and which factors influence their effectiveness in predicting business cycles?

We investigate household composition, demographics and local factors, mortgage markets and government supported enterprises, wealth effects, economic theory, interest rates, and behavioral factors and conclude that all factors contribute to housing starts' accuracy and reliability as a leading indicator to varying degrees, and thus strongly emphasize the importance of creating a comprehensive view by including all aforementioned variables, if not more, to achieve the best results in forecasting business cycles based on residential investment.

Keywords	Housing, business cycles, housing starts, forecasting

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1   Introduction

The purpose of this thesis is to locate, dissect and evaluate the different factors that affect US housing, business cycles, and the connection between them. Special interest is given to connections contributing to the ability of housing starts and residential investment to accurately and reliably predict the direction for the aggregate economy. Also, to answer our research questions, we attempt to gain a more profound understanding of the different underlying relationships that shape US housing in aggregate.

Current research and data have found residential investment to be a consistent and useful indicator for business cycles, especially strong in assessing pivot points surrounding peaks and troughs in the aggregate economy. We find the most reliable and respected advocate in this regard to be Edward E. Leamer and his working papers *Housing IS the Business Cycle* (2007) and its more recent revision *Housing Really Is the Business Cycle: What Survives the Lessons of 2008–09?* (2015).

But much like with many other economic models, theories and policies, there is debate when it comes to the underlying relationships and the factors that cause housing starts and residential investment to appear consistent in its ability to forecast and lead business cycles. In some contrast to the prevailing conclusions, we find Ghent and Owyang (2009) to suggest the possibility that housing is only a proxy for other consumption or wealth indicators.

Therefore expanding on the research and knowledge surrounding US housing, business cycles, and the connection between them seems appropriate, as it may give us fruitful and valuable insights as to what are the key factors to look at when assessing residential investment, and its leading indicator qualities. We may also gain insights as to why some econometric models may fail to portray reality or become outdated quickly.

In our Literature Review we analyze the state of current research, forming a foundation for our knowledge on the statistical connection between residential investment and business cycles observed throughout the years, this is done by mainly studying Leamer's (2007) work on business cycles and housing.

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In the Research Methods chapter, we outline the choices of qualitative research methods we undertake to answer our research questions, as well as briefly touch on the research significance and purpose.

In the chapter on Analysis and Results, we find the bulk of our insights. The chapter looks at multitude of central topics surrounding US housing and business cycles, evaluating their consequences on our central question and hypothesis that housing starts is an accurate and reliable measurement to predict business cycles. Throughout this chapter we investigate which factors are likely to lead to discrepancies between researchers and economists with regards to our topic. The chapter is divided into seven different sections: household composition, demographics and local factors, mortgage markets and government supported enterprises, wealth effects, economic theory, interest rates, and behavioral factors. Literature concerning these is analyzed and evaluated with the intention to assess how the factors are reflected in the ability of residential investment to accurately predict aggregate demand, giving us insights on US housing and business cycles, and possibly on the implications for the models and theories built on them.

In the end, we summarize and conclude our findings and reflect on potential further research possibilities.

2　Literature Review

The thesis draws its inspiration heavily from Leamer's (2007) working paper *Housing is the business cycle,* where Leamer argues that of the components of GDP, residential investment to offer by far the best early warning sign of an oncoming recession. He finds that for long-run growth (GDP), residential investment is inconsequential but for the recessions and recoveries, residential investment is very important, consistently and substantially contributing to weakness before recessions.

He concludes that in six of the last ten recessions, residential investment was the greatest contributor to weakness prior to the recession; close seconds are consumer durables, consumer services and consumer nondurables. For this reason, housing starts are often an excellent indicator of consumer confidence and other consumer spending, as the purchase of a house often comes with other purchases such as home appliances and furniture, etc. He in fact argues that it is not a business cycle, but rather a consumer cycle.

Only twice in the last ten recessions did residential investment not contribute significantly to weakness: these were the 1953 and 2001 "oddballs". Leamer (2007) also finds that that residential investment is the first GDP item to soften, but also the first one to turn back up when the recession is nearing its end, indicating that it would be a particularly strong indicator for trying to assess pivot points.

Leamer (2007) touches on false positives and negatives when predicting recessions and finds only two false negatives in the last 60 years, the 1953 and 2001 recessions. He also found two false positives, in 1951-52 and 1966-67, both of which occurred coincidentally with big ramp-ups in Department of Defense (DOD) spending for the Korean and Vietnam Wars, specifying that this response prevented the recessions from occurring. He goes into detail on why housing especially is so important in predicting recessions and identifies that it is because they have a volume cycle, not a price cycle. This means that home prices are very sticky downward; when faced with a decline in demand the volume of sales adjusts, not the prices. This is due to many behavioral reasons, both identifiable in sellers and buyers. With the decline in volume comes a decline in jobs in construction, finance and real estate brokerages, which is what is then reflected into the GDP. Also, when people put off purchasing homes, they are also

putting off all the buying that is associated with purchasing a new home, further slowing down the economy, resulting in a recessionary spiral. The downturn of 2008-09 confirmed that housing is the single most critical part of the U.S. business cycle. (Leamer, 2015)

3   Research Methods

The thesis qualitatively investigates and assesses factors that affect US Housing Starts' and residential investment's use as predictors of real GDP growth. It attempts to gain insights on factors that affect the leading indicator's ability to accurately predict oncoming recessions or recoveries, making efforts to determine the causal linkages via evaluating and comparing current literature on the observed and researched connections between US Housing starts, and other housing related variables such as residential investment and house prices, and the greater economy measured by the GDP. Simultaneously the unique nature of US housing market and the forces affecting it will be examined in a qualitative manner.

Determining whether the data on housing starts can be reliably used as a leading indicator of economic cycles is required for assessing the value of the indicator in real-life economic forecasting, and consequently in the decision-making resulting from that forecasting. Having an accurate economic outlook is vital for every business manager and corporation as the outlook on future demand for goods and services is a valuable input in determining the company's strategy in terms of production, research and development, recruiting, financing and other day-to-day operations.

Understanding the underlying causal relationships, or lack thereof, and the historical quantitative performance of US housing starts as a leading indicator is greatly beneficial for all investment managers and professionals as this would allow them to make more informed decisions, promoting more efficient use of capital through more efficient pricing in financial and mortgage markets.

Perhaps more importantly, understanding the factors affecting US housing and its cyclicality would greatly enhance the government's decision and policymakers' ability to tailor monetary and fiscal policy to support their goals of maximum employment, steady inflation and moderate long-term interest rates, thereby supporting long-term economic growth. Furthermore, the research surrounding housing could give insights on how to smooth out the cycles, fixing many externalities such as unnecessarily high housing costs and detrimental effects on neighborhood development (HUD, 1979; 1978) and to evaluate the politics surrounding the culture of promoting homeownership and subsidizing and incentivizing it heavily.

