

UDC 332

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Between a Rock and a Hard Place: Economic Sustainability Challenges of the Housing Market. Case of Australia

The housing market plays an important role in any economy, and it is quite often the source of economic concerns. Right now, due to the rise of interest rates across the world, including in most European countries, the US, Australia, and Canada, the concern about the housing market's financial sustainability is one of the most debated economic problems. In this paper, we investigate the mutual interdependence of supply, demand, housing prices, and mortgage loans in Australia. The main goal is to test if simple market logic, where demand drives supply, can be applied to the housing market while simultaneously evaluating the impact of mortgage loan rise on this market. Our research provides valuable insights for understanding the complex behavior of the factors, with a set of rather surprising results.

Keywords: mortgage loan, housing prices, VAR

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Introduction

There are three fundamental economic differences of the housing market compared to any other market. First, in most countries, the housing market combines consumer and investment interests, meaning that people buy houses for two main reasons: to live there (hereinafter called "occupiers") and to generate investment returns (hereinafter called "investors"). It is rarely mentioned in the literature that these groups have opposite economic goals when it comes to the price dynamics of housing. Occupiers act as typical consumers on the market, preferring price decrease or at least price stability. Investors are

usually betting exclusively on the price increase. Even more so, the higher the prices, the more investment incentives there are in the market.

Second, in the past 40 years in Australia, as well as in the US, Canada, and the UK, there has been an astonishing increase in the share of houses that are financed through mortgage loans. This significantly changed the demand for housing. In this paper, we investigate the impact of mortgage loans on the supply of new housing and housing prices.

Finally, the third key feature of the housing market is that the supply of new houses is often

constrained by various factors that are beyond the control of the suppliers (mostly regulation and infrastructure). This means that, unlike most consumer markets where suppliers are fast to respond to the increased demand by increasing the supply, it is not that easy with housing markets. This also explains the fact that most housing problems appear in large cities while rural areas rarely experience imbalances. In fact, in this paper, by “Australian housing market,” we mean the housing market of the eight largest Australian cities, which account for almost all housing price volatility in the country (explained in detail in Data section of this paper).

The housing market in many countries is a source of major concern due to significant price volatility. (Specifically, various housing market “crises” hit Canada [1], Australia [2], and the US [3] in recent years.) The substantial amount of mortgage loans makes price volatility even more impactful, and it often feels like the market is stuck between a rock and a hard place: with price decreases hurting investors and lenders while price increases hurt occupiers. In recent decades, there have been quite a few fundamental changes in the housing market of Australia that we would like to investigate in our paper. First, the dramatic increase in mortgage loans. As evident from Figure 1 below, the mortgage loans growth has outperformed any other major economic indicator. This coincided with two other major changes: a significant housing price increase and a decrease in interest rates. While it is

natural to assume a strong relationship between these processes, and some empirical research was done on this problem [4], there is quite a gap in the literature on this topic, and the goal of this paper is to narrow that gap as we study the interdependence of the factors using vector autoregression (VAR). This unique method is capable of providing major insights into how each of the factors impacts each other.

While we study Australia, it is important to acknowledge that many other developed countries experience similar trends. However, Australia has two important differences. Firstly, it is rather a stable economy with less exogenous macroeconomic shocks relative to the US, UK, and other countries; secondly, the Australian real estate market has been experiencing a crisis since 2018, which is a direct result of the issues analyzed in this paper. The second one is particularly important as such crises could happen in other countries eventually because the underlying economic fundamentals are similar.

As evident from Figures 1 and 2, in the period from June 1990 to June 2021, mortgage loans in Australia have increased 35 times while wages have grown only 2.8 times. An interesting fact is that housing prices in Australia for the period have increased 6 times, which is a significant increase compared to wages but, at the same time, much lower than the mortgage loans surge. The period was also characterized by a dramatic decrease in the mortgage interest rate, from 17% to 2.8%, according to the Reserve Bank

