The impact of monetary policy on housing market activity: An assessment using sign restrictions

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A B S T R A C T
Existing research demonstrates that housing, particularly residential investment, plays an important role in the transmission of monetary policy shocks to the overall economy. With this in mind, this paper investigates the relationship between monetary policy and housing market activity using a relatively new method for identifying monetary shocks. More specifically, a monetary policy shock is identified by explicitly imposing sign restrictions on impulse response vectors. The extra information from sign restrictions is important for new insights regarding the transmission of monetary policy to the housing sector—notably, the results indicate that residential investment is less sensitive to a contractionary shock than standard estimates with recursive restrictions. Given that the response of the housing sector using sign restrictions is smaller than other work using standard identification methods, the work indicates that further research is needed to examine whether other sectors of the economy may be less sensitive to monetary policy than previously thought.

1. Introduction

The recent financial crisis in the U.S. has invigorated debate about the role of housing in the business cycle. The debate has led some to argue monetary policy, by keeping nominal interest rates very low from 2003 to 2006, contributed to the housing boom that led to the collapse in housing prices (Taylor, 2007). Others have questioned whether housing developments reflect macroeconomic conditions or does housing activity, in particular residential investment, drive the business cycle. For instance, Leamer (2007) finds, "problems in residential investment have contributed 26% of the weakness in the economy in the year before the eight recessions since World War II," leading him to argue, "housing is the business cycle." Historically, residential investment has averaged roughly 5 percent of GDP and has contributed substantially to real GDP growth. According to Wheaton and Nechayev (2010), residential investment added over 0.4 percentage points per year to GDP growth between 1993 and 2005. Even more, from 2006 to 2009 residential investment subtracted roughly 1 percent from annual GDP growth.

The housing market serves as a medium for the transmission of monetary policy shocks to the overall economy through several channels. For example, changes to the value of housing generate collateral effects and stimulate borrowing for consumption; see, for example, Iacoviello (2005), Iacoviello and Neri (2009), Lee and Song (2015), and Campbell and Hercowitz (2005). Previous work also shows residential investment, in comparison to other components of GDP, is impacted most by a monetary policy shock; see Bernanke and Gertler (1995) and Erceg and Levin (2006).

Furthermore, the U.S. mortgage market is well developed, as measured by the mortgage debt to GDP ratio (over 70%), which amplifies and expedites the transmission of shocks through housing. As a result, housing and monetary factors that influence housing market activity are of key concern to policy makers. In fact, the focus at the 2007 Jackson Hole symposium, held by the Federal Reserve Bank of Kansas City, was housing.

In this context, the goal of this paper is to estimate the response of housing market activity to an exogenous monetary policy shock using vector autoregression (VAR) analysis. VAR models are widely used to analyze monetary policy, however, identifying a monetary policy shock is a fundamental concern. Typically, researchers adopt a specific informational ordering (recursive identification) of the variables to identify a monetary policy shock, and embedded in the informational ordering are implicit assumptions used to establish "reasonable" results—i.e., results consistent with monetary theory. In this manner, results are influenced by the identification scheme, leading some to question results generated using recursive identification. As Uhlig...
(2005) states, "There is a danger that the literature just gets out what has been stuck in, albeit more polished and with numbers attached." Given these concerns, a complementary identification structure, which makes a priori theorizing explicit, enriches the literature.

Following the work of Uhlig (2005) I use the sign restriction approach to identify a contractionary monetary policy shock. Under this approach, identifying a monetary policy shock does not depend on the informational ordering of the arriving shocks. Instead, I identify a monetary policy shock by explicitly imposing sign restrictions on the impulse response vectors. More specifically, I assume the federal funds rate is strictly increasing, and output, prices (including commodity and house prices), nonborrowed reserves and total reserves are strictly decreasing in response to a contractionary monetary policy shock. I do not impose any restrictions on the variables of interest: residential investment, housing starts, residential building permits, and single-family houses sold. Similar to the method adopted here, a number of others in the literature have imposed explicit restrictions on impulse responses; for example, Dwyer (1997) imposes restrictions on the shape of the impulse response, while Canova and de Nicolò (2002) impose sign restrictions on the cross-correlations of variables.

As a benchmark for thinking about my work here is a summary of similar studies looking at the relationship between monetary policy and housing. Iacoviello and Neri (2009), who study monetary and non-monetary housing shocks, find that housing prices and housing investment are procyclical and sensitive to monetary shocks. They find a 50 basis point increase in the federal funds rate leads to an immediate 0.75 percent decrease in house prices and an immediate 2.5 percent decline in housing investment. These findings are consistent with Jarocinski and Smets (2008), who study the effects of monetary policy on the housing market using a Bayesian VAR, except one difference, house prices and housing investment responses are delayed in Jarocinski and Smets (2008). In contrast to Iacoviello (2005), Del Negro and Otrok (2007) use sign restriction to identify a monetary policy shock and its impact on house prices, however, their results are quantitatively and qualitatively similar. Additionally, Musso et al. (2011) show residential investment gradually declines, and troughs at 3 percent, following a 50 basis point increase in the short-term interest rate. Even when estimating the effects of expansionary monetary policy on residential fixed investment, as opposed to contractionary shocks as with the aforementioned studies, the results are quantitatively similar. Specifically, Givens and Reed (2015) find a 71 basis point drop in the federal funds rate increases residential investment by an average of 3.32 percent.

