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An examination of macroeconomic fluctuations in Korea exploiting a Markov-switching DSGE approach☆

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ABSTRACT

This paper estimates a Markov-switching dynamic stochastic general equilibrium (MS-DSGE) model that allows shifts in the monetary policy rule coefficients as well as the shock volatilities with Korean data ranged from 1976 to 2013. We find that allowing for the regime-switching aspect both in monetary policy rules and shock volatilities is a crucial setup in improving the model's fit with Korean data. The regime estimates indicate that monetary policy more aggressively reacts to inflation, but less strongly to output, after launching the Inflation Targeting (IT) policy in the late 1990s. The identified regimes have three implications on macroeconomic performance in Korea. First, the introduction of the IT monetary policy has contributed to a sharp reduction in the level as well as the volatility of inflation in the 2000s. Second, technology shocks are the most important drivers of output fluctuations in Korea as the major economic crises in Korea are mainly explained by adverse shocks on technology. Finally, it would have been possible to achieve higher output and lower inflation simultaneously if the IT monetary policy regime was maintained over the entire sample period.

1. Introduction

This study seeks to empirically assess how monetary policy behavior in Korea has changed in response to structural shocks across different policy regimes, which are identified by estimating a Markov-switching dynamic stochastic general equilibrium (MS-DSGE) model. We posit that Korean economy may work as a natural laboratory for regime switching approaches. In order to rationalize this argument, Fig. 1 plots key macroeconomic time series of Korea from 1976:Q3 to 2013:Q3, in which large swings in output, inflation, and exchange rate are readily observed after outbreaks of major macroeconomic episodes for the Korean economy.

Over the last four decades, Korean economy had suffered from three significant economic crises—the second oil crisis in the late 1970s, the Asian currency crisis in 1997–98, and the global financial crisis in 2008–09. All these episodes have caused the severe recessions as well as the surges in price level and exchange rate.[1] Despite their similar patterns in outcomes, the aftermath of each episode entails quite differentiated characteristics, as well documented in Cho (2007) and Huh and Nam (2010). In particular, the Asian currency crisis might be the most crucial economic episode for the Korean economy. This economic turmoil has resulted in a sequence of institutional changes in Korea's economic stabilization policy. For instance, in December 1997 the Korean government has allowed foreign exchange rates to freely float, and in 1998, the Bank of Korea, the nation's central bank, has introduced an Inflation Targeting (IT) system to pursue its goal of price stability while having shifted to the interest rate based policy from the money aggregate based approach. In contrast, the recent global financial crisis has damaged Korea's export growth via the shrinking global demand for imported goods. Relatively minor institutional changes are involved in response to this economic event.

Grounded on these historical episodes, we formulate a small open economy MS-DSGE model for Korea, following Galí and Monacelli (2005) and Justiniano and Preston (2010), in order to capture changes in the magnitude of fundamental shocks as well as monetary policy responses.[2] Consequently, our MS-DSGE model allows for regime shifts in the monetary policy rule coefficients as well as the shock volatilities. We employ the algorithm in Farmer et al. (2011) to solve the MS-DSGE

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[1] The consequences of these economic upheavals are detailed in Kim (2009) and Yoon (2011).

[2] MS-DSGE models associated with monetary policy switches have been extensively studied for the US (e.g., Sims and Zha, 2006; Davig and Doh, 2008; Bianchi, 2013) and UK (Liu and Mumtaz, 2011) economies. To the best of our knowledge, however, the macroeconomic effects of introducing inflation targeting in small open economies have been explicitly examined mostly with fixed-coefficient DSGE models, e.g., for Chile (Del Negro and Schorfheide, 2009) and for Brazil (Palma and Portugal, 2014). As an exception, Cúrdia and Finocchiaro (2013) exploit a regime switching DSGE model for Sweden to measure the potential effects due to the transition from exchange rate targeting to inflation targeting.