Leamer (2007) also argues that housing starts' perceived prominence in recessions could be a significant input into creating pre-emptive anti-inflation policy in the middle of expansions. Worth noting is that if the effects of housing starts are not sufficiently understood, policies and decisions affecting residential investment may have unintended, if not even reverse, consequences.

Thus, the thesis searches for convincing causal stories and research results that explain the housing starts and residential investments ability to predict business cycles and GDP by collecting, evaluating and comparing existing literature, qualitatively analyzing the results and drawing conclusions. There are multiple theories and econometric models that use housing starts as an input; the author deems that focusing on the main overarching theories is sufficient for this bachelor's thesis.

By the end, I hope to answer the questions: Are US housing starts significant in business cycle forecasting, and if so, why? What factors influence US housing starts' effectiveness in predicting business cycles?

4 Analysis and Results

4.1 Household Composition

If we are to examine the factors affecting residential investments and housing starts' ability to forecast the GDP, we need to investigate the root causes of the changes in the figures themselves. What are the drivers of residential investment? We first inspect the demand side. To understand this, economists look at headship rates and components of household formation. Headship rate is calculated by dividing the number of households by the adult population. Higher headship rate simply equals fewer adults per household, or more households for a given population.

It is important to look at headship rate as changes in purely homeownership can be misleading. For illustration, imagine a group of 10 people, of whom half own their homes and half rent, the homeownership among them is 50 percent. If hypothetically one is to lose their home to foreclosure and three renters could not afford to keep their apartment and were to move in with one of the remaining homeowners, homeownership rate would climb to 67 percent. This is not providing us with the real picture as it does not include the people who have dropped out of the housing market altogether. (Kolko, 2014; 2015)

Household formation can be broken into three components: adult population growth, shifts in age distribution, and changes in headship rate. All else equal, adult population growth means more households if the headship rate does not change, resulting in adult population and household formations to grow proportionately. (Kolko, 2015)

Shifts in age distribution also affect household formations. Young adults often live with roommates or with their parents, rarely heading their own households. As more old adults result in a higher headship rate, the household formation would increase as population ages. (Kolko, 2015)

Thirdly, the headship rate itself may change due to changes in norms and behaviours. For example, young adults marrying later or spending more years under shared housing would lower the headship rate. Economic fluctuations can swing the headship rate. During recessions for instance, people are more likely to live with relatives or roommates, as they try and adjust their living costs based on their economic situation. (Kolko, 2015)

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Kolko (2015) used the then recent Current Population Survey's (CPS) basic monthly microdata and examined the living arrangements within households to estimate the components of recent household formation. Kolko found that household formation was largely driven by the overall adult population growth. However, the changing age distribution thanks to baby boomers entering the 65-74-year-old bracket also accounted for around 20% of the household formations. Figure 1 below summarizes how the headship rate rises as the population grows older. The individual age group headship rates stayed relatively unchanged and did not contribute meaningfully to the changes in household formations in the period 2014-2015.

Population Estimates, Headship Rates, and Implied Household Formation (first-half 2014 vs. first-half 2015)

	(1)	(2)	(3)	(4)	(5)	(6)
	2014 population estimate (m)	2015 population estimate (m)	Estimated population growth (%)	2014 headship rate	2015 headship rate	Implied household formation (000's)
16-19	16.7	16.6	-0.4%	4.5%	4.6%	23
20-24	22.2	22.0	-0.6%	25.9%	25.7%	-85
25-34	42.1	42.6	1.2%	48.7%	48.4%	159
35-44	39.7	39.7	0.0%	54.5%	54.1%	-151
45-54	43.0	42.7	-0.7%	56.1%	56.1%	-196
55-64	39.6	40.4	2.0%	58.7%	58.6%	391
65-74	25.9	27.0	4.6%	61.1%	61.6%	860
75+	18.7	19.1	2.1%	66.9%	66.9%	264
Overall, 16+	247.8	250.2	2.4 million	50.2%	50.2%	1265

Population estimates are Census monthly estimates for the civilian noninstitutionalized population. Headship rates are calculated from CPS basic monthly files. Figures for each year are averages of monthly data, January-June.

Figure 1. Population Estimates, Headship Rates and Implied Household Formation. [online] Available at: <https://ternercenter.berkeley.edu/blog/new-households> [Accessed 16 April 2020]

Kolko concludes that the household formation appears due to basic demographic shifts rather than the economic cycle. He also notes that young adults' contribution to household formation was meagre due to their increasingly living with their parents and

decreasingly likely getting married or cohabiting with a partner early in their adult lives. It is unclear from the data why millennials are staying at home but it suggests the possibility that sluggish wages and scarce and expensive housing may be to blame. (Kolko, 2015). Elliot and Nam (2013) also found that the cost of student loans appears to jeopardize the short-term financial health of US households, finding households with no student debt to have nearly three times higher median net worth than households with outstanding student debt, thus student loans are highly likely to contribute to young adults' decisions to stay at home longer.

Kolko's (2015) study was over a small time sample for the year 2014-2015, but for our purposes it is not important that the data is up to date, but rather to acknowledge the variables that form the components of household formations and how they may have an effect on how reliable housing starts are in forecasting the GDP.

Household formation boosts housing demand and therefore construction, but it is important to know what is driving the demand. It is likely relevant whether demand for housing is due to overall population growth, or from the increase in within-age-group headship rates. The latter, especially if among young adults, would be a much stronger sign of economic prosperity than the former. Given the probable differences in wealth effects experienced, and the propensities to consume in these two scenarios these differences would be reflected in the growth and composition of GDP. For example, an immediate insight would be that older age-groups are least likely to live in multi-unit buildings or urban neighbourhoods versus single-family homes. (Kolko, 2015)

In an OECD working paper, Catte et. al. (2004) find that across countries, there appears no correlation between house price acceleration and population growth rates, at least during the 1980s and the 1990s. The select few countries where strong correlation with population growth is observed mainly reflects changes in net migration.

Catte et. al. (2004) confirm our previous suspicion, agreeing that different categories' propensities to spend is expected to differ. They also find that higher owner-occupation rates were found likely to enhance the strength of wealth effects experienced, concluding that owner-occupation is a necessary condition for the housing wealth channel to open. The extent of owner occupation amplifies the importance of mortgage market structure, and differences between countries' homeownership rate reflect their tax incentives,

access to mortgage financing and inter-generational wealth transfers. U.S. has famously placed great importance on homeownership, aggressively subsidizing and incentivising it. Home-owner occupation matters as most countries exempt capital taxes on residential property that is used as the owners' main residence, allowing the owners to see home equity as much more liquid, once more resulting in higher wealth effects for owner occupied residential housing.

