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The Business Cycles of Urban Housing Market (Case Study: Urban Housing Market of Isfahan, 1980-2014)

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Abstract

Housing is a commodity with unique features and its market, especially in urban areas, is characterized by unique business cycles that differentiate it from other commodities. On one hand, housing market can be deeply influenced by economic shocks, and on the other hand, the sheer size of housing investments makes the economy particularly vulnerable to any shock in this market. Hence, analysis of housing markets and their boom and recession periods is of interest to the actors of housing sector as well as economists. This study aimed to investigate the business cycles of urban housing market of Isfahan province (Iran) over the period of 1980-2014, and analyze the trends of private investment in this market by the use of Markov Switching Vector Auto Regression (MS-VAR) model, which has shown great strength in differentiating boom and recession periods. The results show that the periods of boom and recession in Isfahan's urban housing market both have an expected length of 10 years, and that the business cycles of this housing market run opposite to the business cycle of the national economy.

Keywords: Business Cycles, Urban Housing Market, Isfahan Province, Markov Switching Vector Auto Regression.
JEL Classification: R31, O18, E32, E37.

1. Introduction

Housing market is deeply linked with the mood and performance of economic actors, especially those operating in cities and metropolises. On one hand, housing is among the basic needs of any household and perhaps the most important asset that a household acquires during its

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lifetime, and on the other hand, it is regarded as an important investment commodity. In other words, there are both consumer demand and investment demand for housing. Housing sector often undergoes cyclical boom and recession periods in both local and national scale. The boom periods are accompanied by steady increase in house prices, rental rates, and thus housing investments, but in the subsequent recessions, house prices and sales drop sharply and so does the investment in this sector.

Housing has unique features that differentiate it from other consumer and capital goods. The first feature of housing as a commodity is its two-dimensionality, that is, its ability to serve not only as an asset but also as a consumer product. The reason housing is considered an asset is its high durability and very low depreciation. For example, Jin and Zeng (2004) have stated that the depreciation rate of real estate is 0.015, but that of other assets is 0.065.

Economic shocks often cause recurring cycles of boom and recession in the housing sector and a house, being an asset, is subject to extensive price fluctuations in such cycles. Real estate constitutes a significant portion of asset and capital of a nation, so house price fluctuations can inflict irreparable damage to the economy and trigger wider financial and economic crises. The prime example of this situation is the financial crisis of 2008, when a surge in demand for housing led to a price bubble, but after several periods of oversupply, real estate prices saw a sharp fall, real estate investments were degraded, and this led to a far wider economic crisis. Delayed supply is another feature of housing market that has played a role in the emergence of recent financial crisis. House price and land price volatilities also have a direct impact on macroeconomic activities as they affect both consumption and investment simultaneously.

Developments in the housing sector are also of interest to central bank officials, because once a house price bubble bursts, many private investors and households will face heavy debts, there will be a decrease in the level of savings, consumption and investment, and banks' liquidity will shrink. In such situation, banks will have to deal with the undervaluation of collaterals, which leads to an even further decline in the prices and therefore their profits. As a result, the number of bankruptcies will increase and banks will face a financial crisis.

Maisel (1967) has shown that real estate investments play an important role in the effectiveness of monetary policy in the economy.

Another important feature of housing market is its association with inflation. Some economists believe that asset prices should be incorporated into the inflation index. The advocates of such adjustment of inflation index argue that asset price can reflect not only the cost of inflation, but also the trend of future inflations. Fisher (1911) believes that an increase in monetary supply first increases the price of assets and then affects other commodities. In Iran, the contribution of housing component to the commodity price index is more than 25%.

Residential units cannot be relocated and remain in the same place throughout their lifetime, thus buyers often pay particular attention to the surroundings of the unit. On occasion, this feature of the housing market has led to the emergence of Dutch disease (Khalili Iraqi and Hasani, 2011).