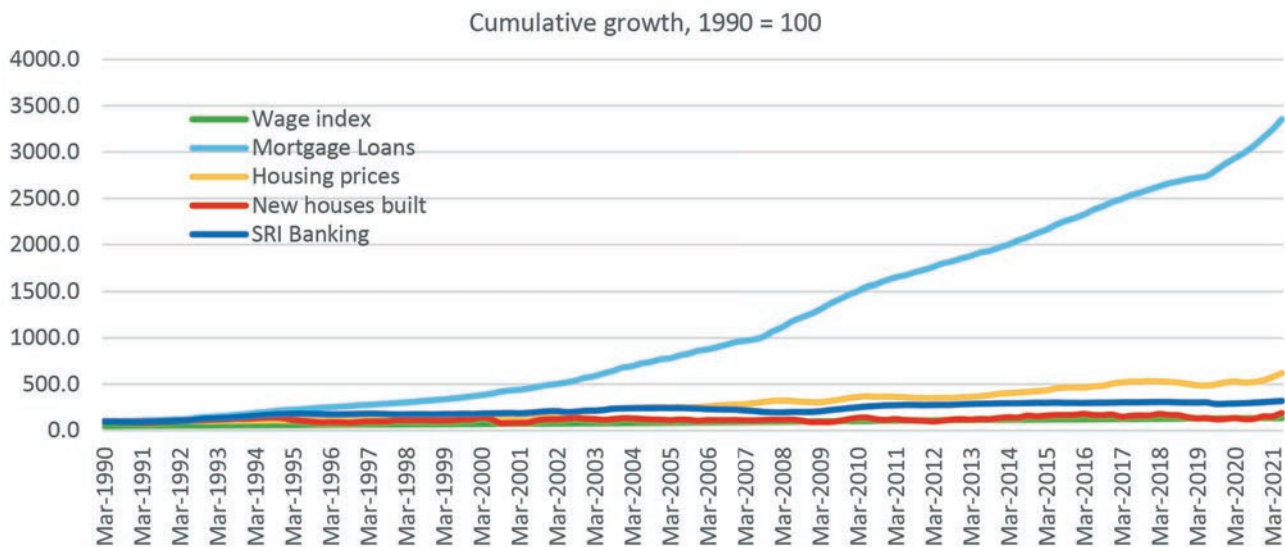


Fig. 1. Major indicators of the Australian real estate market

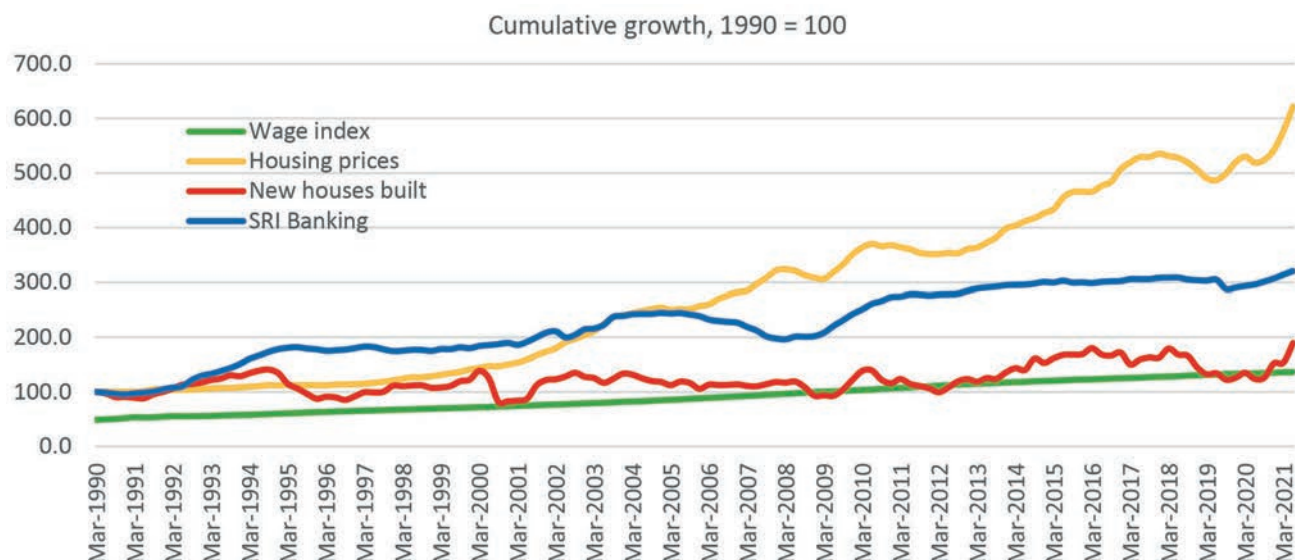


Fig. 2. Major indicators of the Australian real estate market (mortgage loans excluded)

of Australia (RBA) and the Australian Bureau of Statistics (ABS). Although it is naturally positive for consumers, this decrease was offset by the growing amount of mortgage loans, meaning, in the aggregate, the total monthly annuity payments of the entire population increased significantly. (This does not mean that all consumers are worse off but it means that on aggregate the population has to pay more in the interest rate payments than before; naturally it is due to rising housing prices (higher amount of principle) and more people having mortgages vs. buying using savings.)

This paper aims to analyze these dynamics, identify the interdependence of the different characteristics of the housing market, and provide an empirical basis for understanding whether the existing housing market trend is sustainable and, the role of economic policies in this process now, and what could be improved. However, before that, we discuss how traditional economists view the housing market and identify some problems related to this common view.

First, we focus on the demand for housing. It consists of two major types of buyers: consumers, also called occupiers, and "investors," who are, in fact, speculators as they buy real estate with expectations of its price to increase often without creating any added value. In fact, the term "investors" is part of the problem we are investigating as it is misleading. Usually, investors are associated with allocating capital to create value and generate profit. However, buying

readymade real estate has nothing to do with creating value but rather is a bet on the future price increase of the same asset. This process is normally defined as speculation [5–6]. The literature rarely mentions that consumers and speculators have opposite preferences about the market, as consumers win from price decreases and speculators win from price increases. This is true not only for the real estate market but also for any market with a lack of supply and speculators.

From 1990 to 2021, housing prices in Australia increased 5 times, outperforming the Australian stock market (~4 times), attracting more and more speculators (see Figure 3). Such a situation can develop into a bubble, and considering that speculators are leveraged, this bubble could become a systemic crisis, according to the Financial Instability Hypothesis [7]. In fact, the Systemic Risk Index [8] for Australia indicated a significant level of concern back in 2017 (based on data up to 2016). So, although the price increase is often positioned as a "good investment opportunity," it is associated with increased systemic risk and might result in a nationwide economic crisis.

Moreover, here we come to the second part of the market, the supply. Traditional neoclassical economists believe that the housing market, like any other market, should respond to a price increase with an increase in supply. While it is a reasonable expectation, it is also common knowledge that the expansion of housing construction is challenged not only by cost and benefit analysis but by many qualitative factors

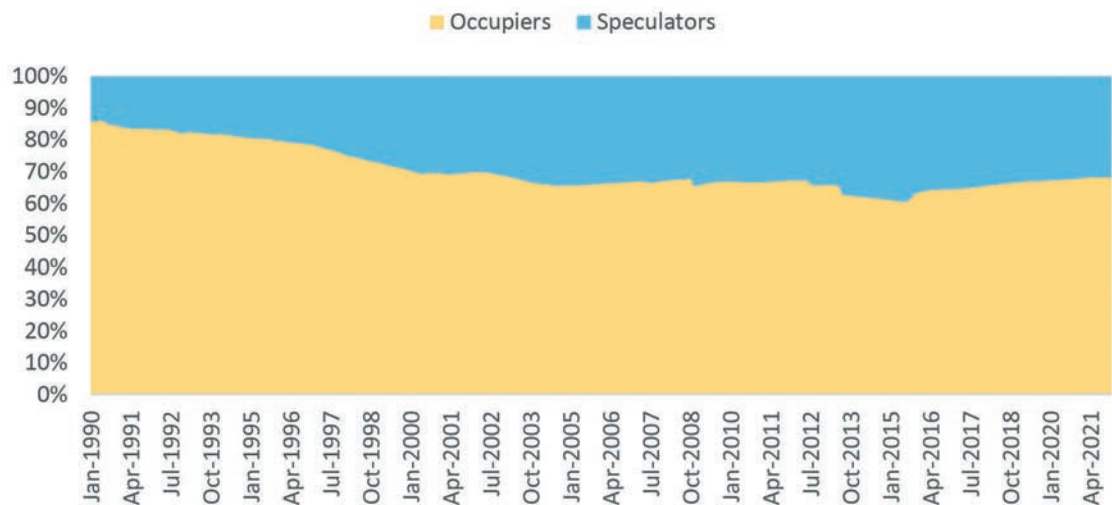


Fig. 3. Mortgage loan market structure

like legal restrictions and infrastructure. One of the research questions we ask in this paper is how the supply of new houses responds to price shocks and mortgage loans.

To summarize, in this paper, we try to answer the questions regarding housing market dynamics between 1990 and 2021 in Australia, including the interactions between mortgage loans and housing prices, in other words, do mortgage loans affect housing prices, and do housing prices affect mortgage loans?; the interactions between mortgage loans and construction of the new house, that is, do mortgage loans affect the construction of new houses, and does the construction of the new houses affect mortgage loans?; and how did the decrease in mortgage interest rates affect mortgage loans, prices, and the supply of new houses? Then, we use answers to these questions to develop an economic policy recommendation to help make the Australian housing market more sustainable.

Such problems when the direction of the impact is unclear, or there is even mutual interdependence, and likely time lags present significant challenges for empirical analysis as traditional regression methods will not work. Instead, we will use vector autoregression (VAR). The empirical results show that the supply of new houses seems so disconnected from the demand and housing prices that we failed to find any statistical relationship between the three.

The remainder of this article is organized as follows. Section 2 comprehensively reviews the literature. Section 3 describes the data. Section 4 introduces the empirical model. Section 5 details

the empirical results and discussions. Section 6 provides conclusions.