4.2   Demographics and Local Factors

Another crucial factor to account for when assessing the ability of housing start data to forecast aggregate demand (AD) and GDP, is the differing "risk contexts" between metropolitan areas, which prove to be especially important during economic downturns or times of crisis. It is reasonable to assume that looking at purely national figures will leave many causal stories unexplained.

Dwyer and Lassus (2015) find that just like with house prices, there is significant heterogeneity when it comes to risk and insecurity in U.S. metropolitan areas. American families face increasing insecurity with regards to their employment, income and housing, as the "great risk shift", caused by government retreat from social insurance, deregulated housing and labour markets and wage stagnation has left individuals increasingly vulnerable to their local context, responsible for their own retirement planning, health crises and ordinary risks of life such as job loss (Kalleberg, 2011; Hacker 2006). Schwartz (2012) also agrees that micro level welfare state erosion has moved housing to the forefront of individual strategies for attaining economic security.

Metropolitan local labour and housing market dynamics take different shapes depending on the economic base and population composition. Metropolitan characteristics such as specialisation in a specific type of production (e.g. take automobile manufacturing and Detroit) shape residential segregation, influencing access to opportunities, distribution of jobs, and exposure to harm or opportunities for growth (Dwyer et. al., 2015). This, coupled with the social importance and unique characteristics of housing discussed in later chapters, underlines the argument that one cannot look at national level housing start data, and assume the effects on aggregate demand will remain similar as to what has been observed before, if the effects on a more granular MSA level aren't considered.

Risk contexts such as jobs, housing and credit combine in different ways in different areas, resulting in disproportionate extents to which metropolitan areas accumulate risks, and are vulnerable to unemployment and foreclosures during downturns. Some may have buffers to provide security (especially the labour market), while some don't (Dwyer et. al., 2015). Murphy and Wallace (2010) find that especially suburban poor and predominantly minority neighbourhoods face distinctive risks due to less robust social services and greater transportation insecurity than in the cities. Wachter (2016), also emphasizes the importance of understanding local market and housing financing conditions.

Ihlanfeldt and Mayock (2014) study the variance in foreclosure spill overs across neighbourhood types based on income levels and racial concentrations. They surprisingly find that in reverse as to what one might expect, foreclosure spill over effect is higher in high income neighbourhoods than in low income ones. This could be due to the likely greater impact on surrounding property prices, which in part may depend more on the appearance of an economically secure neighbourhood.

There have also been studies on the impacts of specific racial compositions on house prices. A hedonic estimate of neighbourhood ethnic preferences by Yinger (2016) found that house prices reflect the households' respective ethnic preferences, with a premium often placed on neighbourhoods with varying ethic compositions, however different areas and demographics place varying values on specific ethnic compositions, thus playing a factor in house prices.

Literature has documented substantial heterogeneity in both timing and magnitude of business cycles at different levels of disaggregation, confirming that recessionary experiences vary across regions. (Owyang et. al., 2005). For example, many energy-producing regions such as Austin and Tulsa's business cycles disjoint from the national cycle (Ghent and Owyang, 2009).

Ghent and Owyang (2009: 338) analyse the relationship between housing and the business cycle at the MSA level for 51 US cities. Surprisingly, they find that housing's performance as a leading indicator for employment is worse, when disaggregated and examined at a city-level. The correlation of MSA level house prices and employment is only half of the one measured at national level, appearing at odds with the existence of

a direct channel from local housing markets to local employment, despite housing being a largely local phenomenon. Naturally, the national figure will be a weighted average, whereas local micro-data will be more specific and therefore subject to greater statistical variance.

Ghent and Owyang (2009: 340) confirm our suspicion that there is substantial variability between individual MSA and national house prices, employment and housing start correlations, although the 2004-2008 housing boom did increase the house price concordance across the board. This heterogeneity further suggests that a weighted average of MSA level fluctuations (national series) may be a poor proxy for city-level effects. However, housing start permits (measured in both values and units) exhibited a more consistent pattern, leading the cycle at the national level, as well as in 80% of the MSA's.

Ghent and Owyang (2009) conclude that as business cycles are incredibly diverse, the relationship lacks consistency at a city-level to suggest the relationship to be: "more complicated than simple causal stories wherein a rise in house prices raises wealth, leads households to consume more, and then leads to an economic expansion" (Ghent and Owyang, 2009: 348). They also find that the observed frequency-dependence in their correlations to suggest differing impacts in the short and long-term. Overall, the results somewhat contrast with Leamer's (2007), and Ghent and Owyang (2009) suggest the possibility that housing is only a proxy for other consumption or wealth indicators.

Del Negro and Ortok (2007) and Glaser and Gyourko (2007) also find that as housing is fundamentally a city-level phenomenon and finding substitutes in the short-run may be difficult, therefore house prices are largely driven by state and regional factors. Furthermore, research has found strong evidence for regional effects of home prices on consumption.

If economic downturns affect MSAs disproportionately, as our analysis would suggest, this will have important repercussions for the validity of econometric models that use national level data as an input. Follain and Giertz (2014) also highlight the importance of MSA-level market conditions and the benefits for making models more geographically granular.

4.3   Mortgage Markets and Government Supported Enterprises (GSEs)

This section considers the role of mortgage markets and government supported enterprises, as factors that affect housing variables' ability and reliability in predicting GDP. With the same intentions, this section briefly inspects the factors that led to the subprime mortgage crisis in 2007, searching for causal relationships that can influence the reliability of housing starts in forecasting.

Prior to the 1930's long-term mortgages were not widely available. The typical short-term "balloon payment" mortgage proved to be problematic, as due to the weak state of personal income and the banking system, owners were unable to meet payments during the Great Depression, leading to widespread defaults. To combat this, the 1930s New Deal charged the Federal Housing Administration (FHA) and Veteran's Administration (VA) with guaranteeing home mortgages, starting the development of the long-term mortgage and creating the modern suburban America, lifting the homeownership rate from 44% in 1940 to 65% in 1976 (Colton, 2002).

First, a brief introduction to the government supported agencies (GSEs) Fannie Mae (created 1938) and Freddie Mac (created 1970) that have shaped the U.S. mortgage markets throughout the years. Fannie Mae and Freddie Mac were created by Congress to provide liquidity, stability and *affordability* to the mortgage market by initially purchasing "conforming" mortgages with restrictions such as below 90% LTV, top 75th percentile credit rating, and direct housing expenses that would total to no more than 28% of homeowners' gross income. In addition, the loan amounts were capped at 125% of median home price, assuring low default rates on these mortgages (Schwartz, 2012).

