North American Journal of Economics and Finance xxx (2016) xxx–xxx

Contents lists available at ScienceDirect

North American Journal of Economics and Finance

journal homepage: www.elsevier.com/locate/ecofin

Asset price targeting in an open economy with cognitive limitations: The best for macroeconomic and financial stability?

Kuo-chun Yeh

Graduate Institute of National Development, National Taiwan University, No. 1, Sec. 4, Roosevelt Rd., Taipei 10617, Taiwan

A R T I C L E I N F O

Article history:
Available online xxxx

JEL codes:
E52
E58
F37
F41

Keywords:
Asset prices
Heuristics
Rational expectations
Monetary policy rules
New Keynesian open economy

A B S T R A C T

The choices of policy targets and the formation of agent expectations have been critical issues addressed by monetary policy management since the financial crisis of 2008. This paper evaluates macroeconomic stability in a new Keynesian open economy in which agents experience both cognitive limitations and asset market volatility. The (im)perfect credibility of various monetary policies (e.g., a Taylor-type rule with- or without asset price targeting, strict domestic inflation targeting, strict CPI inflation targeting, and exchange rate peg) may lead agents to react according to their expectation rules, and thus create various degrees of booms and busts in output and inflation. Simulations confirm that a Taylor-type CPI inflation targeting including an asset price target is the best choice. In contrast, the business cycles induced by Keynesian "animal spirits" are enhanced by strict inflation targeting. Furthermore, a credible exchange rate pegging system with an international reserve pooling arrangement can improve social welfare and stability in an open economy, even though its absolute value of the loss function is slightly lower than a Taylor-type CPI inflation targeting including an asset price target.

1. Introduction

The 2007-08 global economic crisis and the European sovereign debt crisis have strengthened the view that macroeconomics must consider departures from certain assumptions, one of which is the importance of the asset markets' stability (e.g., housing or stock markets). But there are two different views on the necessity of the central banks reacting to the asset prices. The first one says "not to react" because it is difficult to identify bubbles *ex ante* (e.g., Bernanke, 2012; Greenspan, 2007). And even if a bubble can be identified *ex ante*, using the interest rate is ineffective to deal with such a bubble.

However, the second view says the central banks "should react" because bubbles and crashes of the asset prices can have strong pro-cyclical effects and can also affect the stability of financial markets (e.g., Bordo & Jeanne, 2002; Roubini, 2006). Central banks are responsible for financial stability, so the use of interest rates is one of the options for preventing the emergence of bubbles. For instance, Jun Ma, chief economist of the People's Bank of China, also stresses that China's monetary easing for economic recovery must also consider its impact on the prices of goods and assets (Guo, 2016).

Furthermore, the rational expectation hypothesis (RE), which has been the most important factor in monetary policy modeling over the past several decades, must be revised to better reflect the booms and busts in the real world (e.g., Akerlof & Shiller, 2009). The agents' cognitive limitations, instead of the RE, cause the real business cycles to deviate from

E-mail address: kuochunyeh@ntu.edu.tw

http://dx.doi.org/10.1016/j.najef.2016.10.012
1062-9408/© 2016 Elsevier Inc. All rights reserved.

the predictions of the standard modeling approach. One significant case, referred to as "Japan's Disease," describes Japanese extreme risk aversion that renders monetary policy ineffective (Xing, 2016). Some recent attempts (e.g., Branch & Evans, 2011; De Grauwe, 2010; De Grauwe, 2012; Gattia et al., 2005; Woodford, 2013) have provided micro-foundations for models with agents experiencing cognitive limitations to prove the importance of what Keynes refers to as "animal spirits." This concept is that people assign probabilities to possible future outcomes which are not too different from the probabilities with which these outcomes actually occur. The forecasts therefore should be derived through extrapolation from prior observations. Departures from the RE business cycle dynamics can be predicted, for example, using a model of learning that involves discrete switching between simple forecasting rules.

