

Should Monetary Authorities Prick Asset Price Bubbles? Evidence from a New Keynesian Model with an Agent-Based Financial Market

Abstract: We develop the approach in the macroeconomic literature, which is based on the synthesis of New Keynesian macroeconomics and agent-based models, and build a model, allowing for the incorporation of stochastic and realistic dynamics of financial markets, which is set by an agent-based model of a financial market, in a New Keynesian model with a financial accelerator, à la Bernanke et al. (1999). Using our model, we obtain new evidence for the answer to the question of how central banks should prick asset price bubbles for the maximization of social welfare and for the preserving of financial stability, which, surprisingly, has almost not been studied in the literature yet. Our results show that pricking asset price bubbles can be a policy, which enhances social welfare, and reduces the volatility of output and inflation, especially, in the cases when asset price bubbles are caused by credit expansion, or when the central bank conducts effective information policy. We also argue that pricking asset price bubbles with the lack of the effectiveness of information policy, only by raising the interest rate, leads to negative consequences to social welfare and financial stability.

Keywords: Optimal monetary policy; Asset price bubble; New Keynesian macroeconomics; Agent-based financial market.

JEL-Classification: E03, E44, E52, E58, G01, G02

1 Introduction

Crashes and bubbles in financial markets, that lead to instability and volatile dynamics of the economy, have been the subject of hot debate in the macroeconomic literature for a long time. The global financial crisis of 2008 – 2009, and the recent bubble on the stock market in China, have only increased the interest in these phenomena, and stress the existence of drawbacks in the existing methodologies of macroeconomic analysis, including issues that relate to the necessary response of regulatory authorities to financial bubbles.

One stream of research, whose popularity has significantly increased, after the global financial crisis of 2008 – 2009, is the development of agent-based macroeconomics, that is based on heterogeneous interacting agent and bounded rationality. Many agent-based models are built using these features, which successfully explain the dynamics of business cycles.¹ Our paper relates to another similar growing field, that develops behavioral New Keynesian models, which incorporate agent-based models in New Keynesian models. Usually such models consist of two parts: the real sector is constructed using a New Keynesian Macroeconomic model, while the financial market is set through an agent-based model. Our model differs from the previous literature in this field in complexity of the real sector and the financial market. This complication of the model allows us to receive new evidence in another large field of the literature, that studies the necessary response of monetary policy on asset price bubbles.

The hot debate about the necessary response of monetary policy on asset price bubbles among policy makers and academic professors is known as the “clean” versus “lean” debate. Following the “clean” approach central banks should not respond to asset price bubbles, before the bubble bursts, above the necessary reaction for the stabilization of inflation and employment, but just clean up the consequences of the bubble. This approach may be more preferable for monetary policy, because of several possible reasons: generally, bubbles are hard to detect; a bubble may exist only in a small market; the rising of interest rates may not efficiently affect bubbles; or sometimes it may cause the bubble to burst more severely. The “clean” approach prevailed in central banks and academia before the global financial crisis of 2008 – 2009. According to another point of view, following the “lean” approach, central banks should conduct monetary policy, that leans

¹For example, Gaffeo et al. (2007), Russo et al. (2007), Delli Gatti et al. (2010), Dosi et al. (2010), Dosi et al. (2013), and Ricetti et al. (2013). Dilaver et al. (2016) presents the detailed literature review of agent based macroeconomic models.

against asset price bubbles and leads to the increasing of interest rates. After the global financial crisis, the “lean” approach has become preferable, and nowadays the focus, from the question, as to whether central banks should respond on asset price bubbles or not, has been changed to the question, how should central banks respond to asset price bubbles, in which cases should they actively respond, and which strategy of the reaction is it better to use.²

At the early stage of a bubble, it is difficult to identify the bubble, because at this stage, misalignment is not yet large, so monetary policy usually can start affecting the bubble, only after the bubble has already grown to a substantial size. In our paper, we study the possibility for monetary policy to prick asset price bubbles for the increase of social welfare by raising the interest rate in such situation, when the bubble exists, but not in the early stage, market asset prices differ significantly from fundamental asset prices, and the central bank suspects the existence of the bubble, as well as other economic agents. Surprisingly, there is a lack of papers, that study such cases, although this topic is widely discussed in the literature (e.g. in Roubini (2006) and Posen (2006)).

In the paper, we build a behavioral New Keynesian model consisted of a New Keynesian model with a financial accelerator, à la Bernanke et al. (1999), which sets the real sector, and an agent-based model, which sets the financial market populated by bounded rational traders. As already mentioned, our model differs from the previous literature that build behavioral New Keynesian models in the complexity of the model, so the first contributions of our paper is the further development of the approach, which is based on the synthesis of New Keynesian macroeconomics and agent-based models. This complication allows us to make the second contribution, the most significant contribution of our paper, – the extended studying of possible pricking asset bubbles by monetary policy. To the best of our knowledge, there is no other paper in the field of monetary policy about pricking asset bubbles, which is similar to our paper in the quality of the analysis.

In the model we link the real sector and the financial market through four transmission mechanisms: the dynamics of the financial market determines the market price of assets in the real sector; the real sector affects traders’ expectations about the fundamental price of assets; the central bank can also affect traders’ expectations; and there are liquidity flows from the real sector to the financial market. The market price of assets, which is determined during the trading – the interaction of traders in the financial market, sometimes can significantly deviate from the fundamental price of assets, in such cases – bubble

²For more detailed discussion of the “clean” versus “lean” debate see, for example, Mishkin (2011) or Brunnermeier and Schnabel (2014).

cases traders can suppose the existing of a bubble. They may start selling their assets, and it will lead to the bursting of the bubble, and probably to the crisis in the economy. But the monetary policy in addition to the change of the interest rule from the Taylor-rule can unpredictably raise the interest rate in order to prick the bubble or can influence the expectations of traders much earlier than the bubble will burst by itself. For example, it can announce the existence of a bubble in the media. The influence of the central bank on traders' expectations in the model is the central bank's information policy, which can be more or less effective, if traders believe or ignore the announcements of the central bank, respectively. We calculate social welfare losses and volatility of output and inflation in various cases, which differ by the size of the response of monetary policy on asset price bubbles, by the efficiency of the central bank's information policy, or by the existence of the liquidity flow from the real sector to the financial sector that allows us to mimic situations, in which bubbles are partially boosted by credit expansion as the global financial crisis 2007-2009 years.

Our results show that in some cases, pricking asset price bubbles by the central bank can reduce the social welfare losses from asset price bubbles, as well as the volatility of output and the volatility of inflation. This effect is larger, especially in the cases when asset price bubbles are caused by credit expansion, or when the central bank conducts effective information policy, or, in other words, it can effectively influence traders' expectations. We also argue that pricking asset price bubbles only by raising the interest rate with the lack of the effectiveness of information policy leads to negative consequences for social welfare and financial stability.