Mortgage markets stayed relatively the same until 1971, when Freddie Mac engineered the mortgage-backed securities (MBS), bundling the mortgages into homogenous, tradeable securities and guaranteeing the payment of principal and interest on the underlying mortgages, and passing the payment streams directly to investors (Wachter, 2010). Simultaneously policy makers broke down barriers of competition, attracting other financial institutions as secondary mortgage investors/suppliers and expanding the pool of funds for housing. This created an increasingly national market, where interest rates were set by national markets, rather than by local bankers or the government. The share

of mortgages funded through secondary markets rose from 27% to 59% in the period from 1984 to 2001 (Colton, 2002).

Until the mid-2000's the model proved sustainable and the housing finance and capital markets remained segmented, fostering stability.

As financial deregulation and the presence of private securitisers grew, the GSEs gradually lost power over originators. Banks' "originate-to-distribute" model resulted in lending beyond the "socially optimal level", misaligned incentives and the too big to fail moral hazard (Wachter, 2014), this spurred on the race to the bottom in lending criteria and creditworthiness. Schwartz (2012: 51) "finds that deregulation and nonregulation allowed supply to meet demand in ways that connected previously segmented parts of the financial system, and in ways that inverted the old system of maturity matching in pensions and housing", creating sufficient conditions for the 2007 subprime mortgage crisis. In pursuit of profits, the banks, Fannie Mae and Freddie Mac began to stray away from their original mission. Financial institutions rushed to make "subprime" high-interest rate loans to applicants with increasingly poor credit ratings and even to those with no proof of income (Papadimitriou et. al, (2007). Deregulation and the mortgage brokers' search for high commissions also brought up the development of "zero-down" adjustable-rate mortgages (Anders, 2005). Securitization where mortgage backed securities are sold and resold in various "tranches", further removed the investors one step away from the actual lending process, and the originators one step away from the holders of these mortgage backed securities.

Wachter (2014) found that the diminished role of GSEs allowed various foreclosure externalities not to be internalised by competing firms. These externalities included fire sales in result of foreclosures depressing house prices, bank losses diminishing lending capabilities due to said foreclosure losses, and thus finally borrowers being unable to borrow again due to the previous two externalities, forming a third one. Overall, the competitive firms in the mortgage market were essentially missing the impacts on the aggregate credit risk. Wachter (2014) argues that if there were a "monopoly" lender in the economy, they would have behaved more prudently.

For housing finance to further align with the homogeneity of wealth assumptions of modern neoclassical economic theory, on which many econometric methods modelling

housing are based on, economists advocate creating a flat tax and eliminating the home mortgage interest deduction, arguing that subsidizing some forms of borrowing prevents money from going to its most efficient and productive use (Hall & Rabushka, 1995).

Steps have been taken towards fulfilling the homogeneity and liquidity theses modern neoclassical economics assume in their permanent income theories. As a self-fulfilling prophecy, over the past 40 years the financial liberalisation, market and interest rate regulation, increased competition, changes in subsidization and securitization have taken mortgage markets somewhat closer to the neoclassical blueprint (Hannsgen, 2007). Bayoumi & Edison (2003) find that wealth is increasingly driving individuals' consumption in countries where financial systems are more "market-based" rather than "bank-based", likely reflecting financial deregulation. However, with the deliberate policies designed to maintain consumer demand and ongoing pursuits of GSE's to provide affordable housing, the neoclassical blueprint is still far from being executed.

Home sale and equity loans' transaction costs are lower than ever, as these loans are securitized into homogenous instruments that are traded in an increasingly deep and liquid market. Owners are able to borrow and lend closer and closer to the market-rates, reducing "imperfections". The closer we get to the idealistic image of perfect markets in the sense of modern neoclassical economics, the increasingly valid are the neoclassical consumption theories and models built on them. However, Hannsgen (2007) argues that trying to execute the neoclassical blueprint may not be for the best, and the costs of pushing these ideas would be measured in lost homes, declining neighbourhoods and a diminished sense of satisfaction among homeowners.

Catte et. al, (2004) studied the linkages between housing markets and business cycles in various OECD countries, measuring the effects of differences in structural characteristics of their respective housing and mortgage markets, evaluating the transmission from housing wealth to consumption (wealth effects), housing sector activity and stability.

Their OECD working paper found that the institutional features significantly influence the interaction between housing and the business cycle. The strongest impact on consumption was found in countries with large, responsive and effective mortgage

markets: furthermore, the strong effects of mortgage market "completeness" were emphasized.

Mortgage market completeness means the extent to which the markets are "democratised", offering a wide range of products to a broad range of borrowers and ample opportunities for low transaction cost housing equity withdrawal (HEW). Also, as mentioned, housing wealth's exemption from capital gains tax is assumed to encourage owners to see housing assets are more liquid, making them more likely to consume out of that wealth.

Figure 2 below demonstrates the marginal propensities to consume out of housing wealth for a selection of OECD countries in relation to mortgage debt ratios and housing equity withdrawal. Mortgage market size indicators, such as household mortgage debt ratios, appear to be strongly positively correlated with household wealth consumption, "suggesting that the mortgage market is pivotal in translating house price shocks into spending responses" (Catte et. al., 2004: 17). The forms in which a mortgage market's ability to provide financing is measured, are the maximum and typical loan-to-value (LTV) ratios and mortgage repayment length and terms. The more relaxed these indicators are, the greater access to financing.