Literature Review

Research related to our study could be divided into two groups. In the first group, we have papers that are focused on mortgage loans, interest rates, and, to less extent, housing prices. In this group, a number of papers, such as Zerbst and Brueggeman [9], Ferrero, Harrison, and Nelson [10], and Kinghan, McCarthy, and O’Toole [11] are dedicated to the theoretical models on how interest rates and lending conditions (loan-to-value ratio and prudential banking policies) should affect housing prices. To a large extent, this paper challenges the common assumptions about the economic efficiency of the housing market in this literature [12–14]. The assumptions could be simplified to the following: changes in interest rates are the main, if not the only, factor that affects the supply of mortgage loans; mortgage loans do not affect housing prices as the increased demand is matched by increased supply. At the same time, there is a number of empirical papers, mostly focusing on housing affordability, primarily Pawson, Milligan and Yates [15] and Yates [4]. These papers confirm that housing affordability worsened significantly due to significant price increases. The housing prices increase in all of the studies is so significant that neither income growth nor interest rate decrease does not compensate for it.

In the second group, there are works that target housing supply or “new houses built,” as it is

called in many statistical reports. Here, the most notable works are Glaeser, Gyourko, and Saiz [16] and Glaeser, Gyourko, and Saks [17], where, among other things, they indicated the impact of regulatory policies on housing supply, specifically in large cities. Their work indicates certain market inefficiency where increased demand for housing is not met with increased supply due to increased regulatory pressure that does not allow building new houses that easily. This idea can explain that the market inefficiency we are focused on in this paper is observed only in urban areas. In fact, according to the official statistics, housing demand, supply, and prices have remained almost unchanged in rural areas and small cities (defined as cities with a population of less than 150,000 people) of Australia for the past 30 years, and so are excluded from this study, similarly to most of the other works in this field.

In this paper, we perform a complex empirical analysis of interest rates, mortgage loans, housing prices, and housing supply in Australia, thus building a bridge between the studies of supply and the studies of the demand for housing. Our main goal is to identify the significance and the direction of the mutual interdependence of these factors empirically, so policymakers can rely on it while trying to match demand and supply in this market.

Data

This analysis uses the following data: mortgage loans, housing prices, new houses built, mortgage interest rate, and the Systemic Risk Index for Banking (SRIB). *Mortgage loans* are from The Australian Prudential Regulation Authority (APRA) and ABS. Mortgage loans are divided into “occupiers” and “investors.” In statistical analysis, after the unit root test showed non-stationarity, the first differences were taken. After that, the data was proven to be stationary, that is I(1). The notation for the mortgage loans in statistical analysis is “D_ML.”

Housing prices are from ABS. They provide a variety of housing price indexes. In this paper, we use the “Price index of established houses. Weighted average of 8 capital cities”. (codes: A83728456R and A2333613R). It is evident that in Australia, real estate development and price volatility were in large cities (ABS, Residential Property Price Indexes). Rural areas are much

more stable and thus less interesting for analysis. In statistical analysis, after the unit root test showed non-stationarity, the first differences were taken. After that, the data was proven to be stationary, that is I(1). The notation for the housing prices in statistical analysis is “D_HP.”

About *New houses were built*, we use ABS data on residential housing. In particular, we use the “Dwelling units commenced” series. For us, it is important to capture the impact of market factors on decisions to build new houses rather than the actual number of houses completed. The notation for our statistical analysis is NHB.

Mortgage interest rate are from the RBA and ABS. In our statistical analysis, it is marked as “MIR.” *Systemic Risk Index for Banking (SRIB)* was developed in [8] as a component of a larger integrated indicator of the systemic risk of a country. SRIB includes the ratio of total loans to total household income and the ratio of business loans (considered to be productive and thus contributing to the reduction of the systemic risk) to consumer loans (considered non-productive and thus contributing to the increase of the systemic risk). A detailed description of the index can be found in [8]. All data sets are quarterly from March 1990 till Jun 2021. Summary statistics of the data used in the VAR analysis is shown in Table 1.

Methodology

For this analysis, we are using VAR as it allows for treating all variables as endogenous and, at the same time [18]. This allows for capturing the mutual interdependence of the factors. We specify our model as follows:

$$Z_t = \Gamma_0 + \Gamma_1 Z_{(t-1)} + \Gamma_2 Z_{(t-2)} + \Gamma_3 Z_{(t-3)} + \theta_t + e_t(1)$$

where is a five-variable vector {MIR, D_ML, SRIB, D_HP, NHB} as described in the Data above; Γ_t is the coefficient matrix; θ_t are time effects; and is the error term.

An important benefit of VAR is analyzing the impacts of the variables with lags. We have chosen to include 4 lags as our data are quarterly, and 4 lags allow us to capture the entire year. At the same time, the response to the impact is traced over 10 periods as a standard VAR application. In addition to lags, VAR allows for time differencing effects θ_t , which are included in the

Table 1. Summary statistics

	ML	HP	NHB	SRIB	MIR
Mean	716.4	278.9	41838.5	1.5	7.5
Median	522.0	256.0	40629.0	1.5	7.0
Standard Dev	590.3	152.8	8139.0	0.4	2.6
Minimum	61.6	100.1	27885.0	0.6	2.8
Maximum	2066.1	622.4	64596.0	2.1	17.0
Number of Observations	126	126	126	126	126

model (1) to capture any macroeconomic shocks that simultaneously affect all the variables.

The main part of VAR analysis is estimating the impact of the shock in one variable on another variable while keeping the rest of the variables constant, known as orthogonal shocks estimation. This is done using impulse-response functions (IRFs). However, the ordering of variables in the VAR analysis might not be independent of the empirical results [19]. To deal with this issue, a specific variable ordering should be introduced. It will allocate any correlation between the residuals of any two variables to the one that comes first in the ordering. This means that the identifying assumption of such ordering is that the variable that comes earlier in the ordering affects the following variables simultaneously. The variables that come later impact previous variables only with a lag of one period. So, for VAR to work, we have to make an arbitrary order selection based on economic logic. First, we believe the interest rate should come first as it is largely determined by the country’s monetary policy, not by the real estate market. Second, we will have mortgage loans as they should have the fastest response to changes in interest rates. After that, SRI Banking will go as it reacts simultaneously to mortgage loan changes. In position #4, we will have housing prices that can react to changes in mortgage loans and interest rates. Finally, New Houses Built will go last as construction companies will likely take some time to transform market shocks into decisions to build new houses. To summarize, the ordering for the main model will be the following: MIR, D_ML, SRIB, D_HP, and NHB. So, the impact of the shock in the interest rates (#1) on new housing (#5) will be captured with 4 and above lags.