In most countries of the world, households spend a significant share of their income on buying or renting residential units. Extremely high house prices may give rise to some issues regarding the financing. In short, households often try to buy residential units by taking mortgages from financial markets, or in other words, consuming their future earnings. But in countries with low per capita income and poor financing systems, even the installments of mortgages can consume a large share of household income, and this undermines the purchasing power of low-income groups, forcing them to rent a residence instead of buying. According to the reports of Iran's Statistics Center, in 2006, about 68% of Iranian households were renters (Khalili Iraqi and Hasani, 2011).

Real estate, then is characterized by their special features including space-dependent characteristic so that the space that dwelling located there might affect its value and other characteristics of the market. Because of this interrelation of space and real estate features, it need to focus on local housing market taking special local factors in control. Factors that distinguish a local housing market from others are local immigration (Mussa et al., 2017), population demographics (Monnet, 2017) and local labor market (Osland and Thorsen, 2013). In this paper, local housing market of Isfahan is analyzed.

In the next sections, we first review the theoretical basis and the empirical literature concerning the cycles of housing market, and then examine the periods of boom and recession in the housing market of Isfahan, and the evidence revealed by analysis of available statistics. In section 4, we present the research model. The experimental results are analyzed in section 5, and the final results are summarized in section 6.

2. Review of Literature

With the emergence of monetarism in the 1950s and 1960s, business cycles were explained by monetary contractions. Later, with the popularization of new classical school, Lucas (1990) explained the business cycles with rational expectations. With the progress of business cycle literature, new theories suggested that business cycle is an inherent feature of capitalist economy, and the idea of real business cycle was developed. The leading advocates of real business theory include Kydland and Prescott (1982), and opponent of this theory include Keynesian economists such as Krugman and Summers, who have attributed the business cycles to the shocks in demand rather than supply.

Economic cycle (business cycle, trade cycle) is periodic fluctuation of the level of business activity presented by real GDP. There are the short business cycle (Kitchin cycle), the medium-term business cycle (Juglar cycle) and the long economic cycle (Kondratiev wave), and also Forrester's cycles, Toffler's waves and many others (Geipele and Kauskale, 2013). The cycles differ in duration, intensity and other factors.

Although the literature on the relation of housing sector and business cycles is limited, the relation of housing investment and business cycle has been extensively researched by Alberts (1962), Fair (1972), Leeuw and Gramlich (1969) and many other researchers. These studies have assumed a given business cycle and then examined the impact of income on the cycles of housing investment.

Existence of demand uncertainty, asymmetric information, trade cost, adjustment costs, construction lags and other factors make real estate market, cyclic (Grenadier, 1995). The cycles of real estate market are interrelated with economic cycles; at the same time the cycles of real estate market outrun economic cycles.

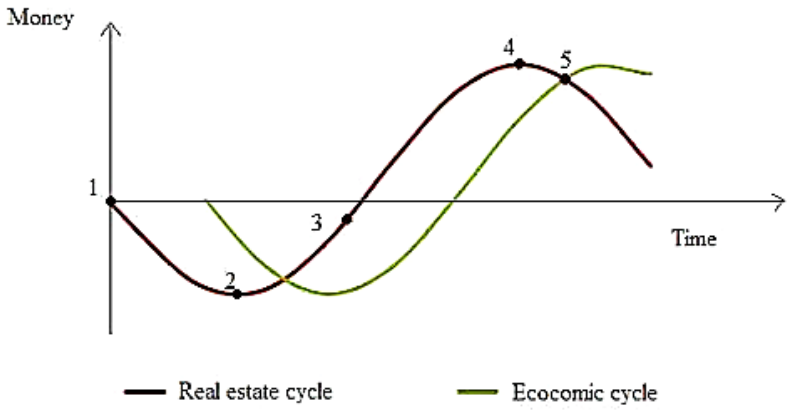

Figure 1: Interrelation between Economic and Real Estate Cycles (Geipele and Kauskale, 2013)

Although the time in and out of cyclical period of housing market is not deterministic, identifying the phases of its economic cycle is helpful. In phase 1-2 prices and cumulative demand are decreasing. There is a crises (bottom) of housing market in phase 2. The expansion and recovery of market causing price level up is expected in phase 2-4. In points 3-4, rapid growth is happened. It is identified by a large number of buyers and sellers, increasing employment ratio and increasing wages. Phase 4 reaches to peak of real estate cycle with equalizing cumulative volume of real estate supply and demand and price growth stops.

