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Exchange rate dynamics in a Taylor rule framework ☆

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ABSTRACT

This paper establishes a dynamic exchange rate determination model incorporating capital control and foreign exchange intervention in a Taylor rule framework. It uses the SVAR model to identify the sources of real exchange rate dynamics for three pairs of currencies: RMB/USD, Yen/USD and GBP/USD. It shows that demand shock, instead of supply shock, plays a dominant role in real exchange determination. Monetary policy has little effect but central bank intervention plays a role in keeping exchange rate persistence for RMB/USD and Yen/USD. Risk premium shock is almost irrelevant to exchange rate dynamics for Yen/USD and GBP/USD. In the case of China, capital control plays a critical role in exchange rate determination. The results show that social welfare losses of China is the largest, suggesting that capital account liberalization would benefit the country in the long term. Therefore, the central bank of China should gradually open up the capital account, give up the fixed exchange rate or the managed floating exchange rate regime, and reduce central bank intervention to improve the effectiveness of monetary policy and social welfare.

1. Introduction

Exchange rate, monetary policy and inflation are three key economic variables concerned by the central bank in any country. Their relationship is an important issue for economic research. Most studies indicate that exchange rate is an important channel for transmitting monetary policy, affecting interest rate and inflation expectation through the uncovered interest rate parity (UIP) condition of international capital flow. However, there is also a long-term debate on whether monetary policy in exchange rate transmission is effective and whether a stable exchange rate should be considered as a goal of monetary policy.

The traditional Taylor rule describes the implementation of monetary policy in a closed economy. Since the world financial crisis starting from the US in 2008, the monetary authorities in most countries have focused their efforts on maintaining

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financial market stability. More and more central banks recognize and take asset prices or exchange rate stability as main targets for monetary policy in an open economy, which can be seen as a new Taylor-type rule. In the past, the traditional monetary model attempts to explain the effects of monetary factors on the determination and expectation of exchange rate dynamics based on the law of one price and the purchasing power parity (PPP) theory, which are regarded as two identity conditions. Due to the choice of the exchange rate system, trade cost, tariffs and non-perfect capital flow, the PPP theory cannot be held and the traditional monetary model failed to be supported by empirical data (Baillie and Selover, 1987; Flood and Rose, 1995). Bacchetta and van Wincoop (2006), Engel et al. (2007) show that the traditional monetary model of exchange rate determination pays little attention to future market expectation of macroeconomic fundamentals. Thus it is important to build an exchange rate determination model introducing the endogeneity of monetary policy. Kempa and Wilde (2011) show that including monetary policy in exchange rate determination may lead to significant different conclusions in the endogeneity of exchange rate target of Taylor's rule. In the standard flexible price monetary model, a price rise would lead to exchange rate depreciation, while in a Taylor rule model, a price rise would result in exchange rate appreciation due to the future expectation of tight monetary policy (Clarida and Waldman, 2008).

The Taylor rule model has been widely used and recognized. Engel and West (2006) introduce Taylor's rule into the monetary model to investigate the behavior of exchange rate between deutschemark-dollar in 1978–2001. Following this approach, Beckmanna and Wildeb (2013) build a Taylor rule exchange rate model where exchange rate is determined by the fundamentals. Using an exponential smooth transition regressive model, they show that deutschemark-dollar real exchange rates adjust much faster to their equilibria. Mark (2009) examines Taylor rule fundamentals for real exchange rate determination. His results support that a simple learning model provides plausible understanding of the real deutschemark-dollar exchange rate dynamics in 1973–2005. Recently, Froyen and Guender (2016) support that weight on real exchange rate stability in the loss function of the central bank is sufficient to improve the performance of Taylor-type rules relative to optimal policies, and Taylor rule fundamentals can account for several empirical exchange rate puzzles, including the apparent disconnect from fundamentals (Lansing and Ma, 2015).

Engel et al. (2007) and Wilde (2012) use a similar method to make an out-of-sample forecast of real exchange rates. They show that the Taylor rule model has better performance in the expectation of exchange rate determination. Their finding is supported by Molodtsova and Papell (2009). Wang and Wu (2012) use the semi-parametric interval prediction method to study the exchange rate dynamics of twelve OECD countries. The estimated results showed that the Taylor rule model is significantly better in the expectation of exchange rate dynamics than the random walk model, the traditional monetary model or the PPP model. Furthermore, Galimberti and Moura (2013) construct a Taylor rule model to demonstrate the relationship between exchange rate determination and endogenous monetary policy. They use panel data regression to fifteen emerging economies and show that a present-value forward-looking specification has better exchange rate predictability. Ince et al. (2015) use data in 1973–2014 to evaluate the short-run out-of-sample predictability for the exchange rates of eight different currencies against the US dollar. They find strong evidence in favor of the Taylor rule model compared to the random walk model. Wu et al. (2015) conduct an in-sample fitting and out-of-sample prediction of exchange rates applying the forward-looking, backward-looking and within-quarters non-linear Taylor rule, and find that both the implementation effect and the prediction ability of monetary policies improve. Wang et al. (2016) also use out-of-sample forecasting to show that the Taylor rule-based exchange rate model outperforms the conventional models and the random walk theories for Australia, Sweden, the UK and the USA.

Most empirical studies impose a long-run constraint in BQ-SVAR, provided by Blanchard and Quah (1989), to investigate the source of exchange rate dynamics, such as Lastrapes (1992), Clarida and Gali (1994), Enders and Lee (1997). As to the advanced economies, Enders and Lee (1997), Hamori and Hamori (2011), Mirdala (2015), and Gehrke and Yao (2016) show that demand shocks explain much of the real exchange rate dynamics for the Japanese Yen and some European currencies against to the US dollar. Farrant and Peersman (2006), Yilmaz (2012), Huh and Kwon (2015), Grossmann et al. (2014), and Craighead and Tien (2015) show that a nominal shock accounts for much dynamics of the real exchange rates of the US dollar against the British Pound, the Euro, the Japanese Yen and the Canadian dollar by imposing some long run restrictions on a SVAR model.

For the emerging economies, several studies show that the exchange rate is determined by real shocks for the Chinese, Indian and Pakistani currencies (Wang, 2005; Inoue and Hamori, 2009). Some studies show that exchange rate dynamics is determined by nominal shocks for the currencies of Poland, Hungary, Ghana and some Asian less developed countries (Dibooglu and Kutan, 2001; Kim and Lee, 2008; Asmah, 2013; Dumrongrittikula and Andersonb, 2016). For the developed countries or the emerging countries, there is no common consensus on the sources of exchange rate dynamics due to different models or different currencies.

It is important to be stressed that there is a contradictory relationship among monetary policy, capital flow and a floating exchange rate system. According to Krugman's trilemma theory, independence of monetary policy, stable exchange rate and free capital flow cannot be achieved at the same time. Monetary authorities can only choose two goals at any one time. In April 2012, China's central bank relaxed the range of the RMB/USD spot exchange rate up to 1%. This range has been further relaxed up to 2% since March 2014. More importantly, the central bank decided to enhance the marketization of the RMB/USD exchange rate through improving the intermediated exchange rate quotation system. In fact, the Chinese exchange rate regime experienced two big changes with several minor adjustments in 1985–2015. The two big changes can be considered as two different regimes, a currency peg against the US dollar from 1985 to June 2005 and a currency peg against a basket of currencies with secret weights from July 2005. According to the trilemma theory, the independence of China's monetary pol-

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