



Relationship between Liquidity and Price Bubble in Tehran's Asset Market

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Abstract

In this paper, according to Austrian school, the existence of bubbles in asset market of Tehran from 1998 to 2009 is attributed to the unexpected fluctuations of liquidity. To find out the process of bubble, the state space form and Kalman filter are used and bubble is brought out as unobserved variable of price series. In order to determine the long run relationship between liquidity and price bubble the VAR method proposed by Johanson and Jelibus is used. The result confirms that variation of liquidity has a significant effect on the creating of bubble in long run.

Keywords: Price bubble; Austrian school

Introduction:

In the framework of asset pricing theory (APT) and assuming the efficiency of market, the price of possessions only depends on the information about the efficiency of possessions with this point of view, the current price, should be according to fundamental base value of the possessions and any kind of deviation of it is called bubble. According to definition of World Bank, bubble refers the situation that the price of the possession, infringes its fundamental price meaningfully. This word becomes common in asset markets, after the weakness of fundamental patterns when explaining excessive fluctuations of price in asset market. This notation becomes the subject different studies. The idea of 'bubbles' in asset prices is then considered. It is argued that a 'bubble' is not a meaningful way to characterize asset price cycles because the concept lacks both analytical coherence and empirical support. Some of the most well-known historical 'bubble' episodes, such as the Dutch 'tulip mania' of the 1630s, are shown to be myths that have been largely debunked by modern scholarship. The inability of economists to give substance to the idea of 'bubbles' argues against using monetary policy to manage asset price cycles. Regarding bubble, different points of views are suggested. According to Chicago's school, accepting the existence of bubble is approval of the agents of ignorance and such behavior is impossible by the

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economical human, therefore, based on this, the existence of bubble in market is defined. As opposite to them Keynesian economists and followers of behavioral finance, accepting the existence of the bubble against the hardcore of their thoughts based on the nationality of human, they rejected its existence and knew it due to real factors. The Keynesian economists by stating theories based on psychology and sociology proves that the possibility of ignorant behavior of a group, even including knowledgeable people, is possible in the framework of herding theories, so these economists, by accepting bubble, attribute it to the ignorance of investors. We call attention to the researches like Tversky and Kahnemann (1974), Lee (1993), Shiller (2001) and Thornton (2007) by satiating discussions such as excessive pessimistic and optimistic, the low small number, informational cascades and Herding theory are the reasons of creating bubble in asset market. According to the followers of behavioral economics point of view, the existence of bubble is accepted as the real result of collective behavior of agents of market. According to this point of view, the appearance and fall of bubbles is due to emotional intelligence and behaviors affected by the thought of the group. Regarding to this school bubble feeds on itself and expands, then it can be once deteriorated by changing the dominant thought, but the third point of view whose source is Austrian school, believes that bubble is the result of expanding monetary policies. In this point of view, bubbles are a part of price changing which are created through expanding monetary policies in asset market. In other words, regarding Austrian point of view, injection of money causes the behavior of non-productive speculation and bubble is shaped. This view is considered, because it attributes the occurrence of a real phenomenon to economical factors. The studies related to this school are such as Shostak (2003) and Callahan and Garrison (2003). This paper follows testing whether money is effective creating bubble in asset market of Tehran in the framework of Austrian school. To answer this question in this fundamental pattern, pricing possessions is collected in the framework of state space form and then using Kalman filter of price bubble is brought out as unobserved variable of pattern. Finally, the existence of long run and short run of our variables is tested using Johansen and Juselius cointegration method.