The studies of Lamont and Stein (1999) in the US and Miles and Andrew (1997) in the UK have shown that asset prices strongly react to income shocks. Poterba (1991), Smith and Tesarek (1991), Mayer (1993), and Earley (1996) have provided evidence supporting the belief that asset prices increase during the boom period and decrease during the recession. Ortalo-Magné and Rady (2004 and 2006) have provided evidence for the existence of this relationship over time, and have used the life-cycle model to study the impact of income shocks on housing demand.

Using the dynamic stochastic general equilibrium model, Davis et al. (2005) found that: 1) the standard deviation of residential investment in business cycles is twice that of other investments, and 2) consumption, GDP, non-residential investment and residential investment move together in the same direction.

In a study by Davis and Heathcote (2003) on the US economy using the general equilibrium model and the calibration method, it has been shown that residential investment has a cyclical property and itself is a factor of business cycles of the economy.

Sutton (2002) has studied the housing markets of several countries and has found that a one-percent increase in the GDP growth rate could increase the house prices by one to four percent. He has explained the mechanism of the effect of real income growth on house prices as follows: an increase in income will increase the demand for housing, and therefore the house prices. On the other hand, with higher incomes, demand for housing investment will also increase, and this also leads to an increase in house prices. Meanwhile, the increased demand will also lead to more investment in the housing sector.

Jafari Samimi et al. (2007) have used the ARDL model to examine the impact of macro variables, including household income per capita, stock price index, construction price index, and the number of completed buildings, liquidity, and inflation rate on house prices.

Najafi (2004) has studied the seasonal changes of Iranian housing market over the period 1991-2002. These results indicate that the cost of materials and construction has a negative impact on housing supply while house prices have a positive impact on investment in the housing sector.

Akbari and Tavassoli (2008) have studied the impact of building taxes collected by municipalities on house prices. Gholizadeh and Kamiab (2008) have used the ARDL method to investigate the effect of monetary policy on house price bubbles during periods of boom and recession in Iranian housing market. Akbari et al. (2004) have investigated the factors associated with house prices in Mashhad, Iran by the use of hedonic pricing model and spatial econometric technique. Khiabani (2003) has used the modified ARDL method to determine the effect of macro variables such as liquidity growth, real exchange rate, production, and stock price index on house price fluctuations.

Bastani and Rezaei (2008) introduced the factors associated with supply and demand for housing and then examined the effect of these factors on the rate of price variation in the housing market. They have

reported that the factors that may affect the supply of housing include the rate of issuance of building permits, prices of construction inputs, and other factors such as poor performance of the capital market, and lack of a coherent plan and policy for the control of speculation in land and housing sector, among others.

Ghaderi et al. (2011) have studied the factors that have affected the housing investment in Iran during the period 1996-2006. This study has shown that, in the long-run, housing investment is influenced by house prices, liquidity, household income, construction costs, stock price index, and currency exchange rate. However, the effect of gold price and bank interest rates was found to be insignificant. Seyednoorani (2013) has used Iran's statistical data for the period of 1996-2008 to develop a housing supply model in which housing construction is a function of house prices and construction costs. This study has shown the positive effect of house price variations and the negative effect of material cost variations and construction opportunity cost (stock index) on housing supply. This study has found the effect of stock index variations on housing supply to be insignificant. Khoshakhlaq et al. (2006) have estimated the housing supply function of different areas of Isfahan by incorporating the investment and opportunity cost into the housing production function. This study has shown that housing supply in the studied areas is more affected by land supply and less by wages, availability of credit, and house prices, and as a result, supply has a very low price-elasticity. The low elasticity of housing supply with respect to opportunity cost and real interest rate in other sectors suggests that investment in this sector is not so much influenced by the boom or recession of rival markets such as currency and gold. This study has reported that high sensitivity of housing supply to land supply is more evident in the urban areas.

