INVESTIGATING THE HOUSING MARKET FLUCTUATION UNDER AN EXPANSIONARY MONETARY POLICY IN AUSTRALIA

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ABSTRACT

This research empirically investigates the impact of monetary policy on the housing market in Australia from 1996 to 2009. Three primary variables associated with the housing sector and monetary policy, including interest rates, money supply and house prices, are estimated by a structural vector autoregression (VAR) model. Depending upon the analysis using the impulse response function, it can be identified that monetary policy significantly affects the housing market in Australia by the adjustments in interest rates and money supply. The empirical results from this study may be useful for policy makers to enact appropriate policies in relation to the infrastructure planning.

Keywords: interest rates, money supply, housing market, structural VAR

INTRODUCTION

Housing market has received great attention in many countries around the world. The studies on the housing sector have been presented in many academic papers, some of which emphasise the determinants while others focus on the market dynamics (Wilhelmsson, 2008). This paper initiates an investigation which analyses the political dynamics on Australia's housing sector. The research findings will be useful for policy makers to establish the infrastructure planning regarding economy within a regional context.

After exploring the housing literature, house prices are considered to be a key variable in the housing market research. Quigley (1999) claimed that the demand for housing can be viewed as a function of the house prices, disposable incomes and a vector of exogenous variables, and housing supply is a function of the house prices, vacancy and new housing construction activities. In simple terms, house prices are the variable that includes the information in regard to both the supply side and demand side of the housing market. The study by Hui and Yue (2006) further argued that an appreciation or depreciation of house prices can significantly reflect the housing market fluctuations. Hence, it is reliable to conclude that house prices are an essential indicator of the housing sector.

The statistics issued by the Australian Bureau of Statistics (ABS) and the Reserve Bank of Australia (RBA) indicate that the Australian house prices have increased dramatically since 1996 in conjunction with an increase in money supply and a significant decrease in interest rates (ABS, 2009; RBA, 2009a; RBA, 2009b). It is widely known that the interest rates in financial market are highly related to the cash rates controlled by monetary policy, which is an essential tool that bridges government and economic sectors (e.g. construction, manufacturing and housing) (McTaggart *et al.*, 2003). In Australia, monetary policy is a process by which the RBA controls the interest rates through changing the money supply in accordance with the *Reserve Bank Act 195*9 (RBA, 2007a). Therefore, a rise in money supply and a corresponding decline in interest rates imply that that there was an expansionary monetary policy being implemented in Australia during the period of 1996-2009.

Although Australia has been experiencing the monetary expansion since the 1990s, the impact of monetary policy on the Australian housing sector received relatively little attention in comparison with that of the US and Europe. Hence, macroeconomic study of the relationship between the housing market and monetary policy in Australia is useful. The aim of this research is to estimate the nature of this interrelationship using the structural VAR (SVAR) model with the restrictions that are consistent with the framework of macroeconomic theory. This paper is structured by first establishing the context of this research, presenting the previous studies on the linkage between monetary policy and the housing sector. Secondly, the methodology as well as the data will be described respectively. Finally, the empirical results will be utilised to analyse the monetary effects in Australia.

LITERATURE REVIEW

Monetary policy performs as an adjuster that assists in transferring governmental interventions to economic activities (RBA, 2007a). Theoretically, monetary policy is able to affect both the supply of and the demand for housing (Elbourne, 2008). The conventional macroeconomic theory justifies that house prices are correlated to the monetary contraction, during which the depreciation of house prices will be triggered by the increases in cash rates and the decreases in money supply. In contrast, influenced by the expansionary monetary policy, the inflation of house prices will be caused as a consequence of the decreases in interest rates and the increase in money supply.

The responsiveness of the housing sector to the shocks of monetary policy has been well considered since the 1990s. The early research relevant to the effects of monetary policy on the housing market is the empirical studies depending upon the reduced-form VAR, such as the research by Baffoe-Bonnie (1998), in which a simplified VAR model was constructed to interpret the dynamic impact of monetary policy on the national and regional housing markets in the US. The findings suggested that monetary policy had a significant effect on the mortgage rates, which in turn triggered immediate responses of the housing prices and the stock of houses sold in both the US national and regional housing markets (Baffoe-Bonnie, 1998).