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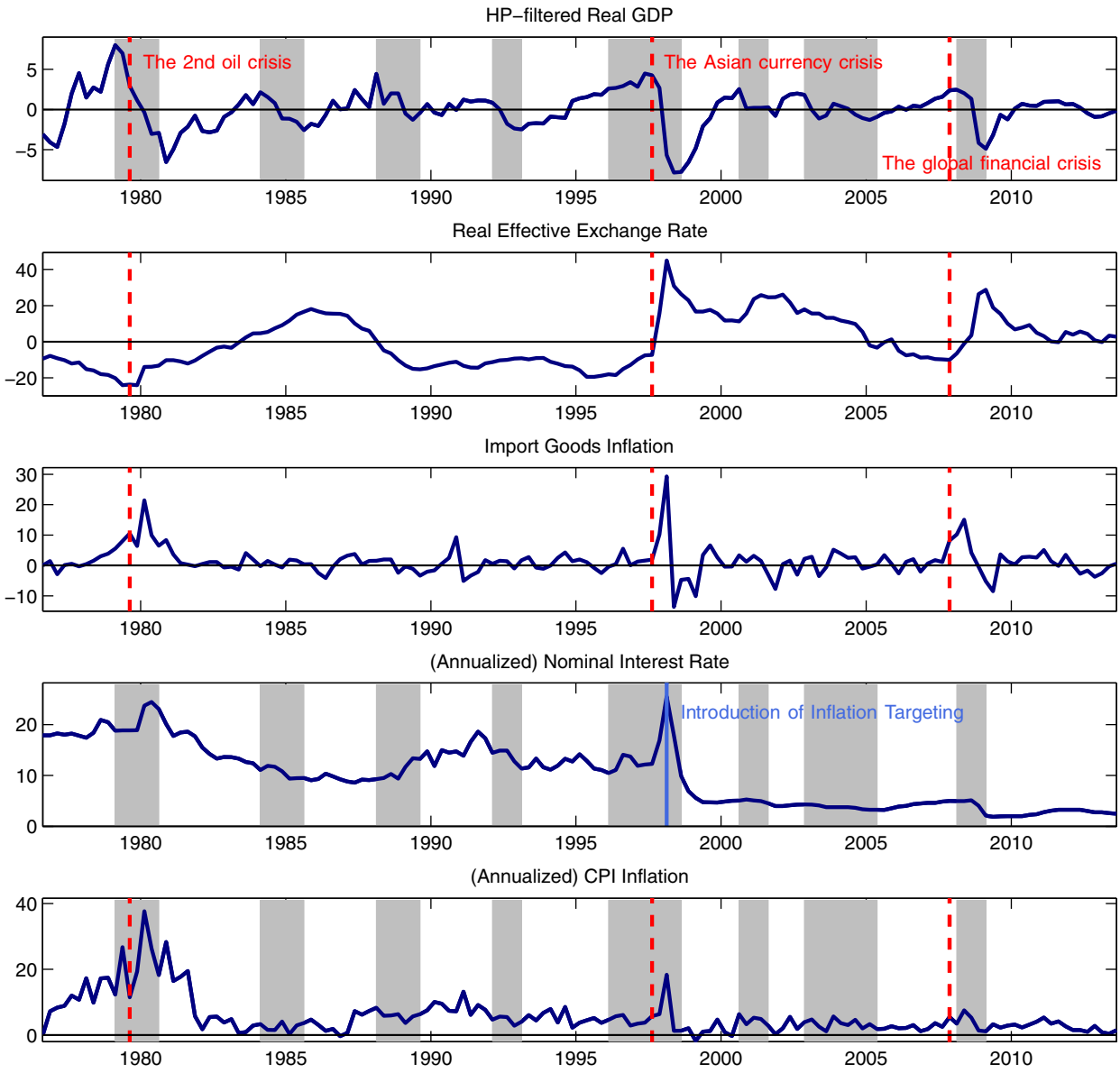

Fig. 1. Time series of Korean data. The shaded areas indicate the recession dates identified by the Korea National Statistical Office (KOSTAT). The vertical lines denote important macroeconomic events for Korean economy.

model, and estimate the model using Bayesian methods, based on Korean data ranged from 1976:Q3 to 2013:Q3. We estimate two versions of the model allowing for regime shifts in (i) the shock volatilities only, and (ii) both the shock volatilities and the monetary policy rule coefficients.[3] By doing so, we aim to judge which specification is the most preferred by data. To this end, we compute marginal data densities of the specifications, and make an explicit comparison of model fit, including a conventional no regime switching DSGE counterpart.

According to the estimation results, our MS-DSGE models' fit with Korean data outperforms the fixed parameter DSGE counterpart. This finding suggests that the MS-DSGE models are more suitable to investigate the structural changes in Korean economy. Among the MS-DSGE specifications, data strongly prefers the specification that allows for regime shifts in both the shock volatilities and the monetary policy rule coefficients. This finding reveals that the regime-switching aspect both in monetary policy rules and shock volatilities plays a crucial role in improving the model's fit with the data.

The regime probability estimates for the best-fitting model characterize four different regimes for Korean economy that are formulated as a combination of *"high"/"low"* volatility regimes and "*IT*"/"*Non-IT*" monetary regimes. Regarding the shock volatilities, our regime estimates perform quite well in capturing the major high volatile episodes in domestic output and CPI inflation, which coincide with the 1979 Oil crisis, the 1990–91 Gulf War, the 1997–98 Asian currency crisis, and the 2008–09 Global financial crisis. This finding suggests that a large fluctuation in the Korean economy tends to heavily depend upon external shocks. Tuning to the identified policy regimes, there is strong evidence that the monetary authority responds more aggressively to inflation, but less strongly to output, after launching the IT in the late 1990s. Meanwhile, its responsiveness to exchange rate only moderately chances across the two regimes.

Three main findings stand out based on the identified regimes. First, our impulse response analysis allowing for policy regime shifts lends

[3] Another possible specification is one that allows regime changes in the monetary policy coefficients only, while the heteroskedasticity of shocks is excluded. However, we do not pursue this avenue in this paper based on the following reasoning. As Sims and Zha (2006) illustrate, an absence of the heteroskedasticity may cause statistic biases in the policy coefficients. In addition, we find that incorporating regime-dependent shocks substantially enhances the data fit.