Farzinvash and Mohseni Zanori (2009) have used the SVAR model to evaluate the significance of house price variations in the monetary transmission mechanism in Iran, and have reported that housing is directly affected by expansionary monetary shocks and is a significant factor in the transmission of monetary shocks to GDP fluctuations.

The present study examines the relationship of four variables: private housing investment, GDP, inflation, and liquidity. Here,

inflation is considered as a proxy of interest rate and return on investment via real liquidity.

3. Boom and Recession Periods of Urban Housing Investment in Isfahan Province

As mentioned above, one way to analyze the behavior of the housing sector actors is to assess the private investment in real estate (see Leamer (2007), Davis and Heathcote (2005), Krystalogianni et al. (2004) and Witkiewicz (2002)). Because increasing in both price level and demand volume of real estate increase demand of private sector for residential investment.

One of the relatively accurate and easily accessible indicators of this demand is the number of building permits issued by municipalities. Building permit is a legal license issued by a municipality allowing a land/property owner to construct a building in accordance with the rules and regulations of urban planning. There are two types of building permit: Permit for new buildings and permit for expansions (Statistics Center of Iran). Based on the records of building permits issued in urban areas of Isfahan, trends of investment in the urban housing sector of Isfahan from 1980 to 2014 can be divided into four periods:

1- A recession period from 1980 to the end of 1992, characterized by short-term fluctuations and generally declining investment. This period mostly coincided with the Iraq-Iran war (1980-1988), and although there was a temporary boom upon the end of the war (1988), the next three years saw the return of recession (1989-1992). During this period, the average annual growth rate in the number of building permits has been -0.4%. Data on seasonal investment in housing also show that in 1985 the average growth of private investment in new buildings was -11.7% while this rate for the seven years period before 1985 was about 6.5%.

2- An 8-year long boom period from 1992 to the end of 1999, which saw a steady growth in private housing investment except in 1997. The unique feature of this period is the gradual but very stable growth. This period coincided with the post-war period known in Iran as reconstruction era, which is characterized by a

relative economic stability during the presidency of Rafsanjani and then Khatami's first term of presidency. During this period, the average annual growth of investment in the urban housing sector of Isfahan has been about 6%.

Figure 2: The Number of Building Permits Issued in Urban Areas of Isfahan Province (1990-1999)
Source: Statistics Center of Iran

3- An 8-year long mild boom from 2000 to the end of 2007. In this period, the residential housing sector of Isfahan province saw frequent fluctuation with generally mild upward trends. During this period, the average annual growth in the number of building permits issued in Isfahan was 5.5%, but the years 2000, 2001, 2003 and 2006 saw a negative growth, which reflects the high volatility of housing investment in this period.

4- A deep recession from 2008 to 2014, which other evidence suggests that it has continued throughout 2015 and 2016 (Heydari, 2017). During this period, the number of building permits issued in urban areas of Isfahan was reduced by more than 6% in 2008 and by another 14% in 2009. But the apex of recession was the 47% decrease in the number of issued building permits in 2014. Over this recession, the number of building permits has decreased from 25000 in 2008 to about 15000 in

2014, and the average annual growth in this indicator has been about -5%.