Over the recent decades, more and more studies have identified the shocks of monetary policy using the SVAR or the vector error correction model (VECM) in order to avoid the model misspecification. For example, the study by Aoki et al. (2002) applied a SVAR to estimate the effect of monetary policy on house prices on a national level. The results indicated that house prices decreased by up to 0.8% after a 50 basis point shock of interest rates in the UK. Furthermore, the research commenced by Iacoviello (2002; 2005) and Giuliodori (2005) also discussed the relationship between monetary policy and the housing markets on the basis of the results yielded by the SVAR. Iacoviello's (2002; 2005) identified that house prices would correspondingly decrease by 1.5% following a 50 basis point tightening of monetary policy. On the other hand, as shown by Giuliodori (2005), the GDP, consumption level and real house prices would fall up to 1.8% in response to a shock of monetary contraction.

Recently, a research theme has emerged to comprehensively clarify the relationships between the housing market and the transmission mechanisms of monetary policy within a national context. For instance, in 2008, an eight-variable SVAR model was established by Elbourne (2008) for the purpose of estimating house prices and a series of monetary transmission mechanisms, including commodity prices, interbank rates, retail sales, price level, narrow money supply, nominal market exchange rates and money demand. Empirical evidence showed that retail sales fell by 0.4% after receiving a positive shock of short-term interest rates while real house prices decreased by 0.75% in response to 12-15% drop in consumption triggered by a monetary contraction.

In addition, Iacoviello and Minetti (2008) contributed to the literature by uncovering the credit channel of monetary policies of four European countries (e.g. Germany, Finland, Norway and the UK). The empirical evidence put forward by Iacoviello and Minetti's (2008) VECM identified that a bank-lending channel existed in the European countries under study, and the shocks of 70 basis point interest rates resulted in an approximately 0.25% decline in the GDP and 0.7-1% drop in house prices.

Unlike the studies by Aoki et al. (2002), Elbourne (2008), Giuliodori (2005), Iacoviello (2002; 2005), Iacoviello and Minetti (2008), Lastrape (2002) estimated the relationship between monetary policy and house prices on a regional level rather than a national level. By applying a SVAR with the data on money supply and the aggregate prices of owner-occupied housing, the empirical results suggested that both the real housing prices and the housing sales across the metropolitan areas in the US were driven up within a short-run period in response to the positive shocks of money supply (Lastrape, 2002). Furthermore, the research undertaken by Vargas-Silva (2008) studied the impact of monetary policy shocks on the US housing markets on both the regional and national levels through the SVAR with the identification procedure suggested by Uhlig (2005). According to the results of the impulse response function, Vargas-Silva (2008, p. 977) identified that '*housing starts and residential investment response negatively to contractionary monetary policy shocks*'.

In summary, this literature review has demonstrated that there is an interrelationship between monetary policy and the housing sector (*Aoki et al.,* 2002; Baffoe-Bonnie, 1998; Elbourne, 2008; Giuliodori, 2005; Iacoviello, 2002; 2005; Iacoviello and Minetti, 2008; Lastrape, 2002). In the existing literature, it is also noted that interest rates and money supply are two key instrumental variables of monetary policy, and the SVAR is an applicable and acceptable model for the estimation on the shocks of monetary policy. However, while there is extensive literature on the relationship between monetary policy and the US as well as the European housing markets, far less has been written about Australia, thus providing this paper with an opportunity for a further study.

METHODOLOGY

The vector autoregression model was proposed by Sims (1980) in the 1980s to replace the simultaneous model. The principals of the VAR do not comprise a priori endogenous or exogenous, zero restrictions and strict economic theory (Charemza & Deadman, 1997). The reduced-form VAR can be written as follows:

$$Y_t = A_1 Y_{t-1} + \cdots + A_p Y_{t-p} + \varepsilon_t, \quad t = 1, 2, 3, \cdots, T \tag{1}$$

$$A(L) Y_t = \varepsilon_t \tag{2}$$

where *Yt* represents a vector with k dimensions; *Ap* is the *p*-th k*k matrix; *Yt-p* is the *p*-th lagged variable articulating to *Yt*; *εt* is a vector of reduced-form error and *A(L)* is a finite polynomial.