Note : MPC is for marginal propensity to consume; HEW is for housing equity withdrawal.
Sources : European Mortgage Federation, United States Federal Reserve Board, Japan Statistics, United Kingdom Office for National Statistics, Bank of Canada, Bank of France, Statistics Canada, Bank of the Netherlands, Bank of Spain, European Central Bank, Reserve Bank of Australia and OECD.
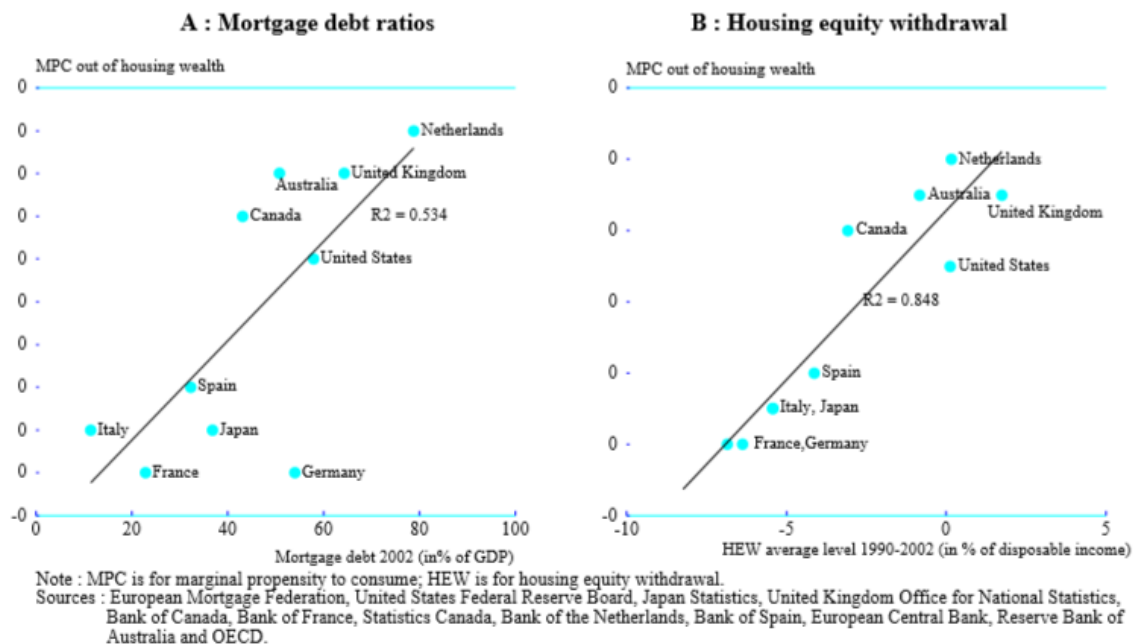
Figure 2. Marginal Propensities to Consume Out of Housing Wealth and Mortgage Market Indicators. (Catte et. al., 2004: 17)

The study found differences in house price variability to be connected to both macro-economic factors, such as inflation variability, as well as structural ones. For macro-economic or monetary policy factors, for example the type of mortgage interest regime (predominantly fixed or floating rate), costs of refinancing and mortgage market flexibility to changes in housing demand contributed to differing wealth effects among OECD countries.

Structural factors such as unnecessarily restrictive zoning regulations or scarcity of urban land were found to subject house prices to larger oscillations due to it driving supply inelasticity. Davis and Heathcote (2005) also find the requirement of suitable land to act as a crucial input into models to produce better results. Mortgage interest rate deductibility also appears to correlate with house price variability. Lax housing tax regimes also affect positively on the strength of housing wealth effects on spending, favourable tax treatment of mortgage interest might encourage excessive leveraging of housing equity, leading to even greater instability.

Catte et. al. (2004) observed differences in the behaviour of residential construction over the business cycle: the volume at turning points was both stronger and quicker in some countries than others.

The more efficient mortgage markets are, meaning less transaction costs, taxes, stamp duties, agent fees/commissions, and barriers to participate (financial liberalization and democratisation), the larger the wealth effects resulting from housing. The U.S., after Norway, has the lowest total transaction fees out of the OECD countries in the study, leading to likely more pronounced wealth effects than other countries.

Like we saw in 2007, the type of, and amount of mortgage debt that housing demand is built on is of crucial importance. Wachter (2014) finds that mortgage debt expansion and leverage are often common features in house price bubbles. In the subprime mortgage crisis these were in part enabled by the increasing proportion of non-traditional mortgages (NTM) such as non-amortising or negative amortisation balloon and interest-only (IO) mortgage products, as well as the subprime loans and Alt-A products, which did not require full income documentation, in combination with the deterioration in the underwriting of these products.

Overall, while a more efficient, "complete" mortgage market is expected to promote economic resilience, the benefits may be entirely offset, or even reversed, by the simultaneous increase in the scope for speculative behaviour. This thesis finds robust evidence that shifts towards more lax underwriting and risky products increase default risk, amplifying downturns and leaving lingering effects in the real economy.

4.4   Wealth Effects

As mentioned, housing is incredibly important due to its dual role in the economy: being a large component of both consumer budget/source of cash, and asset portfolio, as well as being the household's biggest liability and the banks' largest asset (Schwartz, 2012). This section will analyse factors affecting the wealth effects that occur from home ownership, shedding light on why understanding them is crucial, if one is to draw conclusions or forecast future GDP based on data on housing starts and residential investment.

Menegatti and Roubini (2007) summarise results from previous studies, finding that most estimates of the propensity to consume out of an additional dollar of housing wealth range from 4.5 to 16 cents, and out of each dollar of home equity withdrawal, 10 to 50 cents goes to additional consumption. Typically, these estimates do not include consumption that goes into improving one's home, as it is often seen as an investment in the home, nor payoffs of non-mortgage debt. However, this still stimulates consumption and contributes to GDP; Greenspan and Kennedy (2007) find that once this consumption is accounted for, the wealth effects of home-equity withdrawal are multiplied several times over.

Campbell and Cocco (2005) remind that once again, causality is an important issue that must be dealt with, even if one finds the wealth effects that Menegatti and Roubini (2007) summarised, as there may be another force driving both home values and consumption, for example expectations of increases in future income or credit. Aron and Muellbauer (2006) have criticized many studies for lack of control variables, concluding that financial liberalization, meaning wider availability of credit, has accounted for a large proportion of the propensity to consume out of housing wealth increases, at least in South Africa and United Kingdom. These findings are consistent with Hurst and Stafford's

(2004), who found that the greatest propensity to consume out of increases in housing wealth occurs among liquidity constrained individuals, and with our previous conclusions on the effects of mortgage market "completeness".

The OECD working paper by Catte et. al (2004) concurs in this regard with the former studies, adding that households with lower overall wealth are more likely to be liquidity constrained than wealthier households, and because of this, aggregate housing wealth increase will likely have a stronger effect on consumption than equivalent change in financial wealth in the US.

Papadimitriou et. al. (2007) evaluate the impacts of housing market downturns through a Levy macroeconomic model. Calculating the percentage increases of one variable for 1 percentage increase in another variable (elasticities), they find the initial elasticity of real private expenditure to shocks in home prices quite low, at 0.04; however, this rises to 0.12 after a lag of about five months, as the shock is fully absorbed. Furthermore, they find additional effects on household consumption as falling house prices reduce the willingness and ability of consumers to borrow. This confirms that wealth effects come with a considerable time lag.

Anundsen and Jansen (2013) use cointegration analysis to inspect the behaviour of housing prices with regards to debt in the Norwegian housing market and find strong evidence of self-reinforcing effects between housing prices and credit growth due to collateral effects, showing that there is a financial accelerator at work. They also find that in the long-run, house prices depend on household borrowing, real disposable income and the housing stock, while household debt is driven by the real interest rate, value of housing capital and housing turnover. The self-reinforcing effects would imply the potential for "momentum" with house prices and debt, acknowledgement of this can have meaningful uses when forecasting GDP based on housing.

