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Asset price volatility and monetary policy rules: A dynamic model and empirical evidence

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Abstract

A dynamic model is set up to explore monetary policy in the presence of asset price volatility. If the probability for the asset price to increase or decrease in the next period is taken as an exogenous variable, the monetary policy rule turns out to be a linear function of state variables. We also explore a monetary policy rule assuming that the probability for the asset price to decrease or increase can be affected by monetary policy and asset price bubbles, and find that a state-dependent monetary policy rule might arise. We further consider monetary policy with asset prices in the presence of a zero-interest-rate bound. Our study shows that a financial market depression can make a deflation and an economic recession worse, implying that policy actions aiming at escaping a liquidity trap should not ignore asset prices.

JEL classification: E17; E19

Keywords: Asset price bubble; Liquidity trap; Monetary policy rule

1. Introduction

An interesting feature of the monetary environment in industrial countries in the 1990s is that inflation rates remained relatively stable and low, while the prices of equities, bonds, and foreign exchanges experienced a strong volatility with the liberalization of financial markets. Some central banks, therefore, have become concerned with such volatility and doubt whether the

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volatility is justifiable on the basis of economic fundamentals. The question has arisen whether monetary policy should be pursued that takes into account financial markets and asset price stabilization. In order to answer this question, it is necessary to model the relationship between asset prices and the real economy. An early study of such type can be found in Blanchard (1981) who has analyzed the relation between the stock value, interest rate and output, and hereby considered the effects of monetary and fiscal policies. Recent work that emphasizes the relationship between asset prices and monetary policy includes Bernanke and Gertler (1999), Smets (1997), Kent and Lowe (1997), Chiarella et al. (2001), Mehra (1998), Vickers (1999), Filardo (2004), Okina, Shirakawa and Shiratsuka (2000), Dupor (2001), Kontonikas and Montagnoli (2004, 2006) and Zhang and Semmler (2005).

Among these papers, the work by Bernanke and Gertler (1999) has attracted much attention. Bernanke and Gertler (1999) employ a macroeconomic model and explore how the macroeconomy may be affected by alternative monetary policy rules which may or may not take into account the asset price bubble. There they conclude that it is desirable for central banks to focus on underlying inflationary pressures, and that asset prices become relevant only if they signal potential inflationary or deflationary forces.

The shortcomings of the position by Bernanke and Gertler (1999) may, however, be expressed as follows. First, they do not derive monetary policy rules from certain estimated models, but instead design artificially alternative monetary policy rules which may or may not consider asset price bubbles and then explore the effects of these rules on the economy. Second, they assume that the asset price bubble always grows at a certain rate before breaking. In actual asset markets the asset price bubble might not break suddenly, but may instead increase or decrease at a certain rate before becoming zero. Third, they assume that the bubble can exist for a few periods and will not occur again after breaking. Therefore, they explore the effects of the asset price bubble on the real economy in the short-run. Fourth, they do not endogenize the probability that the asset price bubble will break in the next period because little is known about market psychology. Monetary policy with endogenized probability for the bubble to break may be different from that with an exogenous probability.

Some recent literature argues that it is inappropriate to model output with the traditional model which considers only the effects of real interest rate. Goodhart and Hofmann (2000, 2003), for example, explore the so-called "IS curve puzzle" which means that real interest rate has a relatively insignificant *t*-statistic in the traditional IS equation. They extend the traditional IS equation by considering effects of financial markets on output and find that the bias of estimation can thus be avoided. Below we will set up a model in line with this literature and study monetary policy in this framework.

The difference of our model from that of Bernanke and Gertler (1999) consists in the following. First, we employ an intertemporal framework to explore what the optimal monetary policy should be, with and without the financial markets taken into account. Second, we assume that the bubble does not break suddenly and does not have to always grow at a certain rate. On the contrary, it may increase or decrease at a certain rate with a certain probability. The bubble does not have to break in certain periods and moreover, it can occur again even after breaking. Third, we endogenize the probability that the bubble will increase or decrease in the next period. This assumption has also been made by Kent and Lowe (1997). They assume that the probability for the asset price bubble to break is a function of the bubble size and monetary policy. The drawback of Kent and Lowe (1997), however, is that they explore only positive bubbles and assume a linear probability function, which is not bounded between 0 and 1. Following Bernanke and Gertler (1999), we consider both positive and negative bubbles and employ a nonlinear probability function which lies between 0 and 1.