Despite the advantages of the VAR, it was still criticised as ‘atheoretical’ due to its ‘incredible’ identifying assumption (Cooley & Leroy, 1985). More importantly, the reduced-form VAR is not able to reflect the contemporaneous relationships among the variables. To solve these problems, the SVAR was proposed and developed.

There is a hypothesis that matrix *A* and matrix *B* are two invertible matrixes, and so let both sides of Eq. (2) multiply the matrix *A*. Then, a new equation is displayed as Eq. (3).

$$AA(L)Y = A\varepsilon_t \tag{3}$$

If $A\varepsilon_t = B\mu_t$ can be satisfied, the AB-model SVAR can be described as Eq. (4).

$$AA(L)Y = Bu_t \tag{4}$$

Here, *A* is a k*k matrix with ones on the main diagonal; *A(L)* is a finite polynomial; *Yt* is a k-dimension vector; *B* is a symmetric matrix and *ut* is the vector of (orthogonalized) structural shocks. The SVAR models in this study are three-variable SVARs, which means that all of these models contain three variables (M1, INT, and HPI). As a result, the matrix *A*, vector *Yt* with the M1, INT and HPI, matrix *B* and the vector *ut* are indicated as follows.

$$A = \begin{pmatrix} 1 & -b_{12} & -b_{13} \\ -b_{21} & 1 & -b_{23} \\ -b_{31} & -b_{32} & 1 \end{pmatrix} \tag{5}$$

$$Y_t = \begin{pmatrix} M1 \\ INT \\ HPI \end{pmatrix} \tag{6}$$

$$B = \begin{pmatrix} \gamma_{11} & 0 & 0 \\ 0 & \gamma_{22} & 0 \\ 0 & 0 & \gamma_{33} \end{pmatrix} \tag{7}$$

$$u_t = \begin{pmatrix} u_{1t} \\ u_{2t} \\ u_{3t} \end{pmatrix} \tag{8}$$

To make the SVAR be just identified, restrictions must be imposed into the matrix *A* and the matrix *B*. Herein the short-run restrictions will be set up so as to avoid any potentially serious misspecification. Because of the issue that the SVAR model in this study is the one with three variables, three [k*(k-1)/2 = 3*(3-1)/2) = 3] contemporaneous restrictions will be installed into the matrix *A*. The restrictions are based on two hypotheses, namely that the changes in the money supply will not lead to a contemporaneous response of the interest rates, and that the increase or decrease in the house prices will not trigger contemporaneous movements in the money supply and the interest rates. Accordingly, the contemporaneous response of the INT to a shock of the M1 (b_{21}), the contemporaneous response of the M1 to a shock of the HPI (b_{13}) and the contemporaneous response of the INT to a shock of the HPI (b_{23}) are treated as zero.

CHANGES IN THE HOUSING MARKET IN AUSTRALIA

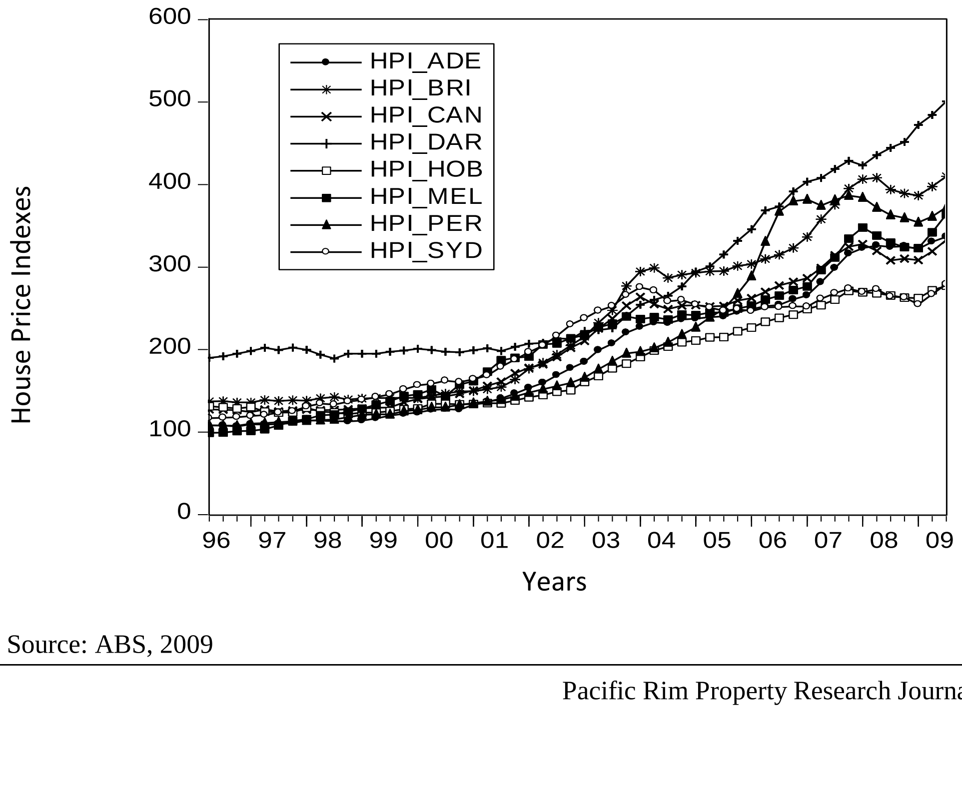
House Price Indexes, Money Supply and Interest Rates