They however also found that incorporating supply side considerations of housing, such as the construction and credit factors, resulted in the observed self-reinforcing effects to dampen. This further highlights the importance of accounting for both demand and supply when modelling housing cycles, casting significant doubts on the suitability of many models that fail to accommodate both sides of the equation, but rather only

account for shocks on one side, such as Davis and Heathcote's (2005) productivity-shock-driven theory.

Catte et. al. (2004) recorded essentially identical "feed-through" effects of housing price movements affecting personal consumption in their OECD working paper, and similarly added that on top of the traditional wealth effects portrayed in the life-cycle consumption models, higher collateral values facilitate households' access to mortgage financing. However, by only looking at house prices, this approach may leave much to be desired in its robustness to comprehensively explain wealth effects, as Leamer (2007) observed that house prices are sticky downwards, resulting in a volume cycle rather than a price one. Leamer (2007) and Owyang and Ghent (2009) also find house prices to be poor leading indicators.

4.5   Economic Theory

Much of the literature, research, and models on housing and business cycle forecasting referenced in this thesis, are rooted in the frameworks and consumption theories stemming from Friedman (1957) and Modigliani & Brumberg (1954), who sought to combine the Keynesian thought with the traditional capital theories of Fisher.

Friedman specifically argues that consumption is a function of permanent income, including the discounted annuity value of future income flows. Furthermore, for Friedman, the Pigouvian real balance effect, (meaning the effect that in a deflationary environment, consumption would increase as inflation-adjusted value of consumers' holdings would increase, leading to consumption recovering), would save capitalism from recession without discretionary government intervention.

In Friedman's world consumption was largely a function of permanent income, rather than current income, thus the marginal propensity to consume out of current income would be relatively small. This contrasts with the Keynesian arguments that argue fiscal policy to have a multiplier effect as consumers would spend the money received from government programs.

There are some glaring issues in Friedman's consumption theory that set the agenda for modern neoclassical macroeconomics. One of these is the theory's dependence on

consumers having homogenous rational expectations of future income in real-world economies with fundamental uncertainties and abundance of behavioural biases, which are to be discussed later below.

However, the modern-day developments depart from Friedman's original theory in many ways. For example, they include rational expectations of future income flows rather than viewing permanent income as what the consumer regarded as their average income over a relatively short period of time originally. One key equation that economists utilize when forecasting housing construction and demand is the 'Euler equation'.

$$\frac{U'(C_t)}{(U'(C_{t+1}))} = (1 + r)\beta$$

Figure 3. Euler Equation.

Permanent income theory says that consumers' marginal rate of substitution in consumption between two periods is equal to the objective rate at which the economy allows such trade-offs. The equation reads out as: *U()*, the function giving utility in any one period as a function of consumption in that period, *(1 + r)* for the gross real interest rate, and *β* as the discount factor (Hannsgen, 2007). This equation represents how much a consumer would weight future utility against present utility. A consumer would increase their savings gradually for the future, up to a point where one additional dollar of savings is worth the same as an additional dollar of current consumption. However, the equation abstracts away from uncertainty and risk regarding future variables, which has led to devastating critiques (Hannsgen, 2007).

"This sort of theory contrasts with the Kaleckian approach in which worker consumption is tied closely to its current income and the simplified Keynesian model with consumption dependent only on current income (Kalecki, 1969; Keynes, 1965 [1936] cited in Hannsgen, 2007: 12)

Essentially modern neoclassical theory, like many other economic theories, presents an ideal world, where capital markets are "perfect", participants occur no transaction costs, behave perfectly rationally and homogenously with regards to their utility and have no behavioural biases or individual preferences concerning some products over others.

Many use so-called co-integration techniques to estimate long-run relationships among variables. This approach has been criticized by Carroll et. al. (2006), on the grounds that "no such relationship can persist over a period of decades, during which numerous factors affecting consumption change greatly" (Papadimitrou et. al., 2007: 8). Similarly, Wachter (2016) criticises most empirical studies for failing to measure local credit conditions in their estimations, because despite only slight variations in metropolitan interest rates, there are meaningful differences in the local sources of supply of credit.

Furthermore, as for all economic models, one can concoct perfectly plausible scenarios that would for certain be unfeasible for the econometric models to reflect simply in terms of one variable affecting the other, as reality is infinitely too uncertain and underlying causal relationships can change unpredictably, for example, via implementation of new legislation. This section concludes with the observation that if housing starts are used as an input to an econometric model, it is highly likely that absolutely vital aspects are abstracted away, limiting the usefulness of the insights "gained" from the model's results.

4.5.1   Uniqueness of Housing Assets

Hannsgen (2007) further critiques the neoclassical consumption theories derived from Friedman, Modigliani and Brumberg, and Fisher for treating all assets as equal homogenous wealth, especially in relation to housing assets, and specifically owner occupied homes that are used as primary places of residence, essentially criticising the commonly applied framework used in modelling permanent income / life-cycle consumption.

Hannsgen argues that housing encompasses many unique characteristics that make it distinct from other assets and should not be treated in the models as "wealth" or a commodity like any other. Essentially, he argues that neoclassical theory misrepresents one of the most significant purchases consumers make in their entire lives, with likely important implications for policy and for the validity results derived from these models relying on the theory. (Hannsgen, 2007)

Comparing the characteristics of owner-occupied homes to a typical financial asset, a Fortune 500 company bond, Hannsgen (2007) finds that the market for bonds is much more *liquid*, and *homogenous* than the one for homes. Despite this, many consider housing assets to be wealth like any other, easily liquidated through sale of home-equity borrowing and plugged into a model based on permanent income theory.

Furthermore, Hannsgen (2007) claims that homes cannot be sold without affecting the occupant's social existence. They carry political and social attachments, making the decision to sell a home far more profound than other financial assets such as bonds. Homes also come with social considerations/benefits such as their role as a status symbol, sense of control and freedom resulting from homeownership, and the pride and sentimental values associated with a *particular* dwelling, which are difficult to reproduce in, or transfer to, in another home. Public consumption goods associated with a home, such as schools, libraries and parks further distinguish the home from other financial assets.

Because of these factors, Hannsgen (2007) argues that in clear contrast to other commodities, homeowners are likely to value their home's *conservation,* not willing to risk their home by taking excessive home equity loans, leading to "lumpiness" in the decisions to consume out of housing, thus not adhering to the assumptions of permanent income theories. Zelizer (1994) characterized the special treatment of housing by arguing that consumers have separate sets of "accounts" for consumption, with more conservative roles applied to the "housing account". This is largely in the same vein as the behavioural bias of "mental accounting".

