Research proposal

Interest Rate Policy Shocks and Its Impacts on Stock Market Bubbles in CIS countries

Prepared by Zhanna Ishuova, Saltanat Kondybayeva, Meruyert Daribayeva

Keywords: structural vector–autoregression (VAR) model, interest rate policy rules, stock price bubbles, stabilization policies

JEL classification: E52, G12

Authors’ email addresses: ishuova_zhanna@hotmail.com, atlaspol@mail.ru, mikoliya@mail.ru

Objectives

In contemporary literature (Furlanetto, 2011; Gambetti et al, 2013; Gali, 2014) widely discussed question about the link between monetary policy and bubble-driven episode of asset price inflation. In accordance with the theory of rational bubbles, if the relative size of the bubble is large, the interest rate hike can increase the price of an asset over time, due to its positive influence on the bubble component more than compensating the negative effect on the central component (Gali, 2014). This theory is confirmed by the results of work (Gambetti et al, 2013): “in equilibrium the bubble component raises at the rate of interest” and higher interest rates could eventually increase the size of the bubble.

In the present project an attempt is made to provide evidence regarding the response of stock prices to interest rate policy shocks, and attempt to use that evidence to make a conclusion about the nature of the influence of interest rate changes on the bubble component of stock prices in CIS countries.

Our goal is to estimate the empirical merits of traditional viewpoint. By the latter, we assume that bubble component of stock prices will decline in response to an increase of interest rates in CIS countries. We utilize a structural vector autoregression (VAR) model with time
varying coefficients as the primary tool of the analysis on quarterly dates of the Republic of Kazakhstan, Belarus, Ukraine and Russian Federation for GDP, a CPI, the GDP deflator, the refinancing rate, and stock price index. Our identification of interest rate policy shocks is based on the approaches of Gambetti et al (2013) and Primiceri (2005).

**Practical contribution of research**

The study will contribute to the ongoing academic debate. First, the study will examine the relationship between interest rate policy and stock prices in CIS countries. Second, additional research will develop our understanding of the impact of interest rate changes on stock price bubbles. That understanding is a required condition before someone starts thinking about how interest rate policy should respond to stock prices. Third, our approach will contribute to that challenge by providing some evidence that have questioned the dominant view among supporters of countercyclical monetary policies in CIS countries, where central banks take action to damp down inflationary booms or to boost growth when the economy is flagging, i.e., that a rise in interest rates will help prick an emerging bubble.

**Hypothesis**

The hypothesis we are going to test is mainly the following: Should an increase in the interest rates in CIS countries have a negative effect on the stock prices in periods where the bubble component is small compared to the fundamental?

This will require implementation of the following steps:

- Summarizing key findings of the literature on the subject;
- Estimation the effect of alternative interest rate policy rules on stock price bubble in CIS countries;
- Assessment of the nature of the impact of interest rate changes on the bubble component of stock prices in CIS countries;
• Discussion of possible directions of monetary policy reforms in CIS countries;

Literature review

The financial crisis of 2008–2010 was related with a rapid decrease in housing prices in the Commonwealth of Independent States (CIS) after a prolonged real estate boom. This has caused a revived interest in the relationship between interest rate policy and asset price bubbles, and restored the long debate on how interest rate policy should respond to deviations of asset prices. Before the crisis, the general opinion of most policy makers was that central banks should concentrate on containing inflation and stabilizing the output gap, and as a consequence do not take notice of the dynamics of asset prices, if they are not considered as a threat to price or production stability. Two arguments (Bernanke, 2000; Kohn, 2006) often indicate to support this view: asset price bubbles are hard to identify and evaluate, and interest rates are “dull” tool to pierce bubbles and their use for these purposes can have unintended collateral damages. The crisis of 2008–2010 challenged that viewpoint and fortified the consensus that central banks should draw attention and ultimately respond to developments in asset markets. Supporters of this view (Santos and Woodford, 1997; Kohn, 2008; Martin and Ventura, 2012; Schularick and Taylor, 2012) argue that monetary authorities should raise interest rates to counteract asset price inflation, even if inflation and output gap deviate from their steady-state values. Although it has been suggested that an increase in interest rates will reduce the amount of asset price bubbles, today there is no sufficient empirical or theoretical studies to prove that viewpoint.