Austrian school in asset market:

The case for an activist approach to asset price cycles relies heavily on the notion that asset prices are prone to ‘bubbles’ that may destabilize the financial system and the broader economy. However, there is almost no agreement in the literature on what might constitute an asset price ‘bubble.’ This fundamental lack of understanding presents considerable problems for any attempt to operationalise an activist approach to asset prices on the part of monetary policy. The literature typically distinguishes between ‘rational’ and ‘irrational’ bubbles, although both these conceptions suffer from similar problems (Dempster, 2011). "The Austrian School of Economics has a long and distinguished history of dealing with problems of epistemology and method in economics that the mainstream of the profession has predominately ignored. The discipline of finance (a specialized sub-field of economics that deals with the principles of the acquisition, management, and use of money capital, by individuals and firms, as a source of liquidity and investment funding), though typically better grounded in real-world practice than its parent discipline, nonetheless suffers from epistemological problems, as well as methodological inconsistencies, that an Austrian perspective could potentially address. Modern proponents of the Austrian business cycle theory (ABCT)

of the 1920s argue that ‘bubbles’ in asset prices are the result of a monetary policy-induced expansion in money and credit that drives both asset prices and the business cycle more broadly" (Von Mises, 1953; Dempster, 2011). As a stylised account of the business cycle, this view informs much popular commentary, notably by *The Economist* magazine, which likes to claim that ‘the Austrian school of economics offers perhaps the best framework to understand what is going on (*The Economist*, 28 July 2005). In fact, the ABCT is inconsistent with current institutional realities and modern macroeconomic theory and evidence (Wagner, 1997; Dempster, 2011).

There is only a very loose relationship between official interest rates and growth in broad money and credit aggregates under current central bank operating procedures (Disyatat, 2008). "The ABCT is a fundamental explanation for ‘bubbles’ because Austrians have an axiomatic theory of the relationship between monetary policy and asset prices. However, the ABCT implicitly assumes some investor irrationality, namely, that investors fail to learn from previous cycles. Proponents of the ABCT argue that this is due to the failure of economic agents to understand or accept their theory—in other words, the theory holds only because most people reject it" (Barnett and Block, 2006). "Unlike many of the contemporary exponents of the ABCT, Mises both anticipated and accepted the implications of a quasi-rational expectations view of monetary policy and the business cycle: The teachings of the monetary theory of the trade cycle are today so well known even outside the circle of economists, that the naïve optimism which inspired the entrepreneurs in the boom periods of the past has given way to a certain skepticism" (Barnett and Block, 2006; Dempster, 2011).

"It may be that businessmen will in the future react to credit expansion in another manner than they did in the past. It may be that they will avoid using for an expansion of their operations the easy money available, because they will keep in mind the inevitable end of the boom ... as the boom comes to an earlier end, the amount of malinvestment is smaller and in consequence the following depression is milder too" (Von Mises, 1953). "Note that the supposed failure to learn what some Austrians view to be the correct model of the business cycle is distinct from the question of whether rational expectations render monetary policy ineffective. Both monetarists and New Keynesians would not dispute the Austrian view that monetary policy is effective to some degree, even in the presence of rational expectations. It should be noted that many Austrian School economists reject the ABCT as an equilibrium theory that departs from Austrian School methodology. Leland Yeager, for example, has called the theory an ‘embarrassing excrescence' (Yeager, 1997).

"Mueller (2001) picks up on Matchup's theme of the relationship between stock market activity and monetary policy, although he inexplicably neglects to acknowledge Matchup's contribution. Mueller's article provides a rough outline of the Austrian analysis of the bubble economy fueled by monetary expansion, and integrates the micro-level perspective provided by earlier theorists with a macro-level, systemic framework where the “expectations of investors and consumers have become highly unstable and economic action is hampered by the perception of insecurity.” Of particular interest is the tying of economic (boom-bust) and stock-market (asset price) bubbles together under this single, unified framework" (Yeager, 1997; Barnett and Block, 2006).