The biggest crux in Friedman's (1957) theory lies with the fact that it does not expect non-human wealth to be particularly illiquid or subject to a special marginal propensity to consume. (Hannsgen, 2007) This effect is crucial due to the sheer financial significance of housing for household's wealth and consumption. Federal Reserve data show that homes account for over 50% of the median American household's assets. (Wolff & Zacharias, 2006). With significant heterogeneity in the market and relatively high transaction costs for moving, people cannot quickly or cheaply move, or diversify from the exposure to their place of residence. Other liquidity constraints, such as lenders' concern over default risk may also prevent the consumption theory from holding. These effects have been verified in several studies (Elliot, 1980).

4.6   Interest Rates

Housing is known to be incredibly sensitive to interest rates, thus it has been suggested that cycles in, and shocks to, interest rates are responsible for the appearance of residential investment as a leading indicator (Smets and Wouters, 2007).

In albeit slightly dated studies, Arcelus and Meltzer (1973) find that even relatively small changes in interest rates could induce changes of 15 to 20 percent in the demand for housing. The effects on supply further enhance the cyclicality, as Arcelus and Meltzer find interest rate elasticities of supply to be relatively large and negative.

Clemhout and Neftci (1981) conclude that changes in interest rates discourages funding and buyers, whilst also affecting supply by curtailing output. A key takeaway from their study is that the cyclical behaviour of the interest rates itself induces swings in housing activity, thus they argue it being a prime variable to focus on for policy making.

Clemhout and Neftci (1981) argue that cyclicality is enhanced due to housing's evidenced interest-sensitivity, resulting in consumers seeing it as a postponable expenditure, possibly waiting to avoid high costs. They suspect that due to this effect high construction activity in one period may spill over into future ones.

They also find that the rate of interest is the only *feasible* instrument for controlling housing cyclicality, as its time and frequency domains match closely those of housing prices. The authors claim that much of the previous literature has overlooked the problem of instruments' feasibility when it comes to policy making. However, they also acknowledge that the econometric models used to analyse these lead-lag relationships between interest rates and housing starts cannot be determined precisely, and to interpret the statistics with caution (Clemhout and Neftci, 1981).

These studies are now quite old and likely not as relevant. However, the relationship between interest rates and housing, all else equal, seems to have persisted to some extent as more current studies have found similar results.

Catte et. al.'s (2004) empirical research suggests that interest rates affect housing investment directly. Observed wide differences in the speed and strength of the statistical relationship between interest rates and house price movements. They find that the impact of interest rates is both stronger and more rapid in countries with more developed mortgage markets.

There is also evidence that inflation expectations are a determinant of house price variation, across countries house price variability is found to be correlated with inflation variability, however this effect is diminished in low-inflation environments (Catte et al., 2004). It is also important to note that the behaviour in relation to responses to interest rates changes varies across different cycles and countries.

In more recent studies, Wachter (2016) finds that despite the conceptual importance of interest rates, empirical studies place little significance on the impact of borrowing costs as measured by interest rates and mortgage costs on housing prices, but rather support that economic fundamentals as real income, GDP and population growth have a large effect on house prices. Instead of interest rates, recent literature finds the supply of mortgage credit to drive house prices.

4.7   Behavioral Factors

This section inspects how culture, media and behavioural biases may affect the ability of housing starts and residential investment to portray consistent, realistic expectations for future GDP growth. While this thesis lays a lot of evidence for as to why consumers treat housing differently from other financial assets, it is reasonable to assume that similar considerations are taken when assessing the financial soundness of purchasing a home, as there is for a larger financial investment. Prospective home buyers likely have expectations of their investments future cash flows, or price development, making them likewise vulnerable to behavioural biases, which in aggregate, have drastic effects on our hypothesis and research questions.

Anundsen and Jansen (2013) find that in Norwegian households' expectations about future development in their own income and future broader economic conditions have a significant effect on housing price growth. It is reasonable to assume this phenomenon applies to the U.S. as well. Home prices affect the wealth effects homeowners

experience, if prices do not reflect fundamentals, it may lead to consumption that is not based on a sound economic foundation.

Lenders' perception of risk involving mortgage loans is likely affected by whether, or the way in which, such products are marketed and presented to them. Catte et. al. (2004) found that in the US, mortgage products designed specifically for housing equity withdrawal were widely marketed. It is reasonable to assume the marketing of products to influence the "consumption" these products. However, as analysed in Chapter 4.5.1, housing is not a commodity like any other (Hannsgen, 2007), therefore, these marketing practices may be bad practice, encouraging reckless behaviour with far deeper repercussions on US housing than anticipated.

Also, if housing starts are driven by "Ponzi" or "speculative" -financing, meaning that it is not based on steady streams of risk-free income, but rather on the expectations of future growth in income, or even unrealistic expectations of potential future income, then the effect on future consumption may be exactly the reverse. This would lead to a recessionary period rather than growth, as the mortgages supplied to consumers will likely result in a net decrease in homeownership due to increase in foreclosures, as happened in the wake of the subprime crisis.

Ponzi finance is pushed by the profit-seeking financial institutions and system. The institutions encourage consumers to take advantage of low variable rate mortgages and loans, encouraging a short-term view whilst understanding that future interest rate hikes could mean that the borrowers are unable to service the debt (Anders, 2005). The deregulated system sought by the neoclassical theorists created the potential for a massive systemic failure, the likes of which we saw unfold in the subprime mortgage crisis of 2007. Minsky (1975) argued that this "Ponzi finance" was a likely outcome of a period of economic exuberance, which would eventually lead to a crisis, and likely a recession.

Minsky's (1975) financial fragility theory further claims that the innate human tendencies of greed, social contagion/herd behaviour and over-optimism subject the economy to one crisis after another. Each time the "faulty system" is fixed, the profit motive and need to outwit regulators and competition spur on innovation that inevitably leads to a disastrous burst. As government regulation is notoriously slow and backwards looking,

it is unlikely that the next crisis involving housing will be enabled via the exact same channels, but rather through some new, once more complex instrument.

Minsky (1975) thus naturally opposes the market-oriented optimists who believe financial liberalization to allow people to borrow during recessions, consuming out of their lifetime income and smoothing their expenditure, but rather believing that easy credit will no longer be around to cushion the impact.

To support Leamer's (2007) argument that prices reflect a volume cycle, not a price cycle, Muellbauer and Murphy (1997) find an "anchoring effect", where lagged house price changes are a significant explanatory variable for the current level of house prices, supporting the hypothesis for a "regret avoidance" behavioural bias Leamer (2007) explained, where homeowners refuse to sell for less than they bought because they "anchor" to its purchase value and refuse to sell at a loss.