IRFs are a graphical representation of the response of one variable (response variable) to

one standard deviation shock in another variable (impulse variable) over 10 periods. The matrix of impulse-response functions is obtained from estimating VAR coefficients, so their standard errors should be considered. 95% confidence intervals of the response are generated using 100 Monte-Carlo simulations. IRFs are a key part of the VAR analysis. The graphs have two lines and two confidence intervals. The blue line and its grey 95% confidence interval represent the response in each of the 10 time periods analyzed (simultaneous, 1st quarter, 2nd quarter, and so on). The Red line and a yellow 95% confidence interval represent cumulative response over the period of time (simultaneous, then simultaneous + 1st quarter, and so on). Both are important as sometimes one variable has a significant positive impact on another, but then it turns negative, and the cumulative impact nets to zero. At the same time, there could be a minor but very consistent long-term impact that will look close to insignificant in each period of time, but the cumulative impact will be significant. If the confidence interval includes zero, the result is generally insignificant in both cases. If the result is negative, it means the impact is reversed, and an increase in the impulse variable causes a decrease in the response variable.

Empirical Results and Discussions

Do Mortgage Loans Affect Housing Prices, and Do Housing Prices Affect Mortgage Loans?

From Figure 4, the graphical analysis shows that mortgage loans and housing prices are almost constantly increasing during the 30-year period analyzed. Hence, it is rather hard to figure out intuitively if there is any impact. However, what is interesting is that the increase in mort-

gage loans is 7 times higher than the increase in housing prices (Figure 4), which means that the price increase alone cannot be responsible for the increase in mortgage loans. To investigate mutual interdependence on a deeper level, we turn to our VAR analysis.

Based on the result of the VAR analysis, it is evident that mortgage loans have no statistically significant impact on housing prices (see Figures 5 and 6). (Reminder: both mortgage loans and housing prices are taken in first differences to deal with non-stationarity, so to be precise it is the impact of mortgage loans growth on housing prices growth.) It is quite surprising, as

our original intuition was that mortgage loans create competition among consumers and thus drive prices up. This result contributes to the main conclusion we illustrate in this paper: the real estate market's supply, demand, and prices are rather disconnected, and common economic logic is hardly applicable.

Do Mortgage Loans Affect the Construction of New Houses, and Does the Construction of the New Houses Affect Mortgage Loans?

From Figure 7, it is by far the most interesting result of the entire paper, as even graphical analysis reveals completely different patterns of

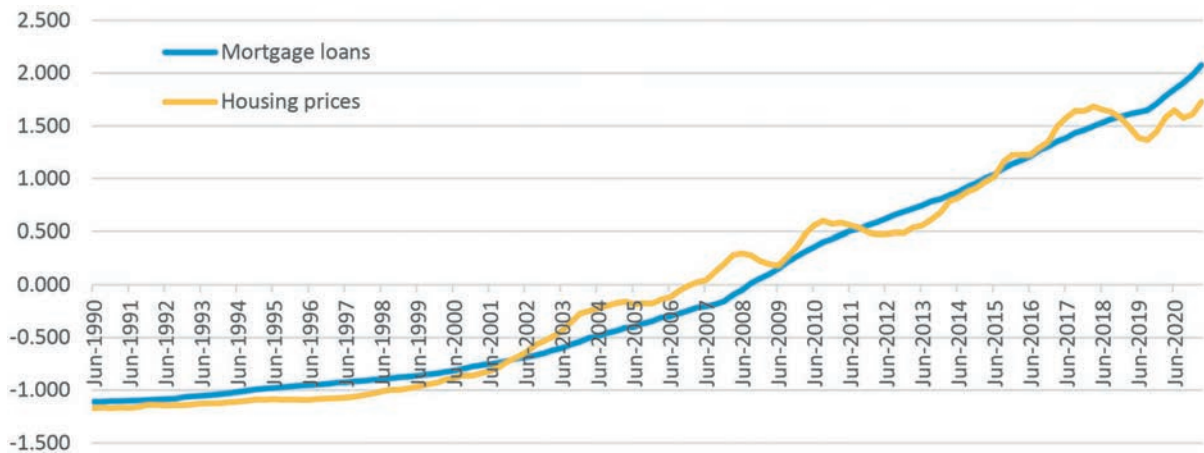


Fig. 4. Mortgage loans and housing prices volatility (z-scores)