Figure 3: The Number of Building Permits Issued in Urban Areas of Isfahan Province (2000-2014)
Source: Statistics Center of Iran

The presented statistical evidence reveals a few points about the housing market and investment in Isfahan. First, this housing sector has experienced clear periods of boom and recession. Second, boom periods have been longer than recession periods, although prolongation of the first recession can be attributed to the effect of Iraq-Iran war. Third, although the housing market has relative stable periods more than deep recession.

And lastly, recession and boom periods of housing sector do not coincide with the periods of the economy. In the fifth section, these issues are further investigated by the Markov switching autoregression model.

4. Research Model

Markov switching model was first used by Hamilton (1989) to study the US business cycles. He showed that this model can explain some features of business cycles that cannot be expressed by simpler models. Evans and Lewis (1995) have tested the long run Fischer

relation by developing a Markov switching model for inflation. Clements and Krolzig (2001) have used this model to study the US business cycles with emphasis on consumption, investment and production variables and concluded that these models can outperform linear models in the use of time series attributes. Vargas (2009) has used Markov switching autoregression model to design an early warning system for the future financial crises. They have concluded that this model can accurately predict Asian financial crises by signaling its occurrence at an earlier period. Janczura and Weron (2010) have reported the effectiveness of Markov switching model in the electricity retail market. After comparing the Markov switching model with stable parameter models, Bec et al. (2011) have strongly rejected the hypothesis of stability of parameters during recession and boom periods.

Markov switching autoregression model uses the following formulation to make a distinction between two states. If a variable is replaced by a vector of variables, then autoregression model will turn into a vector autoregression model and there will be as many equations as there are variables. In this model, s_t is a random variable that represents a structural change. Here, it is assumed that s_t can be either 1(for recession) or 2 (for boom).

$$y_t = \alpha_{s_t} + \sum_{i=1}^{\rho} \varphi_{i,s_t} y_{t-i} + \varepsilon_{s_t} \quad (1)$$

In the above equation, y_t is a dependent variable, α_{s_t} and φ_{i,s_t} are the intercept and the coefficient of the lagged variable for state s_t, and ε_{s_t} is an error component, which has a normal distribution with zero mean and constant standard deviation at state $s_t = i$. Assume that for times 1,2,…, $t_0$we have s_t= i , but at $(t_0 + 1)$ there is a change in the state, so for times $(t_0 + 1)$, $(t_0 + 2)$,…T we have $s_t = j$. With this assumption, $s_t$can be regarded as a dummy variable, but because of its latency, $s_t$cannot be dealt with as easily. Since $s_t$is latent, one should define a probability for the change of state from 1 to 2. The simplest approach is to use the Markov chain to define a time-invariant probability matrix for s_t.

$$pr(s_t = j|s_t = i) = p_{ij}$$

In the above equation, $p_{ij}$is the probability of a change in state from i to j. Since $s_t$is latent, the probabilities of the Markov chain must be discovered using the past regimes and variable history[1]. The Markov state transition matrix is defined as follows:

$$\mathrm{P} = \begin{pmatrix} p_{11} & p_{21} \\ p_{12} & p_{22} \end{pmatrix} = \begin{pmatrix} p_{11} & 1 - p_{22} \\ 1 - p_{11} & p_{22} \end{pmatrix}$$

This matrix is one of the main components of Markov switching autoregression model and expresses the alteration of recession and boom periods by a probability.

Although using a time-variant matrix will increase the model complexity, in this study, it is assumed that Markov chain it time-invariant. Further details on Markov state transition matrix can be found in Wang (2003).

Eq. 1, without its autoregression variables, was first analyzed by Lindgren (1978) and Baum (1980). The version of this equation that contains lagged variable was first introduced by Poritz (1982).

