Monetary policy and commodity terms of trade shocks in emerging market economies

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1. Introduction

For many years, commodity terms of trade shocks have been shaping the macroeconomic dynamics of many emerging market economies (EMEs) (Kose, 2002; Mendoza, 1995). These shocks have proved to be very volatile and persistent, especially in commodity exporting emerging countries, resulting in significant macroeconomic volatility. The recurrence of large commodity terms of trade shocks has called into question the ability of alternative monetary policy frameworks to stabilise emerging market economies.

Several studies have analysed the macroeconomic implications of alternative monetary policy regimes under domestic and external shocks in small open economies (see e.g., Laxton and Pesenti, 2003; Gali and Monacelli, 2005; Medina and Soto, 2005; Devereux et al., 2006). They largely focus on shocks such as productivity shocks, interest rate shocks and demand shocks. While these shocks are important for EMEs, an important channel of fluctuations in EMEs has to do with the fact that their exports are undiversified and dominated by a few primary commodities. As such, these studies did not explain the case for country specific commodity terms of trade shocks.1 Because of the high volatility and persistence of commodity terms of trade shocks, their consideration may help to account for the high volatility of exchange rates and other macroeconomic variables observed in most EMEs (Chen and Rogoff, 2003). Also, commodity terms of trade shocks may induce unfavourable trade-offs between inflation and output gap variability. The risks they pose in EMEs call for policy intervention.

On policy responses to external shocks, the literature has given much prominence to the role of flexible exchange rates (see e.g., Friedman, 1953; Chia and Alba, 2006; Edwards and Yeyati, 2005), but Devereux (2004) has shown that flexible exchange rate without activist monetary policy may not achieve the desired outcomes. Recent studies have shown that alternative monetary policy regimes such as inflation targeting can play a role in dampening cyclical macroeconomic fluctuations and improve welfare in small open economies (see e.g., Svensson, 2000; Cuche-Curti et al., 2008). The choice of monetary policy regime also matters because wages and prices of non-tradable goods are sticky in the short-run and the speed at which relative prices adjust depends crucially on the monetary policy regime. Although the role of monetary policy can be ascertained, the question that remains is, which monetary policy regime is effective in dealing with commodity terms of trade shocks in EMEs.

This study develops a multi-sector New Keynesian Dynamic Stochastic General Equilibrium (DSGE) model to evaluate the appropriate monetary policy responses to commodity terms of trade shocks in commodity dependent EMEs. Precisely, the paper analyses the

1 See e.g., Devereux et al. (2006), Gali and Monacelli (2005) and Mendoza (1995).
relative merits of CPI inflation targeting (CIT) rule compared with non-traded inflation targeting (NTIT) rule and exchange rate targeting (ET) rule in the face of commodity terms of trade shocks in commodity dependent EMEs. Within the same framework, the paper also examines the monetary policy implications of productivity shocks in the commodity sector. The model is framed in the new open economy macroeconomics (NOEM), which integrates nominal rigidities and monopolistic competition. It builds closely on the work of Devereux et al. (2006) and Galí and Monacelli (2005) and extends their models by incorporating the commodity sector to account for country specific commodity terms of trade shocks in a broader monetary model using the framework of Cashin et al. (2004). The model is calibrated to the South African economy, a typical commodity dependent emerging market economy. South Africa is ideal for this analysis because it has a significant portion of trade (about 30% of GDP) which is concentrated in primary commodities such as gold, platinum and diamonds. Commodity exports account for about half of export earnings (Stokke, 2008), while the South African Rand is considered a commodity currency because of its sensitivity to the movement of commodity prices (Cashin et al., 2004).

The multi-sector DSGE set-up allows the distinction between non-traded inflation and CPI inflation which provides a richer framework for analysing dynamic macroeconomic responses to commodity shocks. The choice of a DSGE model is motivated by several factors. For instance, DSGE models are micro-founded in the sense that they are explicitly derived from the constrained optimising behaviour of households and firms in the economy (Tovar, 2008). Further, their structural nature permits clear identification, interpretation and discussion of alternative policy interventions and their transmission mechanisms (Smets and Wouters, 2003). Finally, as argued by Woodford (2003), DSGE models help to overcome the Lucas critique because the estimated deep structural parameters are less likely to change when policies change.

This paper contributes to the literature in two main ways. First, it incorporates the commodity sector in the multi-sector DSGE model of a small open commodity dependent emerging market economy. This allows explicit examination of the country-specific commodity terms of trade shocks and their implications for monetary policy. This characterisation especially in a dynamic equilibrium setting is not common to small open economy models. The paper argues that CPI inflation targeting is the appropriate monetary policy for commodity dependent emerging market economies because it stabilises both output and inflation targeting (NTIT) rule and exchange rate targeting (ET) rule in non-traded sectors. The rest of the paper is structured as follows. Section 2 develops the model while Section 3 describes the calibration of parameters and solution of the model. Section 4 analyses the results. Section 5 provides the sensitivity analysis and Section 6 concludes and provides policy recommendations.

2. The model

2.1. Basic outline of the model

The model describes a small open commodity exporting emerging market economy which has three domestic economic actors: consumers, firms and monetary authorities. There is one external sector which is the rest of the world. There are two production sectors in the domestic economy: traded and non-traded sectors. The traded sector (commodity export sector) produces primary commodities which are completely exported. This sector is meant to characterise the production and export of commodities, especially minerals in South Africa. The non-traded sector produces final goods which are consumed domestically. The commodity export sector is perfectly competitive while the non-traded goods sector faces monopolistic competition. The asymmetric consideration of the two sectors allows deeper analysis of their linkages in the presence of commodity terms of trade shocks. The external traded sector supplies imports to the domestic economy.

The model also features nominal rigidities in the form of Calvo (1983), staggered price setting in the non-traded sector. The nominal friction allows the model to reproduce realistic inflation dynamics and makes the framework suitable for the evaluation of monetary policy (Clarida et al., 1999). Capital stock is assumed to be constant. Consumers own firms and supply labour to the firms in return for profits and wages. Labour is assumed to be perfectly mobile across sectors which implies that nominal wages are similar in traded and non-traded sectors. The economy is assumed to be small relative to the rest of the world. Monetary policy is modelled as a Taylor rule that incorporates interest rate smoothing.

2.2. Consumers

There is a representative household who maximises its intertemporal utility subject to an intertemporal budget constraint. The household utility function is:

\[ U = E_0 \sum_{t=0}^{\infty} \beta^t \left( \frac{c^{1-\sigma}}{1-\sigma} - \eta_t \frac{1+\phi}{1+\beta} \right) \]  

(1)

where \( \beta \) is the subjective discount factor, \( \eta_t \) is the marginal disutility of work, \( \sigma \) is the inverse of the elasticity of substitution between consumption and labour and \( \phi \) is the inverse of wage elasticity of labour supply. \( \sigma \) and \( \phi \) are strictly positive while 0 < \( \beta < 1 \). \( L_t \) is the total labour supply in both traded and non-traded sectors. \( C_t \) is a composite consumption

\[ 2 \text{ See Lane (2001) for a detailed survey of the new open economy macroeconomics.} \]
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