The housing market's special characteristics such as the absence of derivatives and short-selling, low transaction frequency, paired with extreme heterogeneity and indivisibility of the underlying asset, exacerbate informational problems, and make housing prices more prone to have prices depart from fundamentals (Catte et. al., 2004; Cho, 1996). An instrument to short sell real estate has been argued to mitigate bubbles, (Levitin et. al., 2012) although as we have found housing to be a greatly unique asset (Hannsgen, 2007), allowing easy access to short-selling residential real estate could prove to be precarious, for largely the same reasons as to why it should not be forced to fit into the modern neoclassical economic theory, or treated as an commodity like any other.

Studies on the contribution of media and economists' analyses of the housing crisis of 2007 found that the economists from major real-estate trade associations and GSEs like Freddie Mac and Fannie Mae had far more "bullish", optimistic views on the future developments of home prices, with 86.1% predicting strong home-price appreciation to continue, or to keep a normal single-digit rate, at a time when only 48.9% of other economists agreed (Starr, 2012: 153). In all cases, the difference between economists from the real-estate industry and others were statistically significant at a 5% level or greater. The size and direction of these biases reflect concerted efforts to influence public opinion concerning the housing market, and the existence of a "bubble" (Starr, 2012).

Ashiya (2009) finds that forecasters' professional connections and affiliations shape their incentives, making them vulnerable to "wishful expectations hypothesis", where variables are predicted to change to their, or their employers' benefit, the "publicity hypothesis" where the forecasters' main goal is to be published, and the "signalling hypothesis" where the forecaster attempts to make predictions distant from the consensus to stand out as "able".

Starr (2012) also found the real-estate industry to make deliberate efforts in bad faith to manipulate consumers' expectations towards home-buying, despite house prices depreciating at a double-digit rate at the time in 2008. These efforts promoted the "availability" (Kahneman and Tversky, 1973) of a possibility for a continuously rising housing market by attempting to display that there was "no consensus" on the issue. Case and Shiller (2003) found that home buyers had unrealistic expectations about future prices and conducted surveys in four US cities which confirmed that buyers' expectations of large long-term capital gains and low perceived risk played an important role in housing demand during rising prices, indicating that the real-estate industry economists' efforts have likely been successful in influencing consumer behaviour.

The author argues that housing starts, much like stock prices and other tradeable investment vehicles, can depart from fundamentals during times of "irrational exuberance" (Shiller, 2000), noting that for example, periods of high housing growth can cause self-reinforcing economy-wide boom psychology (Shiller, 2007). Also the prevalence of speculative, risky financing may depict an unrealistically bright future, while in reality possibly leading to a net contraction in homeownership and related demand over the long-run, making the culture and behavioural climate surrounding housing and mortgage demand an important input when considering the ability of housing to estimate long-term effects on GDP.

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5   Conclusions

After undertaking exhaustive analysis and literature review for factors that shape business cycles and US housing, and to answer the research questions "Are US housing starts significant in business cycle forecasting, and if so, why?" and "What factors influence US housing starts' effectiveness in predicting business cycles?"

For our first research question we can simply answer Yes, as housing starts are often associated with many wealth effects and consumption multipliers while housing also accounting for a large component of both consumer budget/source of cash, and asset portfolio.

Answering the second question is not quite as straight forward.

From the first two chapters we conclude that a more granular, MSA and regional level considerations of risk contexts such as the differing vulnerabilities of employment, income and housing in relation to changes in household composition can shape the demand side of housing in a multitude of scenarios. Likewise, the changes in the population structure, age distribution or headship rates among demographics are an important consideration when inspecting housing starts and extrapolating the future aggregate economic consequences, especially in conjunction with the mentioned differences in risk contexts.

In the following chapters we find that mortgage markets themselves have a tremendous effect on the wealth effects experienced by homeowners, and the stability of the overall housing market due to their influence on the types of mortgages, amounts and terms. Mortgage supply availability and market "completeness" were found to be the greatest channels to enable consuming out of housing equity, however mortgage lending at a beyond socially optimal level would produce results in the exact reverse. In these chapters we conclude that, mortgage markets and GSE's both drastically shape US housing markets, once again, having a profound effect on the reliability of housing starts as a leading indicator.

We also find that government supported entities and the ideologies and policies pushed through them can similarly influence the markets for mortgages and our research question.

We find that prevailing economic theory can affect by the development of markets by becoming a self-fulfilling prophecy, driving policies for good or worse. Economic theories also have an influence through the research and models built on them, thus it is important to understand the limitations and assumptions they are subject to, and the repercussions for the models at times when they are not met. Economic theory itself does not seem to be a direct influencer on our research questions, but rather can have some long-term consequences.

We also find that for mortgage markets and house prices, the behavioural and cultural "climate" can be expected to have a great influence on housing prices and thus construction behaviour, possibly distorting the market, possible resulting in a bubble. Residential investment that is driven by "Ponzi financing", forecasts of demand departing from fundamentals and/or biased real-estate economists' reports are great examples for situations where, if analysed, our factors would likely foresee the true direction for GDP and the business cycle, beyond the immediate short-term that would be implied by the data on housing starts.

These conclusions strongly emphasize the importance of having a comprehensive understanding of the prevailing market conditions and looking at developments in residential investment beyond the immediate numbers and their statistical implications at first glance, as if only one or a few of these factors are accounted for, one is highly likely to miss out on valuable insights which are only gained when observing increasingly larger parts of the big picture.

In a larger sense, we come to the rather anticlimactic conclusion that all the topics studied in the Analysis and Results chapter, play their own part, and contribute in some way to the ability of using housing starts and residential investment to predict the business cycles and aggregate economy. Some factors may affect more immediately and directly, while others in more discrete and indirect ways.

As previously discussed in this thesis, any observable causal relationship is unlikely to remain the same throughout the years, or to apply in all circumstances. As the world in which we live in is everchanging, so are the causal relationships between the factors we have investigated, and many others unidentified here. The reliability and validity of our results and analysis concluded here are thus likely to change over time, and further research on the topics will likely prove highly fruitful, especially as some time has passed.

Reflecting on this thesis, the author would love to see some further research on the topic of mortgage market "completeness", especially in relation to the observed externalities that arise when mortgages are artificially oversupplied due to misaligned incentives and behavioural biases. Research on this could find suggestions or guidelines, leading to an attempt to find "optimal" type, or level of mortgage lending, which would likely prove highly useful for future policy making with regards to US housing and mortgage finance.

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