The house price indexes (HPI) of Australia's eight state capital cities, which are published by the ABS (2009), will be used in this study. Due to the primary interest of this research, the variables for measuring the shocks of monetary policy must be introduced. Therefore, the data on the interbank rates (INT) and money supply (M1) provided by the RBA (2009a; 2009b) will be employed as well.

The HPI issued by the ABS are based on the quarterly house prices for the established and newly erected dwellings, and each capital city's HPI is based on 1989-90=100. The reference base of the published HPI changed in the 2003-04 financial year after the September quarter 2005 (ABS, 2005). To maintain consistency, the old reference base (1989-90) is used in this study. The method selected to convert the re-referenced data to the previous base is described as $HPI_{89-90} = w \times HPI_{03-04}$, where HPI_{89-90} represents the HPI on the base 1989-90 = 100, HPI_{03-04} denotes the HPI on the base 2003-04 =100, and w is the converting factor and it is the index number for the year 2003-04 (on the base 1989-90 =100) divided by 100. This method has been introduced by Liu et al. (2009) regarding the independence analysis of the Australian house prices.

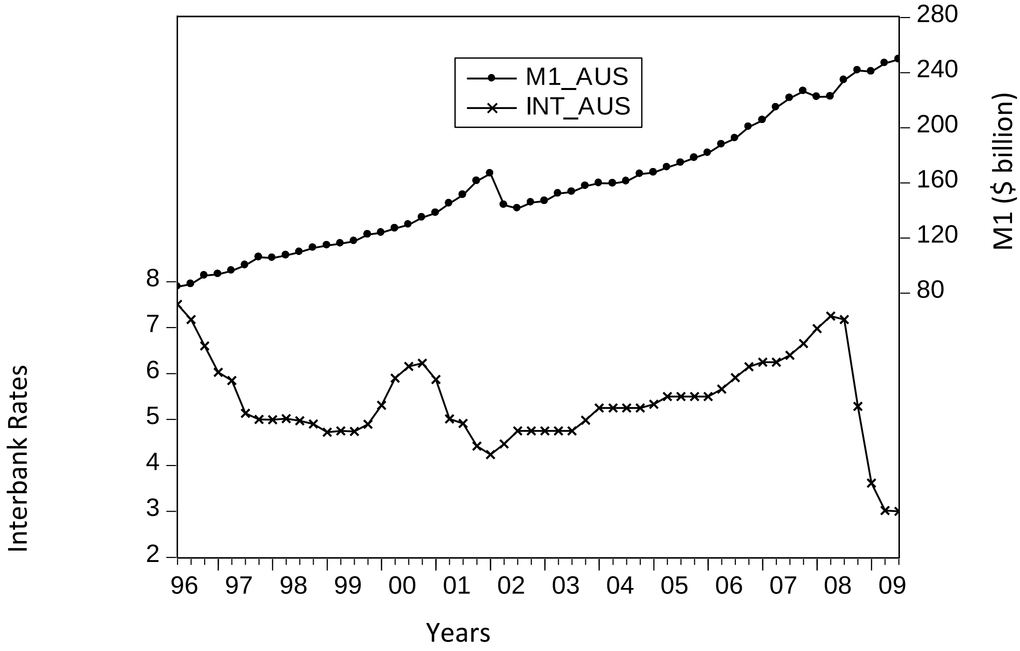
As discussed previously, house prices in Australia have soared since the 1990s. Figure 1 displays the movements in the HPI from the June quarter of 1996 (1996Q2) to the September quarter of 2009 (2009Q3) in the Australian sub-national markets. This figure indicates that the HPI increased dramatically in all state capital cities in Australia during the observed period. The average increasing rates of the HPI across the eight state capital cities between 1996Q2 and 2009Q3 were as much as 263%. In Darwin and Brisbane, the HPI even increased from 190.0 to 500.8 and 137.1 to 410.1 respectively. In addition, Figure 2 illustrates the changes in the Australian interbank rates and M1. It is noted that the money supply (M1) in Australia maintained a dramatic upward trend, increasing by 249.6 billion dollars from 84.7 billion dollars between 1996 and 2009. The interbank rates, conversely, fluctuated down from 7.51% to 3.0% during the period under study.