While residential investment has received extensive attention in the literature—and understandably so, given its direct affect on GDP—other measures of housing market activity have been studied as well. For example, Lastrapes (2002) looks at new and existing home sales and finds that real housing prices and housing sales respond positively to a positive money supply shock. Specifically, new houses sold peaked at 3.5 percent four months after the shock. Also, Taylor (2007) studies the impact of monetary policy on housing starts, finding a semi-elasticity of roughly -8.3 between the federal funds rate and housing starts. Although housing starts, housing permits, and housing sales appear to be correlated, Gupta et al. (2012) demonstrate the response of each variable to monetary policy can vary significantly.

While these findings from existing studies are fairly consistent, so are the identification schemes being used. This leads to the question, does the identification scheme matter for measuring monetary policy’s impact on housing? To put it differently, do the results from imposing sign restrictions match the stylized facts? In short, no. Quantitatively, I find results using sign restrictions are smaller in magnitude in comparison to Iacoviello and Neri (2009); however, results are similar in regards to sign. Residential investment declines by roughly 1 percent shortly after a contractionary monetary policy shock, significantly less than the 2.25 percent decline found with the recursive structure. Similar differences are observed with housing starts, new private housing permits, and single family houses sold. However, in contrast to the recursive approach, short run effects of monetary policy on housing permits and houses sold are statistically insignificant. Moreover, I find housing market activity responds immediately to a contractionary monetary policy shock, with housing starts moving quicker than residential investment. In contrast to Gupta et al. (2012), reaction speed and duration, as well as magnitude, do not differ significantly between houses sold, housing starts, and housing permits.

For comparison, results are also generated using short run restrictions (recursive identification), which show a gradual decline in residential investment and quick responses from starts, permits, and sales following a 50 basis point increase in the federal funds rate. One year after the shock residential investment declines by 2.25 percent, and within six months of the shock the other three measures of housing activity decline by more than 3 percent. Notably, houses sold respond quicker than other housing variables. In regards to reaction speed and shape of impulse responses, short run restriction results differ from sign restriction, but are consistent with Jarocinski and Smets (2008), Musso et al. (2011), and Gupta et al. (2012). More importantly, as it relates to magnitude, the effect of monetary policy on housing activity is significantly smaller using sign restriction, which suggest an over-estimation with recursive identification or an underestimation using sign restriction.

Furthermore, as a robustness check for the baseline results, I extend the restriction horizon to one year, conduct a subsample analysis covering the "Great Moderation" period (1984-2006), and remove restrictions on house prices. Using a longer restriction horizon of one year does not significantly change the shape or magnitude of the residential investment impulse response, however, the immediate effects are insignificant for the remaining three variables. In the subsample analysis, housing activity response is more intermediate; however, magnitudes are similar to the full sample. Moreover, housing market responses to monetary policy are significantly smaller, and insignificant, with unrestricted house prices.

The remainder of the paper is as follows: Section 2 describes the data, methodology, and identification method. Section 3 presents the impulse response functions with detail. Section 4 examines an alternative identification method. Section 5 provides a robustness check. The final section is the conclusion.

2. Data

Quarterly data covering the period 1975Q1-2006Q4 is used to conduct the analysis, and consistent with the literature the data excludes the financial crisis period and beyond. Maintaining consistency with existing literature is an important mechanism for comparing my results to stylized facts. Furthermore, as opposed to a single measure, I use multiple (four) measures of housing market activity: new privately owned housing units started, new private housing units authorized by building permits, new one family houses sold and real private residential fixed investment. Although housing starts, housing permits and houses sold appear to be correlated, as seen in Fig. 1, they are included in the analysis because Gupta et al. (2012) show the response of these variables to monetary policy can vary significantly.

Fig. 1 contains plots of the housing market data (in logs), which reveals a fairly persistent upward trend in residential investment, with a few notable pre-recession pullbacks. Housing starts, housing permits, and houses sold experience similar pullbacks to residential investment, however, trends are not as persistent or noticeable. Additionally, house prices experience a persistent upward trend over the entire period of observation. At the start of the data series the U.S. was coming out of a recession, and the decline in housing activity in 1979 and 1980 preceded two recessions. Similarly, the declines in 1990 and 2005 happen right before economic downturns. Staying consistent with the literature, linear trends are not detrended with VAR analysis, as the VAR will account for these trends. In terms of correlation, as Fig. 1
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