Modeling the Effect of Fiscal and Monetary Policy on Housing Price

in Germany between Years 2000 and 2020

Study Program

Master of Business Administration (MBA)

Module: Economics
Assignment: No. 1
Instructor: Prof. Dr. Gerald Mann

Author: Mohamadreza Sabaghian
Student ID Number: 556076

1st Academic Semester 2020

Place, Date: München, May 21, 2020

Executive Summary

Since Keynes published his book ‘ The General Theory of Employment, Interest and Money’, the monetary and fiscal policies are used to stabilize the economies all over the world. A lot of research is conducted to clarify how these policies can affect different sectors of economy. In this work, we focus on the German housing market and how it is related to monetary and fiscal policies. Firstly, we examine the monetary transition channels[1] with the data from German economy from year 2000 t0 2020. Secondly, we use computational macroeconomics to identify a Structured Vector Autoregression (SVAR) model of the system. For this purpose we first choose a set of important variables which can affect the model. Then, under some reasonable assumptions a model is identified which represents the housing market related section of macroeconomics system of Germany in investigated years. Finally, this model is used to identify how every variable in model can affect the rest of the variables. At last, the shortcomings of this model are defined and some suggestions for the improvements in the future are given.

[1] See. *Mishkin, F. S.*, 1996.

Contents

List of abbreviations

SVAR Structured Vector Autoregression

List of Figures

List of Tables

1 Introduction

The need for a shelter is one of the most fundamental needs. The psychological and economical impact of housing on people economy is undeniable. Therefor, housing sector is a major area of interest for both governments and people. Developments in housing market can affect both consumers and credit institutes. Considering its importance, the housing market plays a central role in monetary and fiscal policies of many countries. In order to better under stand this sector of economy, one needs to be able to model it. Models are used to simulate the behavior of the real system for prediction and planning purposes. In this work, we firstly examine an existing well known model in this area with the real data from German economy. Secondly, identify a model from data to get a better understanding of the system.

1.1 Problem Definition

The first step for simulating or controlling a system is to model it. Modeling is equivalent to understanding a system. Housing sector of economy is no exception to this rule. How can governments or central banks respond to a rising house prices? Or what would happen to housing prices if the central bank decides to increase the interest rate. This questions can only be answered if the housing market economy is well understood (modeled).

1.2 Objectives

In this paper we try to explain the relationship between housing price and monetary and fiscal policies in Germany . The major objectives of the study are: Firstly, to explain the behavior of the housing market in relationship to monetary policies in Germany using the previously mentioned housing related monetary transmission channels. Secondly, to analyze the data and derive a model using computational macro economics method SVAR and examine how shocks to different macroeconomics variables affect housing price and housing output.

1.3 Methodology

Firstly the transmission channels proposed by Mishkin[2] illustrated in Figure 1 are used to explain the macro economics and housing related data in Germany. Secondly, an SVAR

[2] See. *Mishkin, F.*, 2007.

model is proposed and identified using the data evidence. Details about each of these two methods are explained in corresponding chapters.

2 Monetary Transition Channels

In his paper[3], Mishkin gives an overview of the transmission mechanisms of monetary policy in economy. Most importatn channels are namely interest rate channel, asset prices and credit channel. In the following sections we review this paper and explain what is ment by every channel.

2.1 Interest Rate

Interest rate channel is explained with the traditional Keynesian ISLM and shows the effects of a monetary expansion as follows:

$$M \uparrow \Longrightarrow r \downarrow \Longrightarrow I \uparrow \Longrightarrow Y \uparrow$$

where $M \uparrow$ indicates expansionary monetary policy which leads to fall in real interest rate r, which lowers the cost of capital, causing rise in investment spending I, therefore resulting in increase in output y[4]. This is equal to a shift to the right of IS curve in IS-LM graph. One should notice that the real interest rate is a function of the nominal interest rate and inflation such that an increase in inflation causes a decrease in real interest rate. As an example even if the nominal interest rate is at a floor zero an increase in money supply can cause an increase in expected price which respectively decreases the real interest rate.