Furthermore, there is a growing literature in the field of economic sociology that mirrors much of the criticism of neoclassical rationality and maximization assumptions found in Austrian economics while retaining at least some form of axiomatic rationality (or self-interest) and goal-oriented agency (see Yeager, 1997; Barnett and Block, 2006; Dempster, 2011). For example, Abolafia and Kilduff (1988) explore the purposive “actions, attributions, and regulatory efforts of powerful market participants” in the process of conflict that brings about and, eventually, resolves a speculative asset price bubble. Their model treats “economic actors as aggressively self-interested but deeply constrained by the institutional structures within which they operate” (p. 178).

Bubble price in asset market¹:

Consumers’ optimization problem can be used to derive the basic asset pricing relationship assuming no-arbitrage and rational expectations—standard assumptions in economics and finance. For simplicity let expected utility driven from consumption, $u(c)$, be maximized in an endowment economy,

$$\begin{aligned} & \text{Max } E_t \{ \text{Summation } (\beta^i u(c_{t+i}) \text{ for } i \text{ from } 0 \text{ to end}) \} \\ \text{s.t. } & c_{t+i} = y_{t+i} + (P_{t+i} + d_{t+i})x_{t+i} - P_{t+i}x_{t+i+1} \end{aligned} \tag{2}$$

where y_t is the endowment, β is the discount rate of future consumption, x_t is the storable asset, P_t is the after-dividend price of the asset, and d_t is the payoff received from the asset. In this paper the focus is on stock prices, thus P_t is a stock price, and d_t is dividend, however, in different contexts P_t may be a house price and d_t rent, or P_t may be price of a mine and d_t the value of ore unearthed every period. The optimization problem’s first order condition is:

$$E_t \{ \beta u'(c_{t+i}) [P_{t+i} + d_{t+i}] \} = E_t \{ u'(c_{t+i-1}) P_{t+i-1} \} \tag{2}$$

For asset pricing purposes, it is often implicitly or explicitly assumed that utility is linear, which implies constant marginal utility and risk neutrality. In this case, equation (2) simplifies to:

$$\beta E_t (P_{t+i} + d_{t+i}) = E_t (P_{t+i-1}) \tag{3}$$

Assuming further the existence of a riskless bond available in zero net supply with one period net interest rate, r , no-arbitrage implies:

$$E_t (P_{t+i-1}) = E_t (P_{t+i} + d_{t+i}) / (1 + r) \tag{4}$$

Equation (4) is the starting point of most empirical asset pricing tests. This first-degree difference equation can be iterated forward to reveal the solution:

$$P_t = \text{Summation } (E_t(d_{t+i})(1/1 + r)^i \text{ for } i \text{ from } 1 \text{ to end}) + B_t \tag{5}$$

$$\text{such that } E_t(B_{t+1}) = (1+r)B_t \tag{6}$$

The asset price has two components, a “market fundamental” part, which is the discounted value of expected future dividends, the first term in the left hand- side of equation (5), and a “bubble” part, the second term. In this setup, the rational bubble is

¹In order to explain Bubble price in asset market we reference some parts of the paper of Gurkaynak (2005) can be found in the special issue of Finance and Economics Discussion Series, Federal Reserve Board, Washington, D.C

not a mispricing effect but a basic component of the asset price. Despite the potential presence of a bubble, there are no arbitrage opportunities-equation (6) rules these out. Under the assumption that dividends grow slower than r , the market fundamental part of the asset price converges. The bubble part, in contrast, is non-stationary. The price of the asset may exceed its fundamental value as long as agents expect that they can sell the asset at an even higher price in a future date. Notice that the expectation of making high capital gains from the sale of the asset in the future is consistent with no-arbitrage pricing as the value of the right to sell the asset is priced in. Importantly, the path of the bubble (and consequently the asset price) is not unique. Equation (6) only restricts the law of motion of the non-fundamental part of the asset price, but it implies a different path for each possible value of the initial level of the bubble. An additional assumption about B_t is required to determine the asset price. A special case of the solution that pins down the asset price is $B_t = 0$, which implies that the value of the bubble is zero at all times. This is the fundamental solution that forms the basis of present value pricing approaches to equity prices. In the remainder of the paper this solution is alternatively called “the standard model,” “the present value model,” and “the market fundamentals model.”