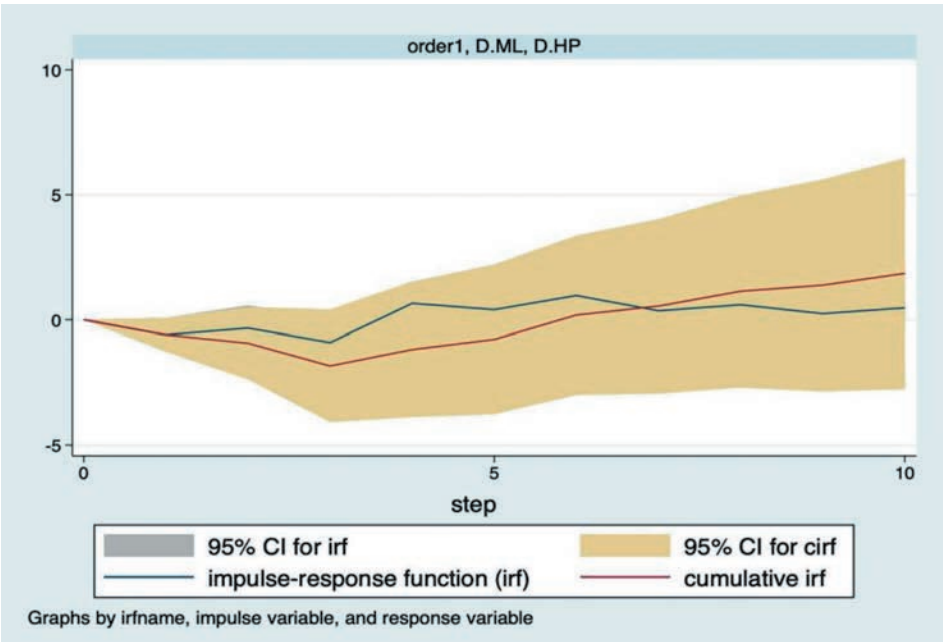


Fig. 5. Impact of ML on HP

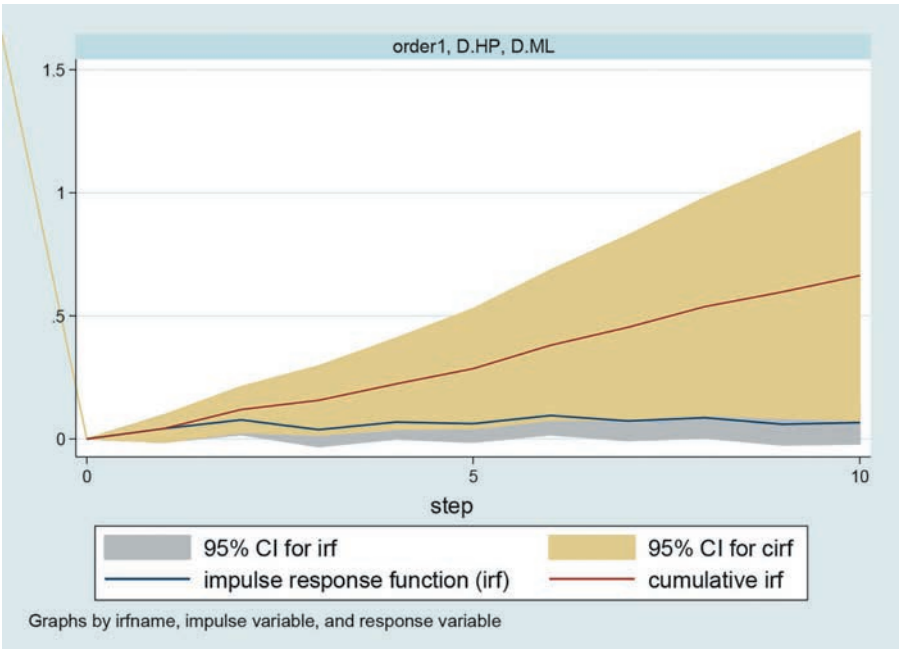


Fig. 6. Impact of HP on ML

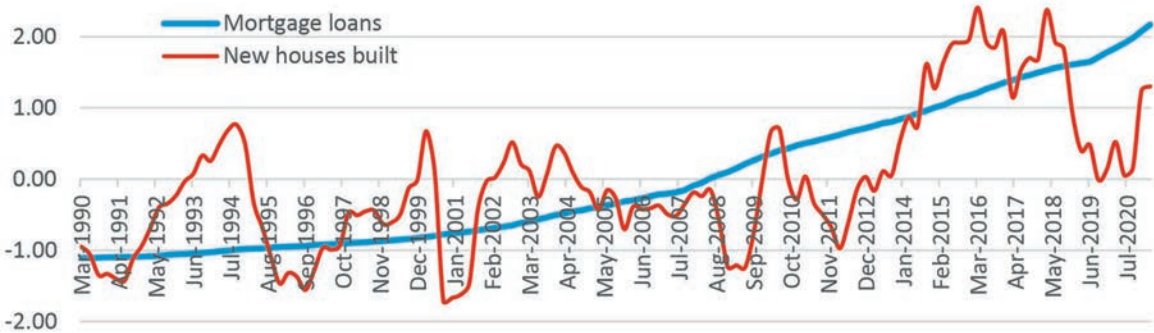


Fig. 7. Mortgage loans and new houses built volatility (z-scores)

mortgage loans and new houses built. While, as was mentioned above, mortgage loans went up 34 times in 30 years, new houses built increased only by 89% (50 percentage points of which were added just in the last 2 years). The pattern of New Houses Built is also very different from mortgage loans as there were few significant drops in construction over the last 30 years: 1994–1995, 2001, 2008–2009, and recently, 2019.

Based on the result of the VAR analysis, our statistical analysis confirms the intuition from the graphical analysis — there is no significant impact of mortgage loan growth on the construction of new houses and vice versa (see Figures 8 and 9). This contradicts a popular assumption that housing market suppliers respond to a simple demand increase by increasing the quantity of housing.

Do Mortgage Interest Rates Affect Mortgage Loans and Housing Prices?

From Figure 10, one of the key processes taking place in the Australian financial system during the time analyzed is decreased interest rates. All else being equal, it is reasonable to expect that the decrease in interest rates will stimulate mortgage loans to increase as the loans' costs go down. However, it is not confirmed by the data. Instead, we see rather independent processes.

Based on the results of the VAR analysis, our statistical analysis confirms our intuition from the graphical analysis. It is also worth mentioning that VAR captures impact with lags, and we can see that even accounting for that, interest rate does not significantly impact mortgage

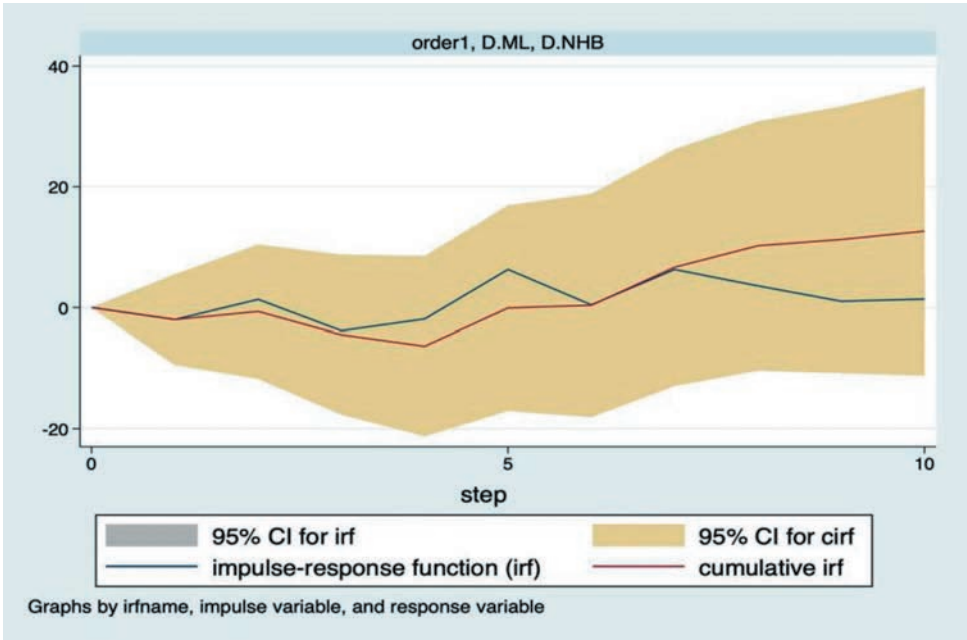


Fig. 8. Impact of ML on NHB

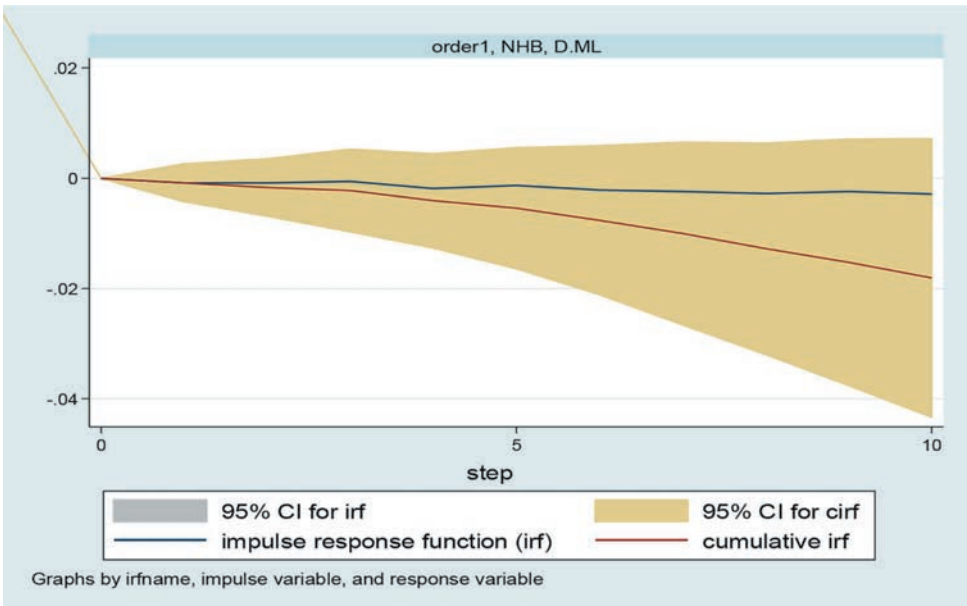


Fig. 9. Impact of NHB on ML

loans (see Figure 11). We also present the impact of the interest rate on housing prices. It is small and mildly significant over time: a decrease in the interest rate will cause an increase in prices (see Figure 12).