Figure 1: House prices indexes of eight state capital cities in Australia



Source: ABS, 2009

Figure 2: Money supply and interbank rates in Australia



Source: RBA 2009a; RBA 2009b

The decrease in the interbank rates and the rise in money supply demonstrate that an expansionary monetary policy was being implemented in Australia within the period of 1996-2009. As justified by the conventional macroeconomic theory, the expansionary monetary policy brings significant dynamics on the housing sector. In next section, the SVAR models with the unit root tests will be adopted to empirically identify the impact of monetary policy on the Australian house prices.

Development of the SVAR Model

The prerequisite of the VAR construction is that the data imported must be stationary. Otherwise, a spurious regression will occur (Granger & Newbold, 1974). Hence, testing the stationarity of the time-series data is the first procedure of the VAR analysis. Table 1 indicates the PP unit root test results of the M1, INT and HPI. The results indicate that these primary variables are not stationary at the level form but stationary after the first difference at the 1% and 5% significance levels. In summary, all data employed in this study are *I* (1), denoting that the time series integrated at the first difference level.

One of the challenges other than the stationary test in the VAR is the optimal lag term selection. As suggested by the Akaike Information Criterion and the Schwarz Information Criterion, the reduced-form VAR models with one lagged term were first constructed. In order to set up the SVAR, the restrictions for the matrix *A* and *B* must be imposed. After formulating the SVAR models, the impulse response function (IRF) can be applied for analysis. The IRF is a function which provides a significant platform to trace the systematically dynamic effect of the shock of an endogenous variable to other endogenous variables in the VAR system.