The market fundamentals model is a special case of a more general model that allows for bubbles. The no bubbles special case is justified by a transversality condition in infinite horizon models. The price of the asset today is the sum of the net present value of expected dividends and the expected resale value:

$$P_t = \text{Summation } (E_t(d_{t+i})(1/1 + r)^i \text{ for } i \text{ from } 1 \text{ to end}) + \lim_{i \rightarrow \infty} (1/1 + r)^i P_{t+i} \quad (7)$$

The transversality condition asserts that the second term on the right hand side is zero. This is justified by the following argument: If there is a positive bubble, and this term is not zero, the infinitely lived agent could sell the asset and the lost utility, which is the discounted value of the dividend stream, will be lower than the sale value. This cannot be an equilibrium price as all agents will want to sell the asset and the price will fall to the fundamental level. Tirole (1982) argues that bubbles can be ruled out in infinitely lived rational expectations models, but the same author (1985) shows that bubble paths for asset prices are possible in overlapping generations models. The current literature usually takes it as given that non-fundamentals based asset prices are possible, skipping the theoretical existence problem, and treating bubbles as an empirical issue. The empirical tests usually start from equations (5) and (6), without delving into general equilibrium arguments.

The state space form²:

The general state space form is

$$y_t = Z_{tat} + G_{tft} \quad (8)$$

$$\alpha_{t+1} = T_{tat} + H_{tft} \quad \text{for } t = 1 \text{ to } n \quad (9)$$

where ξ_t *i.i.d.* $(0, \sigma^2 I)$, α_1 *i.i.d.* $(0, \sigma^2 P_1)$, and the ξ_t and α_1 are mutually uncorrelated. The system matrices Z_t , T_t , G_t and H_t are nonrandom, typically depend on hyper parameters and, as the notation indicates, may vary over time. For a univariate model with an $s \times 1$ state vector α_t and $m \times 1$ vector of errors ξ_t , the matrices Z_t , T_t , G_t and H_t are $1 \times s$, $s \times s$, $1 \times m$ and $s \times m$ respectively and m is $\max(p, q)$. In the literature

²In order to explain this part we reference some parts of the papers of Brockwell and Davis (1987), Harvey (1989) and Hamilton (1994).

(Brockwell and Davis 1987; Harvey 1989; Box, Jenkins, and Reinsel 1994; Hamilton 1994) the max (p; q) representation has been overlooked in favor of one in which the state vector is of length $m = \max(p, q+1)$. In this version, Z and T are as above but $G = 0$ and $H = (1; \theta_1 \text{ to } \theta_{m-1})'$. The prevalence of this form may be explained by the fact that the measurement and state noise are uncorrelated – there is no measurement noise. Uncorrelated measurement and state noise fits in with the more usual state space form where $G_t H_t' = 0$ (Anderson and Moore 1979). Using the Kalman filter the observations y_t are transformed to innovations v_t . In general, for $t = 1$ to n ,

$$\begin{aligned} v_t &= y_t - Z_{tat}, F_t = Z_t P_t Z_t' + G_t G_t', \\ K_t &= (T_t P_t Z_t' + H_t G_t') F_t^{-1}, \\ a_{t+1} &= T_{tat} + K_{tvt}, P_{t+1} = T_t P_t L_t' + H_t J_t' \end{aligned} \tag{10}$$

where $L_t = T_t - K_t Z_t$ and $J_t = H_t - K_t G_t$. The slight simplification of (3) made possible by the max(p, q + 1) representation must be balanced against desirable features of the max(p, q) form. It is our contention that the arguments in favor of the max (p, q) version are compelling. First, when $q \geq p$ the state vector is shorter providing a slight computational advantage. Second, the converged quantities in the max (p, q) representation take on convenient and readily interpretable forms.