Do Mortgage Interest Rates Affect the Supply of New Houses?

From Figure 13, another important result is that the supply of new houses seems to react

consistently to changes in the mortgage interest rate. A decrease in the interest rates seems to precede the periods of new houses increasing, while the rate's increase coincides with a sharp decline in housing. It makes total sense as lower rates allow construction companies to borrow cheaper, and interest rate increases usually precede times of economic instability. Of course, the graphical analysis could not be conclusive and is just an illustration.

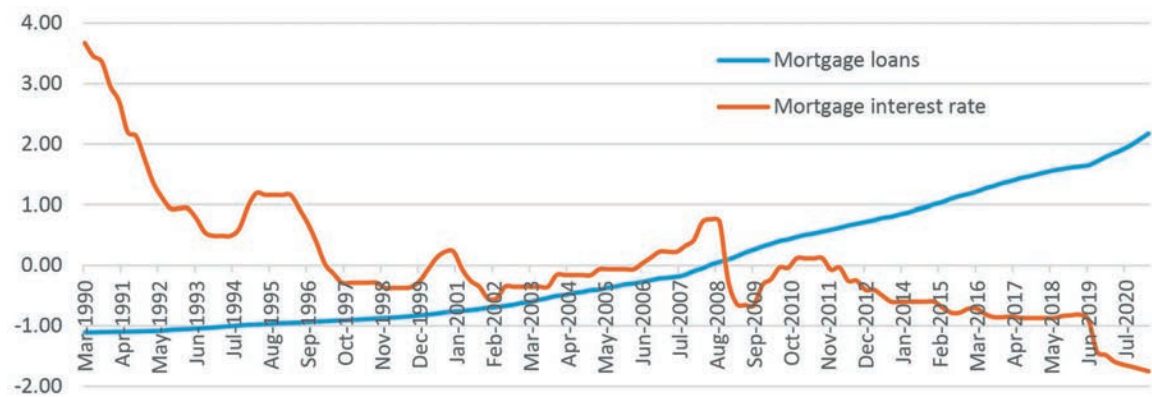


Fig. 10. Mortgage loans and mortgage interest rate volatility (z-scores)

