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Parameter drifts, misspecification and the real exchange rate in emerging countries☆

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ABSTRACT

This paper reviews the baseline framework for the analysis of emerging economies. Using Argentinean data, I estimate a small open economy model with stochastic trend, working capital constraint and augmented with time-varying parameters. I find that "structural" technological and financial parameters of one-sector model are time-varying during 1936–2006. Time-varying parameters correlate with the real exchange rate, suggesting potential misspecification of the one-sector model. Therefore, I propose a two-sector model that endogenously accounts for the real exchange rate. In this model, stationary productivity shocks and the country premium together explain a large share of the variability observed in the data.

1. Introduction

The business cycle in emerging markets differs from the business cycle in developed economies. The emerging markets' business cycle tends to be more volatile than that of developed economies; consumption volatility tends to be larger than the volatility of output; and the trade balance to output ratio tends to be strongly countercyclical. Conversely, developed economies exhibit consumption smoothing and acyclical trade balance to output ratio.[1] There is no agreement, however, on the theoretical framework with which to rationalize these facts. Influential articles, such as Kydland and Zarazaga (2003) and Bergoeing et al. (2002), study the dynamics of emerging markets driven by stationary technology shocks.[2] Other authors, alternatively, highlight the importance of non-stationary shocks or explicitly introduce frictions to the standard open economy real business cycle model.[3]

The objective of this paper is to review the basic theoretical framework for the analysis of emerging economies, i.e. to review the role of the one-sector real business cycle model as a baseline specification when studying emerging economies. To pursue this objective, I estimate a real business cycle model with stochastic trend, working capital constraint and time-varying parameters using annual Argentinean data for the period 1936–2006. I find that the data favor the model with time-varying parameters when compared to the standard business cycle model with trend shocks and working capital constraints. Then, I use the evidence from the time-varying parameters to identify potential

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[1] Aguiar and Gopinath (2007) and Neumeyer and Perri (2005) present a detailed study of business cycle facts for a large number of developed and emerging small open economies.

[2] Kydland and Zarazaga (2003) study Argentina's recent macroeconomic behavior and find that real business cycle models appropriately describe its business cycle up to a puzzle regarding the lack of investment recovery in the 1990s. On the other hand, Bergoeing et al. (2002) implement a growth accounting strategy in an open economy real business cycle model to describe the behavior of Mexico and Chile during the so called "lost decade".

[3] For example, Aguiar and Gopinath (2007) present a model with stationary technology shocks and permanent shocks and conclude that the volatility of the trend shocks is the key difference between developed and emerging economies, i.e., it is larger for emerging markets than for developed small open economies, inducing the facts observed in the data. In contrast, Boz et al. (2008) arrive at different conclusions following an alternate estimation strategy and argue that the trend shocks' volatilities in developing small open economies and developed small open economies do not differ from each other. Instead, different dynamics are due to informational frictions. Garcia-Cicco et al. (2010) reinforce the idea that standard real business cycle models with trend shocks might not be an appropriate representation of emerging economies using a large sample of annual data for Argentina. In turn, Neumeyer and Perri (2005) highlight the importance of working capital constraints and interest rate shocks to generate the observed facts and to rationalize the way real interest rates correlate with output and other macroeconomic variables.

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sources of misspecification. I find that the time-varying parameters tend to change in times of large real exchange rate corrections. This leads to significant correlation between time-varying parameters and the real exchange rate. To check the robustness of this result, I replicate this exercise using Chilean and Mexican data for the period 1961–2012 with similar findings.

The economics behind the strong co-movement between real exchange rate and time-varying parameters goes as follows. During periods of crisis, the real exchange rate depreciates dramatically. In a model in which the real exchange rate is not modeled, this is captured by a change in parameters associated to the financial frictions this economy faces, i.e. financial parameters; and also by technological parameters that regulate the capital and labor shares and the intensity of capital utilization. Hence, I interpret this as evidence towards the misspecification of the one-sector real business cycle model. For this reason, in the rest of the article I develop and estimate a small open economy model with tradable and non-tradable sectors. I find that the two-sector model is able to explain a large share of the variability of national account variables and the real exchange rate once this variable is included in the vector of observables. I find that stationary productivity shocks and the country premium together, account for a large share of the variability observed in the dataset. This implies that these shocks are key driving forces in emerging economies. On the other hand, permanent technology shocks explain about one third of output and consumption volatility and have a mild impact in generating the variability of other observables. One important implication of this analysis is that the share of variability explained by the trend shock is remarkably different between the two-sector and the one-sector model. In other words, considering the endogenous variability of the real exchange rate highlights the role of transitory technology shocks compared to the permanent shock as a driving force of the business cycle in emerging economies.