On the basis of Yeh (2016), this paper concentrates on the effects of various monetary policy rules including asset price targeting. It also makes several contributions beyond the previous literature (e.g., De Grauwe, 2012; Galí, 2008; Galí & Monacelli, 2005):

First, this paper makes an extension to evaluate the macroeconomic stability of various monetary policy rules pertaining to a new Keynesian open economy in which agents experience cognitive limitations. With intuition, uncertainty is created when animal spirits prevail. This approach enables simulation of the effects of various monetary policy rules on macroeconomic stability in circumstances that more closely resemble the real world.

Second, the (im)perfect credibility of various monetary policies (e.g., a Taylor-type rule including an asset price target, strict domestic inflation targeting, strict CPI inflation targeting, exchange rate peg) may lead agents to react according to their expectation rules, and thereby create various degrees of booms and busts in output and inflation. Therefore, an optimal monetary policy can be derived according to the volatility of variables and the mean squared forecast errors.

Finally, according to the above modeling, we can determine whether the degree of macroeconomic stability guaranteed by commitment to a given policy rule is as great as that previously suggested by the RE dynamics. As Woodford (2013) indicated, relaxation of the RE hypothesis has potential consequences for policy design.

The rest of this paper is structured as follows. Section 2 explains the basic new Keynesian open economic modeling and shows how to include the heuristic variable (animal spirits) and an asset price target in monetary policy rules. Section 3 shows the simulation results according to the volatility of macroeconomic variables and loss functions, which can be explained by the heuristic variable under different monetary policy rules. Section 4 presents the conclusions.

2. Modeling

The basic new Keynesian framework below, originally developed in Galí and Monacelli (2005), Galí (2008), De Grauwe (2012), and Yeh (2016), models an open economy as one among a continuum of economies making up the global economy. The appendix of this paper explains the connections within the above literature and the means to extend a closed economy model to an open economy form. The assumptions on preferences and technology, combined with the Calvo price setting structure and the assumption of complete financial markets, give rise to a highly tractable model and to simple and intuitive log-linearized equilibrium conditions. The equilibrium conditions can be reduced to a two-equation dynamic system consisting of a new Keynesian Phillips curve and a dynamic IS-type equation, whose coefficients vary with parameters that are specific to the open economy. The driving forces are a function of international variables, which are taken as exogenous to the open economy. The two equations must be complemented with a description of how monetary policy is conducted.

2.1. Basic new Keynesian open economy model

A standard dynamic IS equation for the open economy in terms of output gap can be derived by solving infinite-horizon decision problems of households and firms (Galí, 2008).

$$\widetilde{y}_t = a_1 \widetilde{E}_t \widetilde{y}_{t+1} + (1 - a_1)\widetilde{y}_{t-1} + a_2\left(i_t - \widetilde{E}_t \pi_{t+1} - i_t^n\right) + \varepsilon_t,$$

where $\widetilde{y}_t = y_t - y_t^n$ denotes the domestic output gap equal to real output minus potential output at time t; i_t, the nominal interest rate; π_t, the domestic inflation; and ε_t, a white-noise disturbance term. A lagged output is not really necessary but can be added to justify habit formation. In addition, $\widetilde{E}_t$ is the expectations operator, where the tilde symbol refers to expectations that are not formed according to the RE hypothesis. Note that i_t^n is the natural rate of interest of an open economy:

$$i_t^n = \rho + a_3 A_t + a_4 \widetilde{E}_t \Delta y_{t+1}^*,$$

where $\rho \equiv -\log \beta$ is the time discount rate, A_t is technology following an AR (1) process, and Δy_{t+1}^* represents changes in the foreign output. In the following context the superscript * indicates the foreign variables.

As Eq. (A4) of the appendix shows,

$$\widetilde{y}_t = a_6 \widetilde{E}_t \widetilde{y}_{t+1} + a_7 \widetilde{y}_{t-1} + a_8\left(i_t - \widetilde{E}_t \pi_{t+1} - \rho\right) + a_9 A_t + a_{10} \widetilde{E}_t A_{t+1} + a_{12} \widetilde{E}_t \Delta q_{t+1} + \varepsilon_t,$$