2.2 Asset Price Channels

Exchange Rate: According to Mishkin[5] the exchange rate channel can be illustrated as follows:

$$M \uparrow \Longrightarrow r \downarrow \Longrightarrow E \downarrow \Longrightarrow NX \uparrow Y \uparrow$$

An expansionary monetary policy least to fall in domestic real interest rate. As a consequence domestic currency$E$ becomes less attractive in comparison to other currencies. Depreciated currency makes domestic good more attractive for export. As a result net export NX raises followed by aggregate output. s Equity Price Channels: Two sub-channels are introduced for equity price namely Tobin's q and Wealth Effects[6]. Tobin's q can be

[3] See. *Mishkin*, *F. S.*, 1996.
[4] See. *Mishkin*, *F. S.*, 1996.
[5] See. *Mishkin*, *F. S.*, 1996.
[6] See. *Mishkin*, *F. S.*, 1996.

summarized as following[7]:

$$M \uparrow \Longrightarrow P_e \uparrow \Longrightarrow q \uparrow \Longrightarrow I \uparrow \Longrightarrow Y \uparrow$$

Higher equity prices P_e leads to a higher q factor (market value of the firm divided by replacement cost of capital). When q is high companies issue equities and buy new investment goods which are relatively cheaper so investment increases. The wealth channel is described as follows[8]:

$$M \uparrow \Longrightarrow P_e \uparrow \Longrightarrow wealth \uparrow \Longrightarrow consumption \uparrow \Longrightarrow Y \uparrow$$

Housing and land price which is our topic of interest in this work can be categorized in this channel as equity.

2.3 Credit Channels

Two basic channels of monetary transmission emerged because of asymmetric information are Bank Lending and Balance Sheet channels. Bank Lending Channel[9]: This transmission channel is very straightforward:

$$M \uparrow \Longrightarrow bankdeposits \uparrow \Longrightarrow bankloans \uparrow \Longrightarrow I \uparrow \; Y \uparrow$$

Increased bank reserves and available loans causes investment to rise. Balance Sheet Channel[10]:

$$M \uparrow \Longrightarrow P_e \uparrow \Longrightarrow adverseselectionandmoralhazard \downarrow \Longrightarrow lending \uparrow \Longrightarrow I \uparrow \Longrightarrow Y \uparrow$$

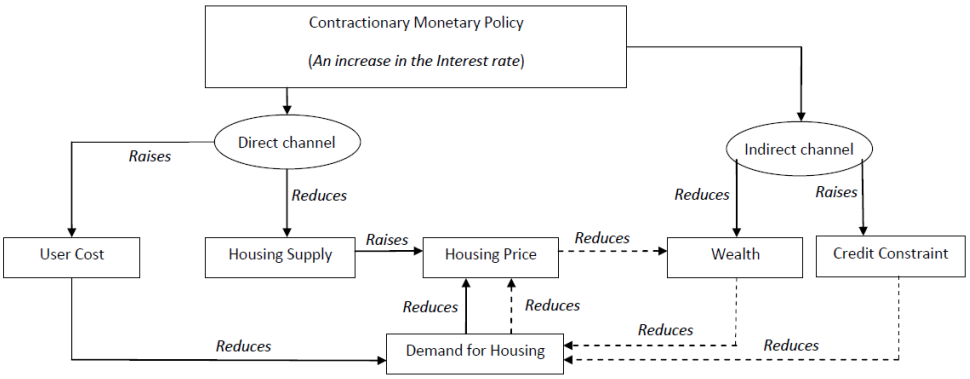
Expansionary monetary policy raises the cashflow and consequently reduces adverse selection and moral hazard (risk) and therefore more lending.

2.4 Housing Related Transmission Channels

Among all the channels explained in previous sections, a very concise representation of the housing market related channels are shown in Figure 1

[7] See. *Mishkin, F. S.*, 1996.
[8] See. *Mishkin, F. S.*, 1996.
[9] See. *Mishkin, F. S.*, 1996.
[10] See. *Mishkin, F. S.*, 1996.

Figure 1: Monetary Transmission Channels Affecting the Housing Market



Source: See *Wadud*, *I.*, *Bashar*, *O.*, *ali ahmed huson joher*, *h. j.*, 2009

Following his older paper on monetary transmission channels, Mishkin concentrates merely on housing market in his more recent paper[11] and explains these channels as follows:

2.4.1 Direct Channels

Direct Interest Rate Effects through the User Cost of Capital

The user cost of housing capital can be described as[12]

$$uc = hp((1-t)i - \pi_e) - (/pi_h - /pi_e) + \delta$$

whre uc is user cost of capital, hp is the relative purchase price of new housing capital, i is the mortgage rate and $/pi_h$ and $/pi_e$ are the appreciation of housing prices and real inflation. δ is depreciation rate for housing. The formula also deductible mortgage interest by adjusting the nominal mortgage rate by the marginal tax rate t. after tax real interest rate. One can see that when the interest rate raises the user cost of capital raises and consequently the demand for housing decreases. The fall in demand result in a fall in supply and consequently aggregate demand. Looking more precisely in $(/pi_h - /pi_e)$ part of user cost equation one can see the effect of interest rate. When interest rate raises the expected appreciation of housing price falls and therefore the current user cost of capital increases which in turn result in decline in demand.