We are not the first who decided to analyze empirically the impact of interest rate policy changes on stock prices. Patelis (1997) analyze the role of monetary and financial variables in predicting stock returns. He finds that rise in the federal funds rate will have a substantial negative effect on the expected stock returns in the short term and positive impact in the long run. Such predictability works mainly due to the effect of federal funds rate changes on the expected excess returns in the future, rather than dividends or expected returns.
Bernanke and Kuttner (2005) use an event–study approach to reveal effects on stock prices of unforeseen changes in the federal funds rate. Authors consider that a surprise of 25 basis point reduction in the federal funds rate is connected with an approximate one percent rise in stock prices. Their analysis mostly describes that response to constant drops in the equity premium, and to a lesser degree of corresponding cash flows. Nevertheless, they do not report the response of stock prices to the monetary policy surprise.

Rigobon and Sack (2004) get analogous assessments of the reaction of stock prices to changes in interest rates, using a heteroskedasticity–based estimator and Humphrey-Hawkins testimony dates as a means to control for possible reverse causality.

Gürkaynak et al (2005) use intra–day data to assess the response of stock prices to two factors connected with Federal Open Market Committee decisions. The first factor matches with the work of Bernanke and Kuttner (2005), to the unforeseen movements in the federal funds rate target. The assessed impact on stock prices is comparable to disclosed by Bernanke and Kuttner (2005). D’Amico and Farka (2011) obtain analogous results, which included the same intra–data strategy as Gürkaynak et al (2005). The second factor is related to the changes in expectations about future rates. The impact of the second factor on stock prices is a major, but more restrained than the first, perhaps because of the changes in expectations on output and inflation that may be partially compensated by the effects of expected changes in interest rates.

To our knowledge, the literature does not contain any attempts to uncover the impact of interest rate policy shocks on the bubble component of stock prices in CIS countries.

**Methodology of research**

We assume an economy with time varying riskless real interest rate $RIR_t$, using partial equilibrium asset pricing model. The main body of our research is based on the theoretical model developed by Gali (2014). Let $P_t$ denote the price in period $t$ yielding dividend stream $Div_t$. The price $P_t$ consists of two components: a central ($P_t^c$) and “bubble” ($P_t^b$). Formally,
\[ P_t = P_t^c + P_t^b \]

where the central component is defined as the present discounted value of future dividends:

\[ P_t^c \equiv E_t \left[ \sum_{i=1}^{\infty} \left( \prod_{j=0}^{i-1} \frac{1}{RIR_{t+j}} \right) \text{Div}_{t+i} \right] \quad (1) \]

It is convenient to log–linearize (1), then:

\[ p_t^c = \text{const} + \sum_{i=0}^{\infty} \phi^i \left( (1-\phi) E_t (\text{div}_{t+i+1}) - E_t (\text{rir}_{t+i}) \right) \]

where \( \phi \equiv G / \text{RIR} < 1 \), \( G \) – rate of dividend growth, \( \text{RIR} \) – an interest rate.

If the asset price contains a bubble, how does a change in interest rates affect it? To answer this question we should combine the responses of two components of the price of an asset to an exogenous shock in the interest rate policy. We have:

\[ \frac{\partial p_{t+i}}{\partial e_t^\nu} = (1-\alpha_{t+i}) \frac{\partial p_t^c}{\partial e_t^\nu} + \alpha_{t+i} \frac{\partial p_t^b}{\partial e_t^\nu} \]

where \( e_t^\nu \) – an exogenous shock, \( \alpha_t \equiv P_t^b / P_t \) – share of the bubble in the observed price in period \( t \). To derive the response of the central component we should use (1):

\[ \frac{\partial p_{t+i}^c}{\partial e_t^\nu} = \sum_{j=0}^{\infty} \phi^j \left[ (1-\phi) \frac{\partial \text{div}_{t+i+j+1}}{\partial e_t^\nu} - \frac{\partial \text{rir}_{t+i+j}}{\partial e_t^\nu} \right] \]
Economic theory indicates an increase in the real interest rate and reduced dividends in response to tightening of monetary policy, i.e. under the traditional viewpoint:

$$\frac{\partial p_{t+i}^b}{\partial e_t^v} \leq 0$$

for \(i = 0, 1, 2, \ldots\) i.e. a tightening of monetary policy should reduce the size of the bubble. Thus, the total effect on the observed asset price should be uniquely negative, regardless of the relative size of the bubble:

$$\frac{\partial p_{t+i}^b}{\partial e_t^v} < 0$$

for \(i = 0, 1, 2, \ldots\)