Methodology of finding the bubble in Tehran asset market:

According to state space form our model in Tehran's asset market is followed as:

$$\begin{aligned} PRD &= C_1 * PED(-4) + SV_1 \\ SV_1 &= C_3 * SV_1(-1) + (\text{var} = \exp(C_2)) \end{aligned} \tag{11}$$

Where PRD is the logarithm of first lag of price index of Tehran's asset market in fixed price of 1991, PED is the logarithm of first lag of price index of cash returns and SV1 is an unobserved variable (bubble part).

At first we probe the integration of the variables in equations 10 and 11 with augmented Dicky-Fuller test. After that we use the Box-Jenkins method in order to find cash returns presses. Our result confirms that this process is an ARIMA(4, 1, 0). Finally we assume that the bubble is followed as an autoregressive process with one order.

In order to find the coefficients of equations above we use a maximum likelihood method. Finally, with using the Kalman filter and estimating the maximum likelihood of the variables of state space form the best estimation of unobserved variable would be gained. The result of this estimation is available in table 1.

Table 1. Result of the Kalman filter estimation of the bubble

Method: Kalmen filter					
Observation: 48					
	Final state	Root MSE	z-Statistics	Prob.	
SV1	-7.115	829.791	-0.008	0.993	
Log Likelihood	-283.193	Akaike information criterion			16.182
Parameters	0.000	Schwarz information criterion			16.182
Diffuse priors	0.000	Hannan-Quinn information criterion			16.182

Analysis of short and long run between the size of liquidity and price bubble in Tehran's asset market:

The aim of this study is to investigate the relationship between the size of unplanned variation of liquidity and the price of bubble of Tehran's asset market in short and long run. In order to do this we use a simple linear regression which the result is followed as:

$$\text{Log}(bb)=1.64+0.43\text{log}(bp)$$

t: (0.9) (2.70)
Std: (1.45) (1.13) (12)

The elasticity of bubble in the total index of Tehran's asset market (bb) compared with the unplanned variation of liquidity (bp) is 0.43 significantly. In another word, each 100 units increasing in the size of unplanned variation of liquidity cause to increasing around 38 units in the price bubble of Tehran's asset market from 1998 to 2009.

The result of co integration test is available in table 2. According to table 2, we test the Max-eigenvalue test and Trace test to find the existence of long run relationship. Our result verifies that there is not any long run relationship between the variables.

This result argues that in short run we could explain the existence of bubbles with the Austrian school. But in long run, because of finding no relationship we consider that there do not exist the sufficient evidence of Austrian school manners at this time or similarly with Chicago school we find no bubble in Tehran's asset market.

Table 2. Result of co integration test between bb and bp

<i>Unrestricted cointegration rank test (Trace)</i>				
Hypothesized		Trace 0.05		
No of CE(s)	Eigenvalue	Statistics	Critical value	Prob. **
None	0.272	13.351	15.494	0.102
At most 1	0.000	0.009	3.841	0.923
<i>Unrestricted cointegration rank test (Maximum Eigenvalue)</i>				
Hypothesized		Max-Eigen 0.05		
No of CE(s)	Eigenvalue	Statistics	Critical value	Prob. **
None	0.272	13.351	14.265	0.069
At most 1	0.000	0.009	3.841	0.923

Notes: result denotes rejection of the hypothesis at the 0.05 level.

Conclusion:

In this paper we base the Austrian school in order to find if the price bubble in Tehran's asset market is influenced of unplanned variation of the size of liquidity over the period of 1998 to 2009 in quarterly amounts. To do this, we use Kalman filter model and test the existence of short and long run. Our result confirms that the variation of liquidity cause to make a price bubble in total index of Tehran's asset market. We find no long run relationship between our variables.

A further prospect for this type of study is to repeat the tests proposed here with longer time series. This will be possible whenever supranational institutions produce consistent time series data on national accounts.

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