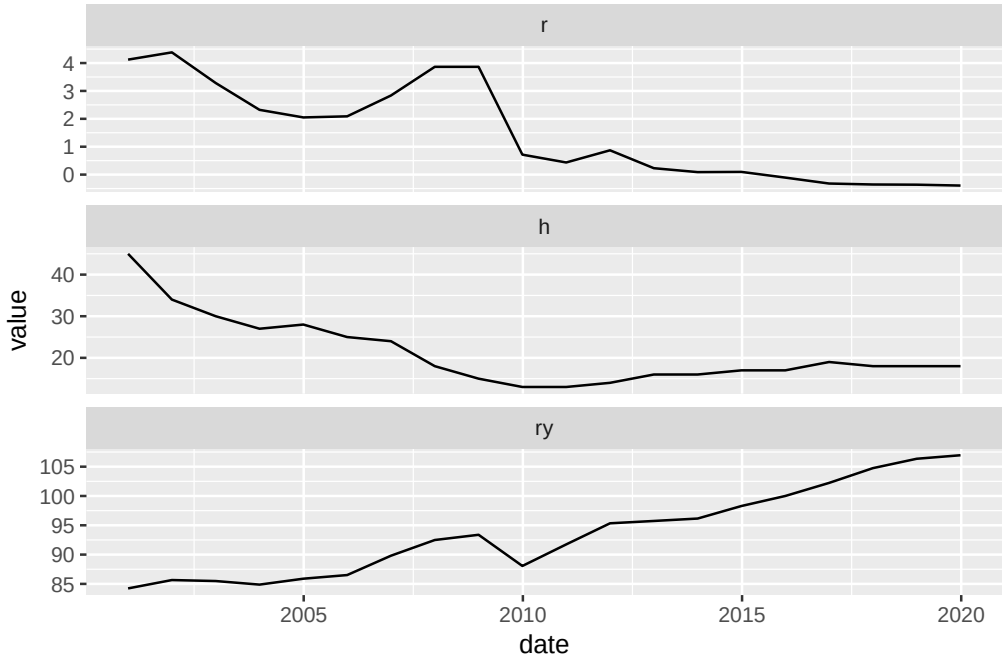
[11] See. *Mishkin*, *F. S.*, 1996.
[12] See. *Mishkin*, *F.*, 2007.

Interest Rate Effect on Supply[13] Higher short-term rates, which increase cost of supply and decreases housing activity.

2.4.2 Indirect Channels

Wealth Effects[14] There evidences proving an increase in wealth should have positive effect on consumption[15]. As we know from previous section an expansionary monetary policy can increase the demand for housing which normally leads to in increase in house price. Therefore, this results to an increase in total wealth and consequently aggregate demand. Balance Sheet, Credit-Channel Effects on Consumer Spending[16] An increase in house price improves the house hold balance sheet and reduces the risk for the credit giver as explained in previous sections. In Figure on can see a general plot of changes in the variables introduecd in .

Figure 2: Interest Rate, Government Spending and House Price in Germany in Years 2000-2020



FOM

As one can see a has lead to house price to decrease.

[13] See. *Mishkin*, *F.*, 2007.
[14] See. *Mishkin*, *F.*, 2007.
[15] See. *Mishkin*, *F.*, 2007.
[16] See. *Mishkin*, *F.*, 2007.

3 SVAR Identification

For implementaiton of the methods introduced in previous section the SVAR package in R[17] software is used.