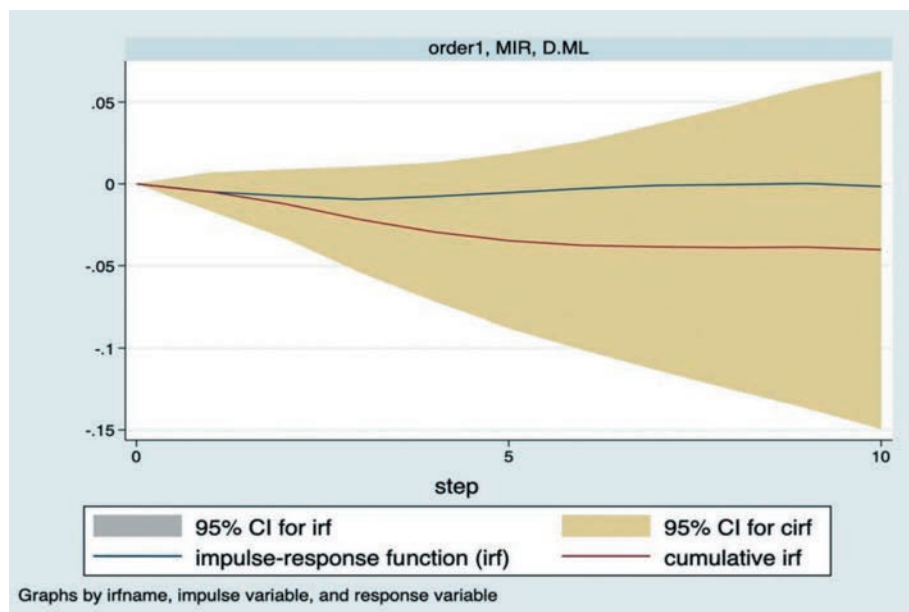


Fig. 11. Impact of MIR on ML

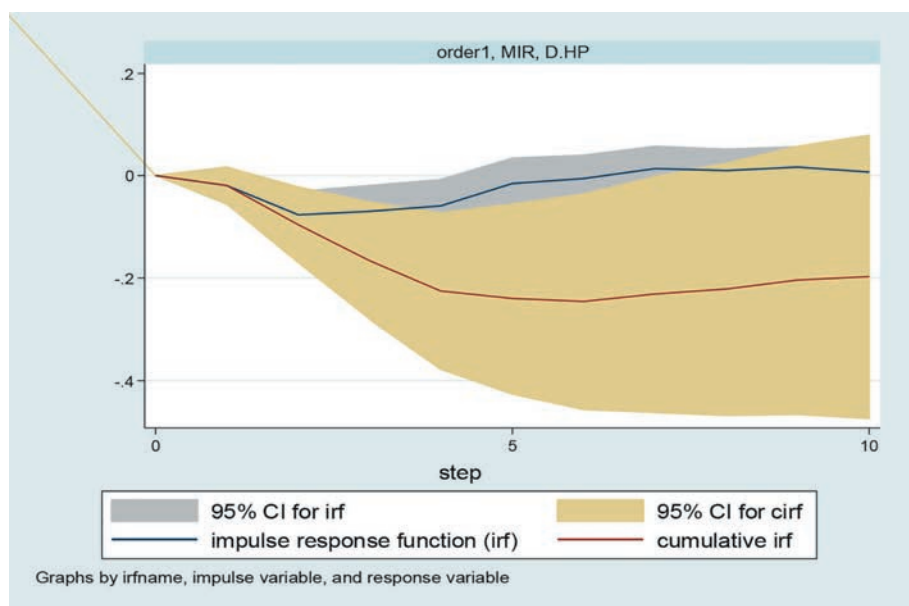


Fig. 12. Impact of MIR on HP

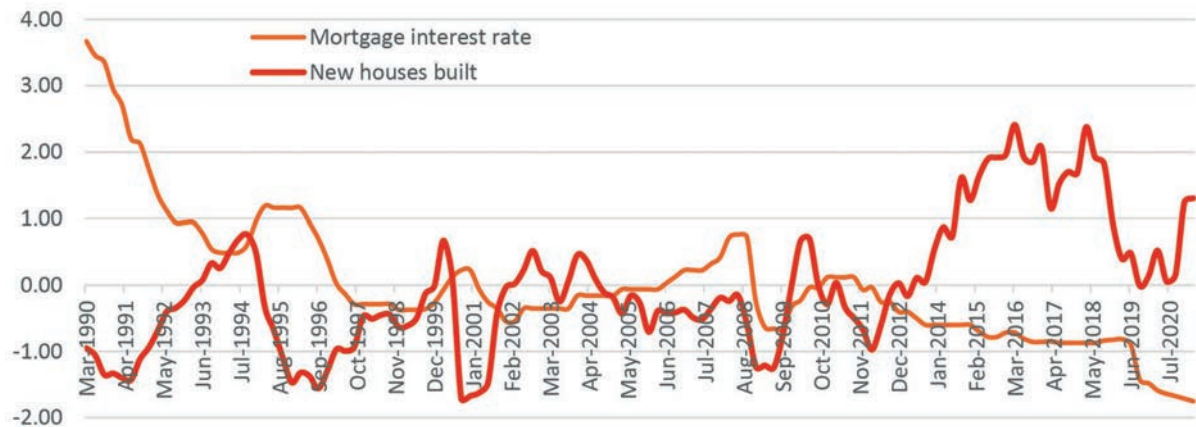


Fig. 13. Mortgage interest rate and new housing volatility (z-values)

Based on the results of VAR analysis, our statistical analysis confirms the intuition described above in the graphical analysis: mortgage rates indeed have a significant and long (see Figure 14).

How do Interest Rates and Mortgage Loans Affect the Systemic Risk of the Banking System?

From Figures 15 and 16, one of the major results of [8] was that mortgage loans in Australia significantly increased its systemic risk index. While from the graphical analysis, it is hard to identify the impact as both mortgage loans and the systemic risk index for banking grew significantly during the period analyzed, our statistical analysis reveals more conclusive results.

As for the impact of the interest rates, it is quite evident that SRI Banking goes up every time there is a decrease in the interest rates. However, it is hard to see if there is a direct relationship between the factors or other variables that simultaneously affect the interest rates and systemic risk. VAR analysis helps to clarify that.

Based on the results of the VAR Analysis, our analysis confirms the significant and very long-lasting (over 2 years) positive impact of mortgage loans on systemic risk. At the same time, interest rates have no significant impact on SRI (see Figures 17 and 18).

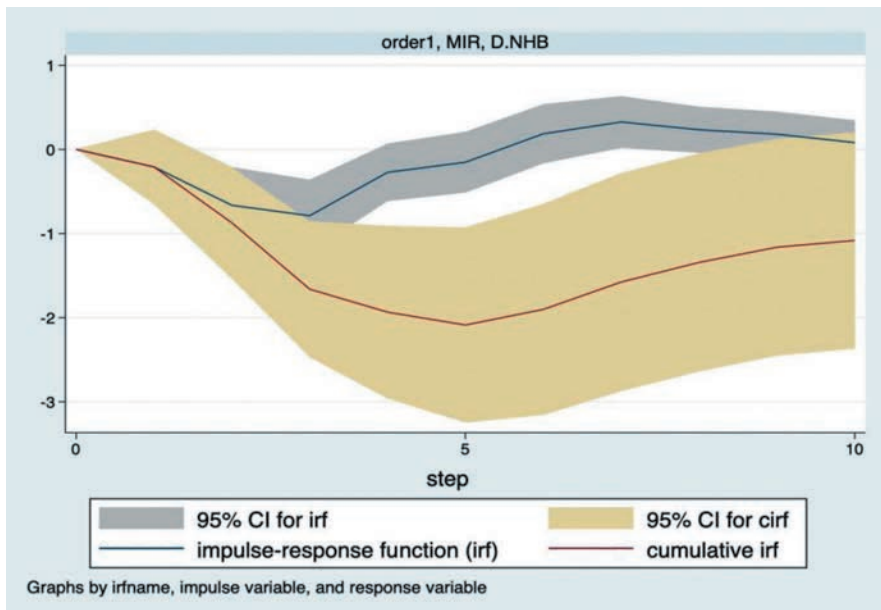


Fig. 14. Impact of MIR on NHB

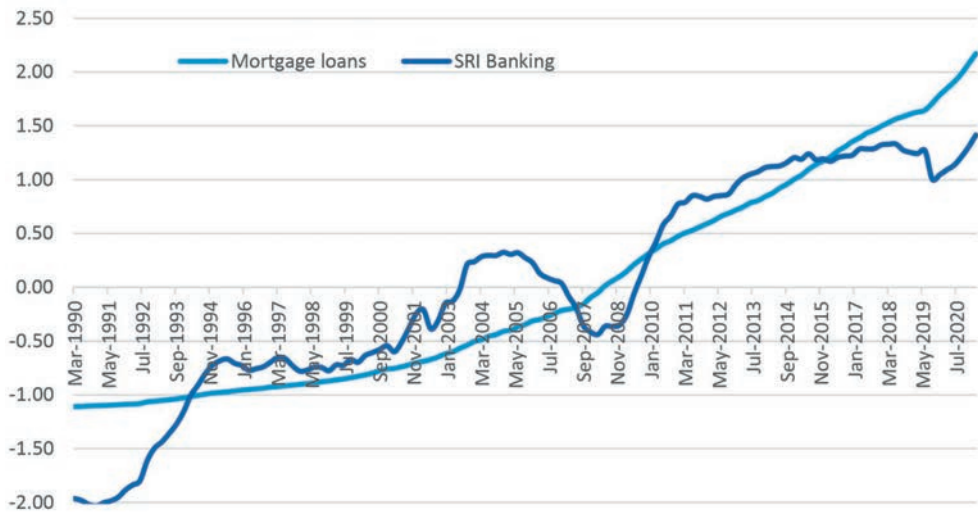


Fig. 15. SRIB and mortgage loans (z-scores)

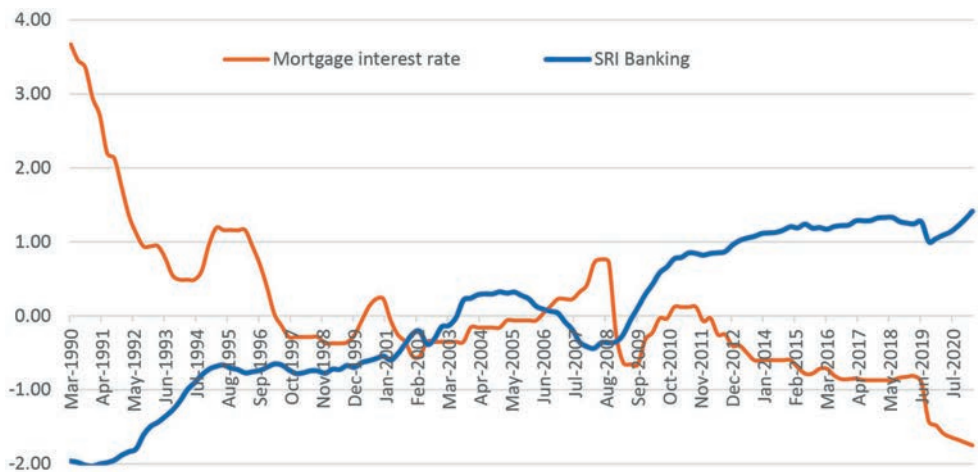


Fig. 16. SRIB and mortgage interest rate (z-scores)