The probability density function of the variable $y_t$is:

$$f(y_t|s_t) = \frac{1}{\sqrt{2\pi {\sigma_{s_t}}^2}} \exp\left(-\frac{y_t - \mu_{s_t}}{2{\sigma_{s_t}}^2}\right) \quad (2)$$

Where μ_{s_t} is the mean of the variable at state s_t. If the time of alteration of s_t was known, it could be treated as a dummy variable, and state 1 could be changed to 0 and state 2 could be changed to 1, and in that case, we would need to obtain the derivative of the joint probability density function with respect to α_1, α_2, φ_1, φ_2, ${\sigma_1}^2$ and ${\sigma_2}^2$. But as mentioned, one cannot simply determine how $s_t$varies over the period t∈ [1,2 ... T], so the below procedure need to be followed.

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1. Markov switching vector autoregressive models are also known as regime switching models. The term regime refers to k different states (st = j, j = 1 ... k), and switching refers to random rotation of state from i to j.

First, we determine the joint probability function of y_t and s_t, and then sum up the formulations of states 1 and 2:

$$f(y_t, s_t|y_{t-1}) = f(y_t|s_t, y_{t-1})\, pr(s_t|y_{t-1})$$

$$f(y_t|y_{t-1}) = \sum_{s_t=0}^{1} f(y_t|s_t, y_{t-1})\, pr(s_t|y_{t-1}) \quad (3)$$

$$= \frac{1}{\sqrt{2\pi {\sigma_{0_t}}^2}} \exp\left(-\frac{y_t - \mu_{0_t}}{2{\sigma_{0_t}}^2}\right) \times pr(s_t = 0|y_{t-1})$$

$$+ \frac{1}{\sqrt{2\pi {\sigma_{1_t}}^2}} \exp\left(-\frac{y_t - \mu_{1_t}}{2{\sigma_{1_t}}^2}\right) \times pr(s_t = 1|y_{t-1})$$

Next, we write the logarithm of the likelihood function:

$$LnL = \sum_{1}^{t} Ln\{\sum_{s_t=0}^{1} f(y_t|s_t, y_{t-1})\, pr(s_t|y_{t-1})\} \quad (4)$$

which is, in fact, the weighted average of conditional probability density function. To obtain maximum likelihood estimators, we need to determine the derivative of the logarithm of the likelihood function with respect to α_1, α_2, φ_1, φ_2, ${\sigma_1}^2$, ${\sigma_2}^2$, p_1 and p_2. Hamilton (1984) has proven that the resulting estimators are unbiased and consistent. One of the prominent methods of parameter estimation in this context is the filtering method introduced by Hamilton (1989)[1,2].

5. Empirical Findings

Equations of private housing investment, GDP and price index adjusted liquidity were estimated using the Markov switching vector autoregression (MS-VAR) model. This study was carried out using the data acquired from the websites of Iran's Central Bank and Statistics Center. Because of statistical constraints, the scope of the study was

1. Alternative approaches include the Bayesian method and the rational expectation method.
2. For further information, see Hamilton's Time Series Analysis (1994).

limited to the period of 1990-2014. The model was estimated by MATLAB software.

Using the MS-VAR model with three equations with the lag ρ = 1 and two states ($s_t = 1,2$), a total of 28 parameters were estimated (3 standard deviations for each of the equations; 4 state transition probabilities; 18 coefficients of lagged variables; and 3 intercepts).

Coefficients of lagged variables are presented in Table 1. For each equation, the coefficients are presented for two states. The standard deviations estimated for the periods are presented in Table 2. Here, state 1 represents the boom and state 2 represents the recession of urban housing market of Isfahan province.

According to the results, in the first equation, the coefficient of the lagged dependent variable in state 2 (recession) is significant at 95% confidence level. Also, the lagged dependent variable in state 1 and the lagged variable *private housing investment* in state 1 are significant at 90% confidence level. The negative sign of the lagged variable *private housing investment* in the first equation reflects the relative stability of housing investment during the recession, as a decline in investment during a recession is followed by increased investment in later periods. This argument also applies to boom period, as the lagged variable *private housing investment* in state 1 is significant, but its coefficient is too small for the effect to be tangible. The coefficients of other variables of the first equation are not significant.