3.0.1 SVAR Model Identification

The structural VAR models are often used to trace the contemporaneous linkage among macroeconomic variables. The SVAR model has the following general form[18]:

$$A_0 Y_t = mu + A_1(L) Y_t + B\varepsilon_t$$

where yt = [y1t , ..., yKt] is a vector of observable variables, Ai , i = 1, . . . , p, are (K × K) coefficient matrices, and intercept parameters are collected in µ. We focus on the case of time invariant deterministic terms for notational clarity. Model augmentation with time-varying deterministic terms (e.g., breaks, linear trends), however, is straightforward. Furthermore, the VAR model is stationary (invertible) by assumption. The vector ut consists of reducedform residuals, which are serially uncorrelated with E(ut) = 0 and Cov(ut) = sigmau. The nonsingular matrix B captures the instantaneous effects of the structural shocks on the variables of the system Where Y_t is n-vector relevant variables, then A_0 and B are $n * n$ matrices and $A_1(L) = \sum_{i=1}^{q} A_{1i} L^i$ is the matrices polynomial in the lag operator in which A matrices have the same size as A_0 matrix. The error termsε_t (structural schocks) is an n-vector of serially uncorrelated zero mean structural schocks with and identitiy contemporanous covariance matrix. The crucial part in SVAR modelling is the choice of the macroeconomics variables. The second challenge is that the nmuber of parameters to be identified in the structural model is larger than that of the reduced VAR form. Therefore, some new relations needs to be introduced. This can be usually done by introducing restrictions on A_0 or B_0 matrix.

In this work, we assume the following set of variables as the variables involed in modeling.

[17] See. *Lange*, *A.* et al., forthcoming.
[18] Source: See *Lange*, *A.* et al., forthcoming.

The assumed Y is :

$$\begin{bmatrix} ry \\ \pi \\ rg \\ r \\ mc \\ h \\ hp \end{bmatrix}$$

r is the money market interest rate (EONIA) rate at which banks provide loans to each other with a duration of 1 day, In my opinion this is a good indicator of the monetary policy since it combines central banks ECB's deposit facility rate and s. This affect is more clear when we look in the recent data after 2018 where central banks interest rate for refinancing is zero but the deposit facility goes negative and this stimulates banks to lend more money. Original data is monthly and we need to average to get the yearly rate. See https://www.bundesbank.de/en/statistics/time-series-databases

rg is General government deficit(-) or surplus(+) as defined in the Maastricht Treaty from Bundes Bank is used, In my opinion it is a good indicator of the Government fiscal policy since it includes both expenditure and earinging of the gorvernment. Change in percentage for each year is calculated and sign is reversed such that when the governemnt has a deficit it is an indicator if positive government spending.

ry is Germany / National accounts / Overall economy / Gross domestic product (price adjusted) 1, 2, 3

hp is Real house prices, 2015=100, adjusted! https://data.oecd.org/price/housing-prices.htm cite: OECD (2020), Housing prices (indicator). doi: 10.1787/63008438-en (Accessed on 18 May 2020) mc change in percent Construction price index / Germany / Unadjusted figure / Total bundes bank

h west germany is used as trend is the same in east! this is the only free source of data I could find for this period. https://www.statista.com/statistics/999254/number-completed-new-dwellings-west-germany/ in thousenad

The variables are chosen based on the model proposed in housing in Australia[19] based on supply and demand model with a modification that the exchange rate and foreign interest rates are ommited from demand equation. The resulting equatioins are as follows:

[19] See. *Wadud*, *I.*, *Bashar*, *O.*, *ali ahmed huson joher*, *h. j.*, 2009.

$$h^s = a_1 mc + a_2 rhp + b_1^s \varepsilon^s h^d = a_3 ry + a_4 rhp + a_5 r + a_6 / pi + a_7 rg + b_1^d \varepsilon^d h^s = h^d$$

The notion of time is deleted from the above equation but once can consider that the every variable reperesnt different time instance for example $a - 1mc$ depending on the cohsen number of lags represent $a_{1t} mc_t, a_{1(t-1)} mc_{(t-1)}$... this will lead to