Table 1: PP unit root tests of the variables for 1996Q2 – 2009Q3

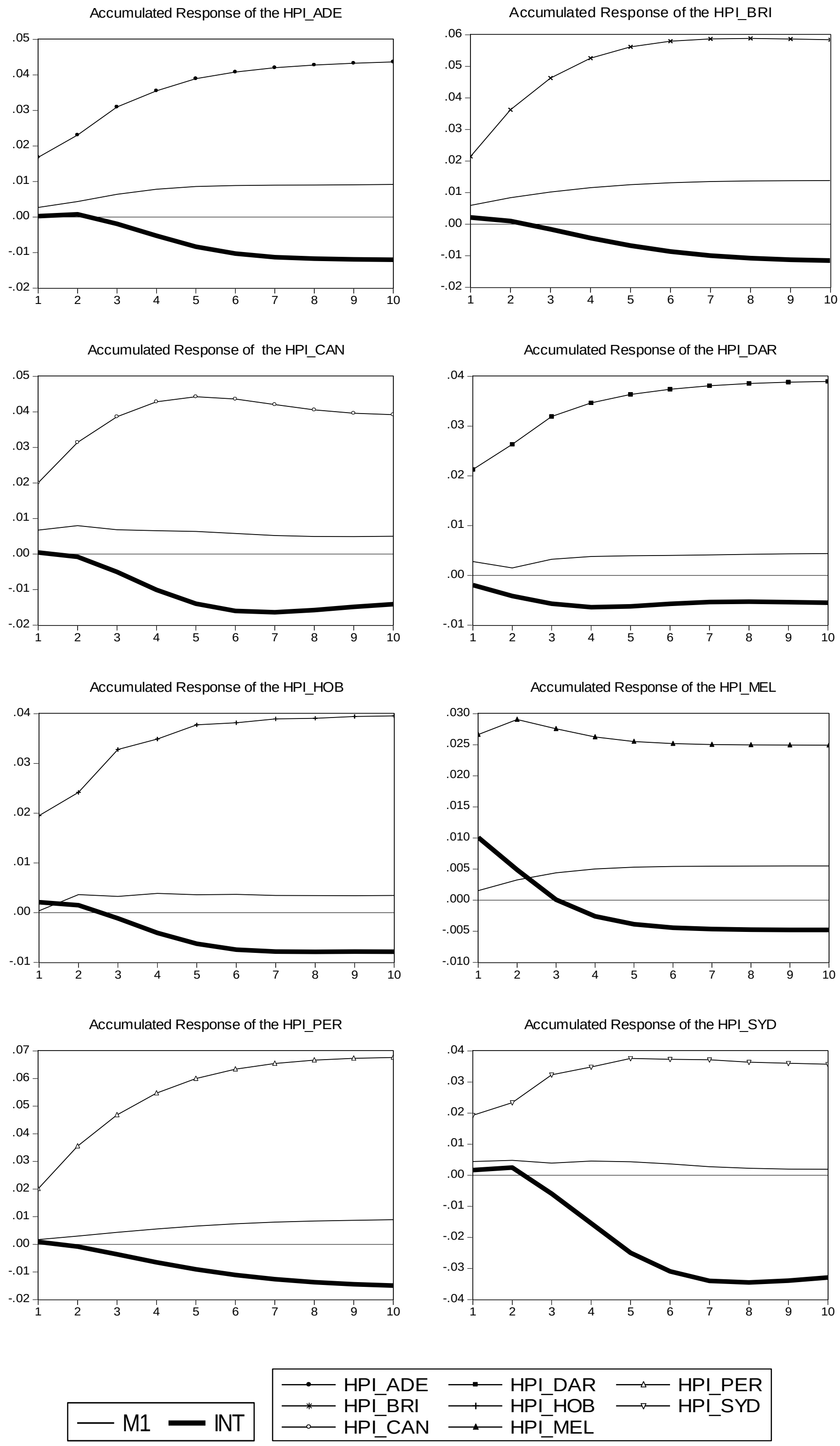
Variables	Level		First Difference		Results
	Model specification (lags)	PP Test Statistics (5%, 1% sig. level)	Model specification (lags)	PP Test Statistics (5%, 1% sig. level)	
ln(INT)	Trend &Intercept (2)	-1.85 (-4.14, -3.50)	None (2)	-3.48 (-2.61, -1.95)	I (1)***
ln(M1)	Trend & Intercept (2)	-2.74 (-4.14, -3.50)	None (2)	-4.60 (-2.61, -1.95)	I (1)***
ln(HPI_ADE)	Trend & Intercept (2)	-2.23 (-4.14, -3.50)	None (2)	-2.17 (-2.61, -1.95)	I (1)**
ln(HPI_BRI)	Trend & Intercept (2)	-2.07 (-4.14, -3.50)	None (2)	-2.46 (-2.61, -1.95)	I (1)**
ln(HPI_CAN)	Trend & Intercept (2)	-2.01 (-4.14, -3.50)	None (2)	-2.57 (-2.61, -1.95)	I (1)**
ln(HPI_DAR)	Trend & Intercept (2)	-1.22 (-4.14, -3.50)	None (2)	-3.05 (-2.61, -1.95)	I (1)***
ln(HPI_HOB)	Trend & Intercept (2)	-2.68 (-4.14, -3.50)	None (2)	-3.71 (-2.61, -1.95)	I (1)***
ln(HPI_MEL)	Trend & Intercept (2)	-1.86 (-4.14, -3.50)	None (2)	-4.12 (-2.61, -1.95)	I (1)***
ln(HPI_PER)	Trend & Intercept (2)	-1.84 (-4.14, -3.50)	None (2)	-2.11 (-2.61, -1.95)	I (1)**
ln(HPI_SYD)	Trend & Intercept (2)	-0.71 (-4.14, -3.50)	None (2)	-3.21 (-2.61, -1.95)	I (1)***

Note: PP Tests, which are the unit root test similar to the ADF Tests, contain three kinds of model specification: only intercept, trend and intercept, and no trend and no intercept. ** and *** denote the 95% and 99% significance level.