The main contribution of this paper relies on the fact that the one-sector model is currently the baseline model to analyze macroeconomic behavior in emerging economies. For instance, Neumeyer and Perri (2005) and Uribe and Yue (2006) use the one-sector model to study the role of working capital constraints and interest rate shocks in emerging markets. Aguiar and Gopinath (2007) used a variant of this model to explore the effects of permanent and transitory technology shocks, while Garcia-Cicco et al. (2010)review these questions and use the one-sector model to highlight the importance of financial frictions and Boz et al. (2008) follow a similar strategy to study a linear Bayesian learning channel for the transmission of technology shocks. Hence, if the real exchange rate is important for the business cycle in emerging markets, several of the findings in the existing literature should be re-evaluated as these shocks and mechanisms in the existing literature do not consider this endogenous channel that implies sectoral, tradable and non-tradable, relocation.

My paper builds over the baseline one-sector model that includes many recently developed devices such as trend shocks and working capital constraints.[4] In addition to these features, my model allows for time-varying parameters. Therefore, this paper is also related to a growing literature on the estimation of models with parameter instabilities. Cogley and Sargent (2005), Sims (1999) and Primiceri (2005) estimate vector autoregression models with coefficient instabilities and time-varying volatilities for the US to study monetary policy during the Great Moderation, while King (2006), Justiniano and Primiceri (2008) and Fernández-Villaverde and Rubio-Ramirez (2007), among others, estimate dynamic stochastic general equilibrium models with parameter instabilities to study similar questions from a general equilibrium approach.

In this paper, I assume time-varying parameters follow autoregressive processes of order one, as in Fernández-Villaverde and Rubio-Ramirez (2007). Also in line with these authors, I assume that volatilities of the exogenous shocks are time-invariant. As pointed out by Sims (2001), this might be an important assumption. I work under this assumption because the estimation of nonlinear models using full information methods is still under study.[5]

This paper is also related to the study of the real exchange rates in small open economies and their importance as a transmission mechanism of foreign shocks, as in Mendoza (1995). Recently, the interest in the behavior of real exchange rate has increased. Mendoza (2005) studies the interaction between real exchange rate and sudden stops, Burstein et al. (2005) study the dynamics of the real exchange rate after large devaluations, Burstein et al. (2006) study the impact of changes in non-traded goods and the real exchange rate, while Burstein et al. (2007) study the role of sticky prices in non-traded goods sector. More recently, Aguirre (2011) studies the behavior of real exchange rate with shocks to the country spread and Ouyang and Rajan (2013) decompose the real exchange rate behavior of 50 economies over the last 20 years. However, the strategy in my paper is to extract information about the real exchange rate using national account variables through the lens of the one-sector real business cycle small open economy model with time-varying parameters that act as "wedges" that accommodate accordingly to the information contained in the data.

The remainder of the paper proceeds as follows: in Section 2, I discuss the benchmark one-sector model and the time-varying parameters assumption. In Section 3, I review the solution and estimation procedures used in this study and discuss the main estimation results. Section 4, studies the features of time-varying parameters and technology shocks in the time-varying parameters model and provides evidence supporting the misspecification hypothesis. Section 5 introduces and estimates a two-sector model. Section 6 provides concluding remarks and discusses directions for future research.

2. Small open economy model with parameter drifts

This section discusses the baseline one-sector model which builds on Aguiar and Gopinath (2007), Garcia-Cicco et al. (2010) and Neumeyer and Perri (2005) augmented with parameter drifts. In the following, I present the optimization problems of the firms and the households, and then, I introduce the stochastic processes of the time-varying parameters.[6]

2.1. Firms

I assume firms operate in competitive factors and goods markets. They rent capital and labor from households and combine them using a Cobb–Douglas technology to produce a unique type of good that can be traded internationally, used for investment or consumed. I follow Neumeyer and Perri (2005) and Uribe and Yue (2006) in assuming that firms need to advance a share of the total wages before starting the production process at any period t. However, while these authors assume that producers must always advance a fixed share of the total wages, I allow for the possibility that these shares could be time-varying.

The second key assumption regarding the firms' setup is that firms are subject to both transitory and permanent productivity shocks as discussed by Aguiar and Gopinath (2007) and Garcia-Cicco

[4] The online appendix replicates the time-varying parameter analysis of this paper taking as a baseline specification the financial frictions model in Garcia-Cicco et al. (2010). Even in this case, the behavior of time-varying parameters is similar to the one shown in Section 4.

[5] A recent paper, Andreasen (2013), reviews the features and caveats of nonlinear Bayesian estimation using a particle filter.

[6] I follow the convention in Garcia-Cicco et al. (2010). I use capital letters to denote variables in levels and lowercase letters to denote stationarized variables. A full set of equilibrium conditions for this model is available in the online appendix.

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