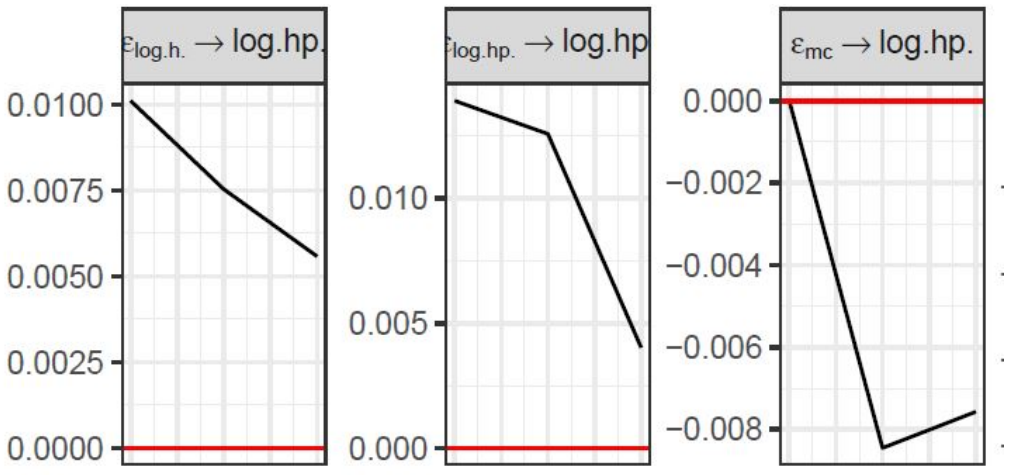
$$rhp = c_1 mc + c_2 ry + c_3 rhp + c_4 r + c_5 / pi + c_6 rg + b_1 \varepsilon$$

The second assumption chosen by author in this work is that A_0 is a lower triangular matrix therefore as one can see in the order of variables in bla equation every variable can have only correlation with previous variables in the same time stamp and with all variable in previous time stamps. Therefore, the order of variables play a crucial role in our model.

3.1 SVAR Results

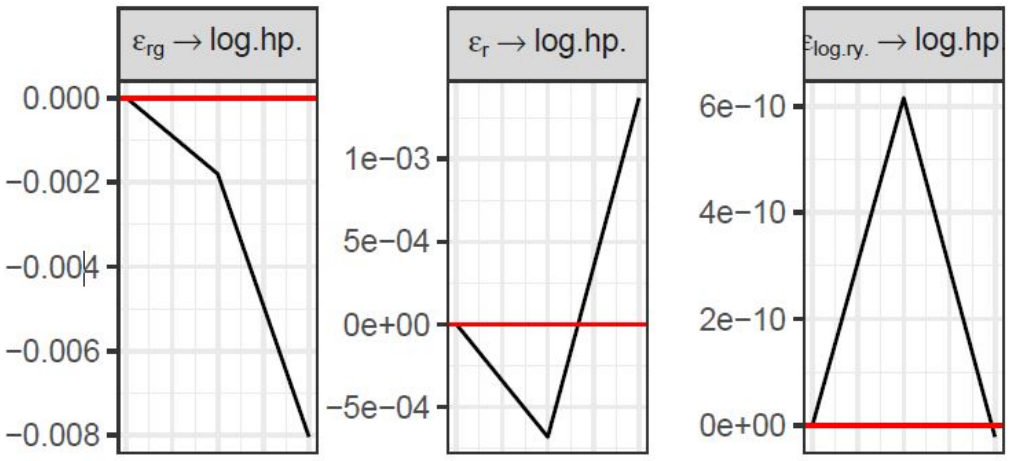
The following picture shows the results of the identified model to different schocks

Figure 3: Interest Rate, Government Spending and House Price in Germany in Years 2000-2020



FOM

Figure 4: Interest Rate, Government Spending and House Price in Germany in Years 2000-2020