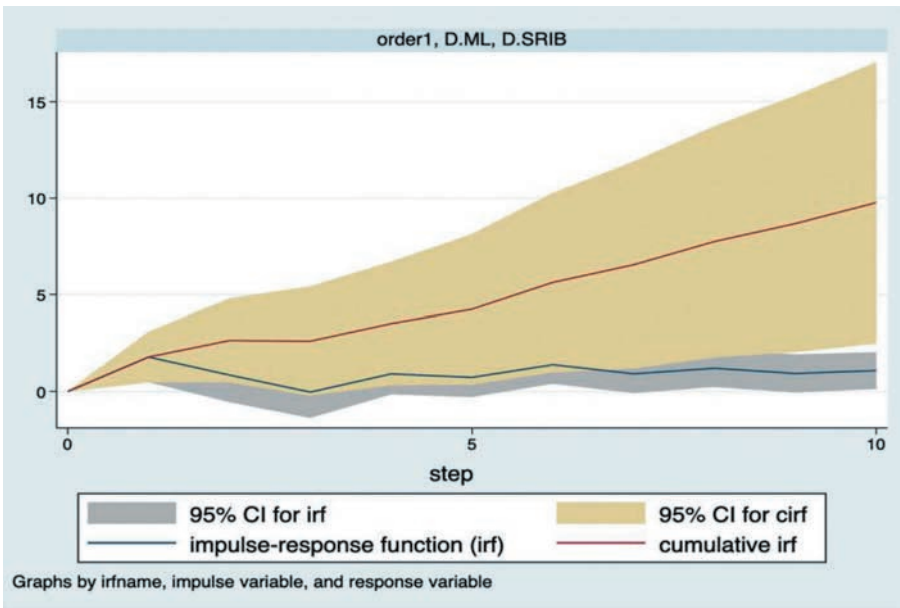


Fig. 17. Impact of ML on SRIB

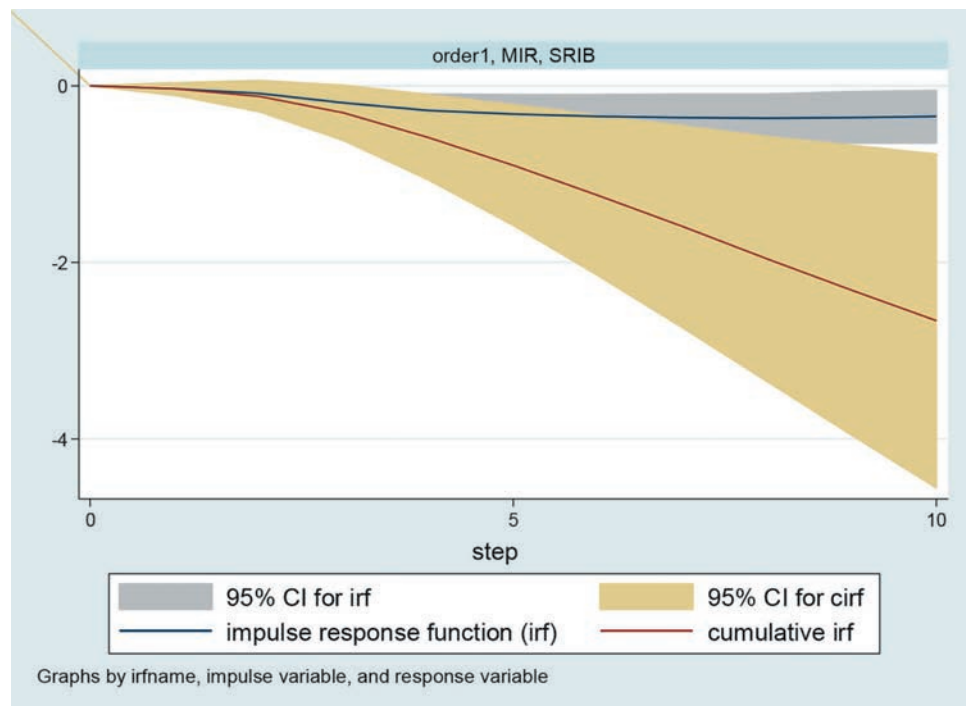


Fig. 18. Impact of MIR on SRIB

Conclusion

The problem of increasing housing prices in Australia, as well as many other developed countries, is well-known and touches almost everyone. Today, with rising interest rates, it has become even more unstable, threatening the financial sustainability of the countries. Providing affordable housing in such an inflationary market is a challenge, and we hope our results will help researchers and policymakers understand the problem better. In this paper, we provided evidence that common assumptions about the market dynamics, like demand driving supply, do not apply to the real estate market in Australia. This contradicts the common assumptions in the literature [12–14]. However, it supports and expands recent empirical research on the subject, such as Pawson and Yates [15] and Yates [4].

In fact, the supply of new houses seems so disconnected from the demand and housing prices that we failed to find any statistical relationship between the three. A natural extension of this paper would be figuring out what, in fact, drives the supply of new housing. However, this question goes beyond the scope of this paper as it requires a different methodological approach.

A place to start, per Glaeser, E. L., Gyourko, J., and Saks, R. E. [17], will be the investigation of construction permits and infrastructure available. At the same time, it is clear that relying on “demand driving supply” logic in this situation is false, and it is unlikely that the availability of mortgage loans will result in new housing being provided.

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Між каменем та наковальнею: загрози ринку нерухомості для сталого економічного розвитку. Приклад Австралії

Ринок нерухомості грає важливу роль у будь-якій економічній системі, і часто стає джерелом економічних проблем. Зокрема зараз через зростання відсоткових ставок у більшості країн Європи, Сполучених Штатах, Австралії та Канаді, зростає стурбованість щодо фінансової стабільності та сталого розвитку. У цій статті ми досліджуємо взаємозалежність попиту, пропозиції, цін та іпотечних кредитів на прикладі Австралії. Головна ціль статті — це перевірити чи звичайна логіка ринкової економіки, що попит мотивує пропозицію, вірна для ринку нерухомості, та оцінити як розповсюдження іпотеки впливає на ці ринкові сили. У статті зібрані результати дослідження, багато з них досить неочікувані, які дозволяють краще зрозуміти комплексність факторів на цьому ринку.

Ключові слова: іпотека, ринок нерухомості, VAR (векторна авторегресія)