Impact of Monetary Policy on the Housing Market in Australia

This research further examines the impact of the expansionary monetary policy on the HPIs in Australia between 1996Q2 and 2009Q3 using the developed SVAR model. The accumulated responses of the house prices in eight state capital cities to the shocks of the interbank rates and money supply are shown in Figure 3. In all of the graphs, a shock of house price itself would lead to positive increases in the future house prices, implying that the changes in the current house prices do affect residents' expectations in the short-run period. Moreover, the responses of house prices to the shocks of money supply and interbank rates individually exhibit a similar trend of change. Summarily, a shock of money supply (M1) has a positive effect on house prices while the interbank rates negatively affect the housing sector in the Australian sub-national housing markets. These results comply with the conventional economic theory discussed in the literature review.

Figure 3: Accumulated responses of the HPI to the INT and M1



The results of the IRF suggest that the responses of house prices in Brisbane, Adelaide, Perth and Canberra are more sensitive to the shock of money supply. The maximum responsive values of these four cities achieve 1.36%, 0.90%, 0.87% and 0.80% in eight quarters. However, Hobart and Darwin's responses are less evident, in which a positive shock of money supply results in 0.4% positive changes in the HPI in ten quarters. In the case of other two cities, the increasing trends of the HPI are driven up by 0.50% on average in five quarters in response of a shock of M1. Regarding the effects of interest rates, the impulse of the interbank rates triggers dramatic negative impacts on house prices in eight capital cities. The responses of the HPI to a shock of the INT are more apparent in Sydney where the HPI shows -3.45% of movements in eight quarters. Adelaide, Brisbane, Canberra and Perth are in the lower tier where the maximum values of the responses of the HPI to a shock of the INT respectively achieve -1.17%, -1.16%, -1.64% and -1.49% in eight quarters. However, in Melbourne, Darwin and Hobart, the maximum values of the responses of the HPI to the impulse of the INT are much smaller, approximately 0.63% in six quarters.

In summary, under an expansionary monetary policy between 1996 and 2009, the house prices across the Australian metropolitan areas had been significantly driven up by the decrease in interest rates and the increase in money supply. The possible reason is that the expansionary monetary policy allowed the residents to enter the mortgage market for housing easily and then the demand for housing was stimulated. Moreover, the increases in house prices should be a signal with regard to a decrease in the housing affordability (Hui & Yue, 2006). Therefore, the changes in monetary policy may be a significant political issue that influences the housing affordability.

CONCLUSIONS

This study empirically examined the impact of the expansionary monetary policy on the housing sector in Australia between 1996 and 2009 using the SVAR models. According to the structural decomposition of the impulse response function, it was identified that the decreases in the interbank rates and the increases in money supply had produced dramatic responses of house prices in the Australian eight capital cities. These findings comply with the justification of the conventional macroeconomic theory. Specifically, the results indicated that: (1) the values of the response of the HPI to a shock of M1 are evident in Brisbane (1.36%), Adelaide (0.90%) Perth (0.87%) and Canberra (0.80%) but less apparent in Darwin (0.43%) and Hobart (0.39%); (2) the responses of house prices to a shock of the interbank rates are sensitive in Sydney, Adelaide, Brisbane, Canberra and Perth, in which the maximum values of the house price responses ranged from 1.16% to 3.45%. However, in Melbourne, Darwin and Hobart, the responses of house prices are less evident, approximately 0.63%. The empirical evidence of this study suggests that the housing markets across the metropolitan areas in Australia are sensitive to the changes in monetary policy. Thus, the perspective in regard to housing development should be included in the decision process of monetary policy in Australia.

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