In the second equation (y), statistical significance can be seen for the lagged variables *GDP* and *Liquidity* during boom and the lagged variables *private housing investment* and *GDP* during recession. The coefficient of *private housing investment* in the second equation (-0.05) represents a negative but very limited effect of housing investment during the recession. This result shows that business cycles of the housing sector do not coincide with those of the economy. Also, the positive effect of the lagged variable *GDP* in both boom and recession periods in the second equation reflects the relative stability of business cycles of the economy.

Examining the coefficients of the third equation (m) shows the significance of the lagged variable *GDP* in the boom and the lagged variable *private housing investment* in the recession. Other

coefficients, however, are not statistically significant. This insignificance of the coefficients of the third equation point toward the insignificant effect of macroeconomic condition, including the business cycle of the housing sector, on the monetary policy of the central bank; an issue whose importance has been frequently emphasized in the economic literature.

Table 1: Coefficients of the Lagged Variables of the MS-VAR Model (The Numbers in Parentheses are the Significance Levels)

Equation		variable lag (i)	variable lag (y)	variable lag (m)
Private housing investment (i)	State 1	0.08 (0.06)	-0.12 (0.18)	-0.16 (0.08)
	State 2	-0.59 (0.00)	-0.19 (0.25)	-0.11 (0.13)
GDP (y)	State 1	0.74 (0.57)	0.56 (0.00)	-0.28 (0.01)
	State 2	-0.05 (0.01)	0.10 (0.04)	0.14 (0.86)
price index adjusted Liquidity (m)	State 1	0.02 (0.48)	0.75 (0.01)	-0.41 (0.32)
	State 2	-0.32 (0.02)	0.44 (0.68)	-0.23 (0.91)

Table 1 presents the standard deviation of each equation in different states. The standard deviation of the *private housing investment* equation shows that the second period has more fluctuations than the first, and this signifies a recession in the housing sector and investment in urban housing of Isfahan.

Meanwhile, the standard deviation of the *GDP* equation shows the opposite result, which reflects the asymmetric relation of the business cycle of the economy with the business cycle of the housing sector.

Table 2: Standard Deviation of Equations for Different States

Equation		Residual standard deviation
1) private housing investment (i)	State 1	0.00012
	State 2	0.00030
2) GDP (y)	State 1	0.00028
	State 2	0.00016
price index adjusted liquidity (m)	State 1	0.00190
	State 2	0.00200

According to the state transition probabilities given in the state transition matrix, p, the probability of staying in state 1 is 90%, and thus, the probability of a transition from state 1 to state 2 is 10%. The second column of this matrix represents the probabilities of staying in state 2 and transition from state 2 to state 1, which are 90% and 10% respectively. The numbers in parentheses are the significance levels and show that probabilities of transition matrix are statistically significant.

$$\hat{P} = \begin{pmatrix} 0.90(0.00) & 0.10(0.00) \\ 0.10(0.00) & 0.90(0.00) \end{pmatrix}$$

6. Results

The results inferred from the estimated model coefficients can be summarized as follows.

The business cycles of urban housing market of Isfahan province have an asymmetric relationship with the business cycles of the economy, in the sense that these two cycles run in the opposite direction. Boom and recession periods of the housing market are both relatively stable, but recession periods are more persistent, as entering a recession will cause a greater reduction in the housing investment of the next period. Also, monetary policies were found to be independent of the business cycles of the housing sector and the cycles of economic boom and recession, which reflects the inadequacy of monetary policies.

Using the status transition matrix, the expected length of boom and recession in the housing market can be determined. In the case of this study, the expected lengths of recession and boom in Isfahan's urban housing market were estimated to 10 years, meaning that, on average, this housing sector is expected to undergo a 10 year period of recession, then experience 10 years of boom, and then repeat the cycle.

Table 3: Expected Length of Boom and Recession Periods

expected length of boom (state 1)	10
expected length of recession (state 2)	10

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