Changes in interest rates may also affect the bubble as follows: through the systematic possible comovement between the uncertain dynamics of innovation in the bubble with an unexpected interest rate component:

$$\Delta p_t^b = rir_{t-1} + \varepsilon_t$$

where \(\varepsilon_t = p_t^b + E_{t-1}(p_t^b)\) is a random process satisfying \(E_{t-j}(\varepsilon_t)=0\) for all \(t\). Response of the component bubble to tighten monetary policy is given by:

$$\frac{\partial p_{t+i}^b}{\partial e_t^v} = \begin{cases} \theta_i \frac{\partial rir_t}{\partial e_t^v} & \text{for } i = 0 \\ \theta_i \frac{\partial rir_t}{\partial e_t^v} + \sum_{j=0}^{i-1} \frac{\partial rir_{t+j}}{\partial e_t^v} & \text{for } i = 1, 2, \ldots \end{cases}$$
The relationship between these variables and the structural shocks is assumed to take the form of an autoregressive model with time-varying coefficients:

\[ y_t = P_{0,t} + P_{1,t} y_{t-1} + P_{2,t} y_{t-2} + \ldots + P_{k,t} y_{t-k} + \epsilon_t \]  

(2)

where \( P_{0,t} \) is a vector of time varying intercepts, \( P_{i,t} \) are matrices of time varying coefficients, \( \epsilon_t \) follows a white noise Gaussian process with mean zero and covariance matrix \( \Sigma_t \).

To define the impulse response functions let us rewrite (2) in companion form:

\[ y_t = \beta_t + P_t y_{t-1} + \epsilon_t \]  

(3)

where \( y_t = [y'_t, y'_{t-1}, \ldots, y'_{t-k+1}]' \), \( \epsilon_t = [\epsilon'_t, 0, \ldots, 0]' \), \( \beta_t = [P'_t, 0, \ldots, 0]' \) and \( P_t \) is the corresponding companion matrix.

We use Bayesian methods in order to estimate the model with time-varying coefficients. The goal of our estimation is to characterize the joint posterior distribution of the parameters of the model. To do that we use a Gibbs sampling procedure which works as follows. The parameters are divided in subsets. Parameters in each subset are drawn conditional on a particular value of the remaining parameters. The new draw is then used to draw the remaining subsets of parameters conditional on this. The procedure is repeated many times. After a burn-in period (of 20000 draws in our case) these conditional draws converge to a draw from the joint posterior.

**Bibliography**


Participants

The team consists of three experts Zhanna Ishuova (Team Leader, PhD in Economics), Saltanat Kondybayeva (PhD in Economics) and Meruyert Daribayeva (PhD in Economics). All the team members have working experience in the Economic Department of Al Farabi Kazakh National University. In 2013 Saltanat Kondybayeva jointly with Zhanna Ishuova published a paper included in the Scopus database on the effect of monetary policy on real house price growth which will provide inputs for the proposed research. More detailed information about team members is provided in their CVs, which are attached to the Proposal.

Zhanna Ishuova will be responsible for the overall coordination of the project, summarizing inputs from team members, calibrating models’ results, and writing the final report.

Saltanat Kondybayeva will be responsible for literature review, updating database, and developing models (jointly with Meruyert Daribayeva).

Meruyert Daribayeva will be responsible for monetary policy review in CIS countries, updating database, and developing models (jointly with Saltanat Kondybayeva).

Funding sources

The grant provided by the EERC will be sole source funding for this project and will cover the consultant time of the team members. The daily rates are $250 for the Team Leader and $200 for each of other two team members. The team will have in kind contribution to project: personal
computers, fees for internet and phone services, office supplies, etc. The estimated cost of the project is $11050.

**Timetable and deliverables**

Taking August 15, 2014 as an indicative date for the start of the project the following timetable is proposed:

October 30, 2014: literature review and monetary policy analysis in CIS countries are finalized; key outputs reflected in summary notes and submitted to the EERC.

January 28, 2015: collection and processing of data.

March 25, 2015: developing models; summary note produced on the outcomes and submitted to the EERC.

June 1, 2015: draft final report produced and submitted to the EERC.

The final report revised and submitted to the EERC in three-week time after receiving the comments from the EERC.