4 Conclusion

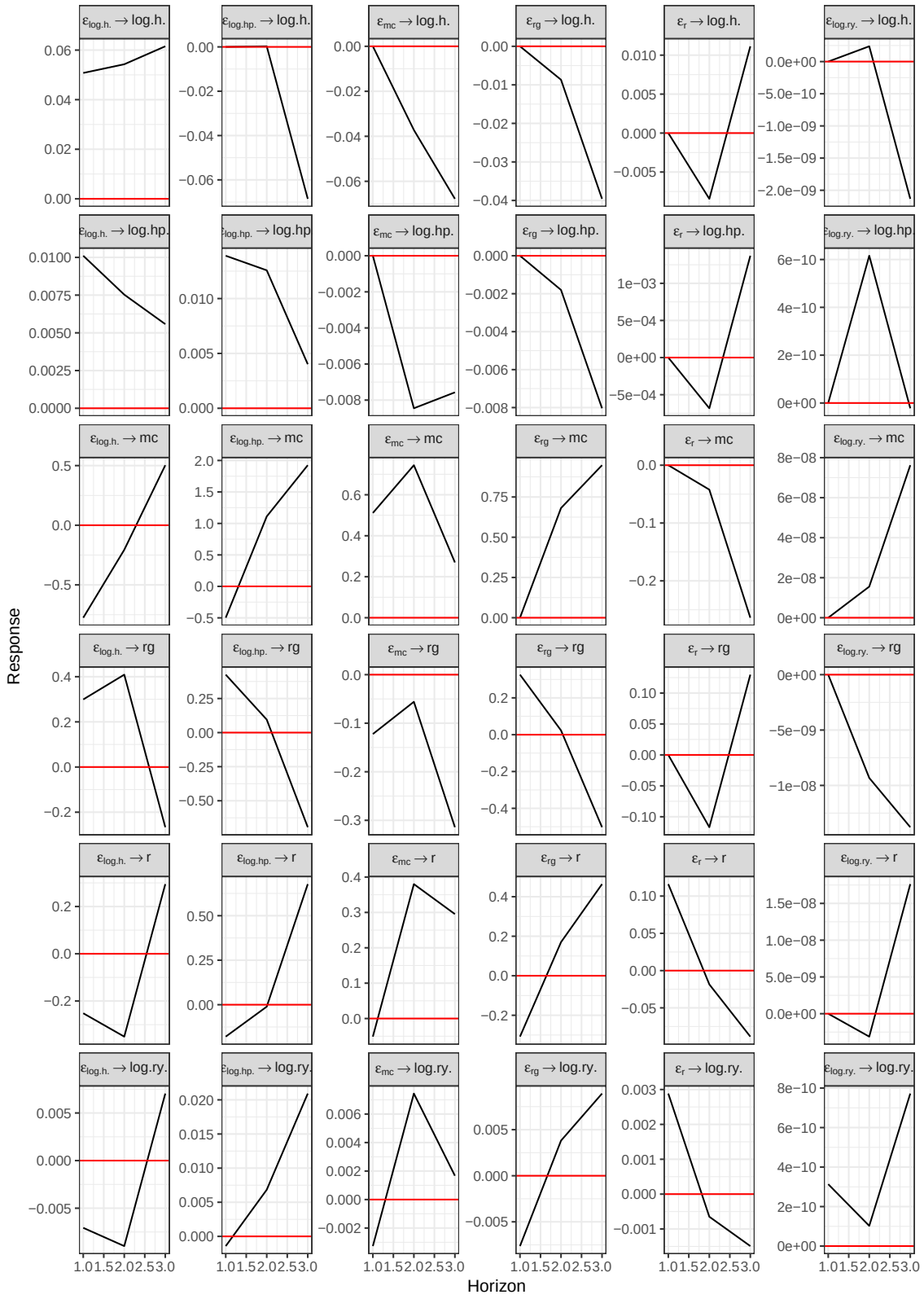
Both models show a correlation between monetay ploicies and house price. In my opinion data is not complete for conclusion. “ The results indicate that supply of new houses in Australia rises with higher real house prices; and that house prices rise and fall with higher inflation rate and interest rate, respectively. Dynamics of the impulse responses reveal significant effect of monetary policy on new house constructions, real house prices, material costs and inflation. Results also suggest that housing output, real house prices and interest rates respond significantly to shocks to housing supply, housing demand and to a number of other variables. “

Anhang

Appendix 1: Appendix

Full Image of impulse respose is here:

Figure 5: Beispielbild



Bibliography

Lange, *Alexander*, *Dalheimer*, *Bernhard*, *Herwartz*, *Helmut*, *Maxand*, *Simone* (forthcoming): svars: An R Package for Data-Driven Identification in Multivariate Time Series Analysis, in: Journal of Statistical Software (forthcoming)

Mishkin, *Frederic* (2007): Housing and the Monetary Transmission Mechanism, in: Finance and Economics Discussion Series, 2007 (2007), pp. 1–53

Mishkin, *Frederic S.* (1996): The Channels of Monetary Transmission: Lessons for Monetary Policy, NBER Working Papers 5464, s.l.: National Bureau of Economic Research, Inc, 1996-02, URL: https://ideas.repec.org/p/nbr/nberwo/5464.html

Wadud, *I.K.M.*, *Bashar*, *Omar*, *ali ahmed huson joher*, *huson joher* (2009): An SVAR Analysis of Monetary Policy Dynamics and Housing Market Responses in Australia, in: Deakin University, Faculty of Business and Law, School of Accounting, Economics and Finance, Economics Series (2009)