Business Cycles in Emerging Economies: The Role of Common Trends*

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This Version: April 25, 2011

Abstract

Recent research on aggregate fluctuations in emerging economies has paid little attention to the strong comovement of output and interest rates across countries observed in panel data at business cycle frequencies. We fill this gap by building a multi-country, emerging economy, DSGE model where country risk is correlated across countries by a common regional trend. A Monte Carlo-type of experiment shows this new driving force reduces the link between internal domestic conditions and country risk emphasized in the literature while improving the overall fit of the model, particularly the comovement between business cycles across emerging economies. We also empirically assess our model by calibrating it to Latin American economies. The results show that in most of these economies, but not all, the role of a common risk factor is central for business cycle dynamics while simultaneously downplaying the role of internal conditions in country risk fluctuations.

1. Introduction

The dominant approach when modeling business cycles in emerging market economies, within a dynamic stochastic general equilibrium (DSGE) framework, is to postulate a small open

*We are thankful to Adam Gulan for his comments. Of course, any errors or shortcomings are ours.
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economy that borrows in international capital markets at a country specific interest rate. This interest rate is specific to the country because it is assumed to be the outcome of adding a country specific spread to a world interest rate. In a seminal contribution Neumeyer and Perri (2005), henceforth NP, showed that, in order for these models to properly account for business cycles in emerging economies, this spread must react to internal macroeconomic conditions in the domestic country. The relevance of such type of financial frictions has been corroborated by several other researchers. Oviedo (2005) showed that a requirement of good fit for a prototypical business cycle model of an emerging economy was to link the country specific spread to the economy's domestic productivity process. Moreover, Uribe and Yue (2006), henceforth UY, showed that the way domestic macroeconomic conditions affect emerging economies's spreads is an important propagation mechanism in the business cycle of these economies. Moreover, García-Cicco et.al. (2010) and Chang and Fernández (2010) have recently presented evidence that financial frictions akin to these tend to dominate over other driving forces when accounting for business cycles in emerging economies.

However, an important topic that this literature has left aside is the potential role of common regional factors as a driving force of the business cycle of emerging economies. In particular, no theoretical model that we know of has explicitly accounted for the possibility that spread dynamics could be partly explained by a regional component independent of the domestic macroeconomic conditions with the potential to deliver a strong comovement between the business cycles in these emerging economies. The lack of such a common trend is surprising given the vast evidence presented in favor of it by another, more empirically oriented, strand of the literature. Calvo et.al. (1993) were among the first works to present solid empirical evidence in favor of common external factors shaping macroeconomic dynamics among Latin American economies. In the same spirit, Aiolfi et.al.(2006), using time series methods, uncover a sizeable common factor in the business cycle of a pool of Latin American economies. And an additional strand of this literature has studied emerging market spreads and has documented a strong tendency of these variables to move in tandem. McGuire and Schrijvers (2003), for example, using principal components analysis, report that a single common factor explains roughly 80 percent of the common variation across a panel dataset of emerging market spreads. A similar finding has also been recovered by Dedu et.al. (2010) who find that the correlation tends to increase even more during periods of financial stress. In the following section of this paper we present evidence in favor of this common trend component in the business cycle of emerging economies that we believe materializes itself in the form of a strong comovement of output and country-specific spreads across these economies.

We therefore believe that the lack of an explicit treatment of common regional driving forces is an important gap in the theoretical literature on emerging markets' business cycles and this paper seeks to fill this gap. The strategy we follow is simple and straightforward: we augment the model developed by NP in two dimensions: (i) we build a multi-country version of this model; and (ii) we explicitly model the presence of a common regional trend in the spreads the countries in our model face in world capital markets. We then calibrate our model in a way similar to the calibration strategy used by NP, except that ours includes also the presence of such regional component in the spread.

We present the results of the paper in two steps. In a first step, we do a Monte Carlo-type of experiment where we simulate data under the hypothesis of a significant common trend component across countries. Importantly, the two-emerging-economy-model we use to simulate data is calibrated so as to deliver second moments that, to the best extent possible, resemble those in the data both within and across emerging countries. The most important result that emanates from this experiment is that a multi-country model with a common trend has the potential of bringing the model based dynamics closer to the data, particularly the observed high correlations of output and interest rates between emerging economies, without worsening the overall fit of the model in other dimensions of the data. In a second step, we build a seven-country model and calibrate it using data on seven Latin American economies. With this experiment we show that the presence of a common trend is a key factor when trying to match the strong comovement observed in the macro dynamics across Latin American economies at business cycle frequencies. Another result of our experiments is that the presence of a non-trivial common trend reduces, to some degree, the relevance of domestic conditions when determining the dynamics of country-specific spreads.

Overall, we think that our results contribute to the understanding of business cycles in emerging economies as they stress the relevance of a driving force that has been unexplored by the literature: a common regional trend in the spreads these economies face in world capital markets. We think this new driving force is relevant because it can bring the model based dynamics closer to the data, particularly the observed strong comovement in business cycles, and because it reduces the strong dependency of country-specific spreads on domestic conditions that the current literature has emphasized.

The rest of this work is divided into five sections including this introduction. In section 2 we present some of the main stylized facts of business cycles in emerging economies. Section 3 builds the multi-country business cycle model. The key results of the paper are presented in Section 4. Concluding remarks are given in Section 5. An appendix gathers some of the technical details of our analysis.

2. Stylized Facts in Emerging Market Business Cycles

In this section we document the main stylized facts of the business cycle in a pool of emerging market economies. This task has been done by several previous works since the seminal analysis of Agenor et.al. (2000). One of the most recent and comprehensive of these studies is the work by Aguiar and Gopinath (2007) who compare the second moments of a pool of 13 emerging economies and compare them to those of a pool of small open and developed economies for the period 1980-2003[1]. Aguiar and Gopinath focus their analysis of the second moments of four key macroeconomic aggregates: output, private consumption, investment and the trade balance share. In this section we expand Aguiar and Gopinath's analysis along three dimensions. First, we update their emerging markets' dataset up to the year 2010. Second, we incorporate data on country specific interest rates along the lines of NP and UY. And, third, not only do we pay attention to the same standard second moments that these previous works have analyzed but we also study the comovement between country interest rates and output in these economies at business cycle frequencies, a dimension of the data which has not received any attention in previous works. The technical appendix in

[1]For an even more comprehensive study of business cycles in both developed and developing economies see Benczur and Raftai (2008).

the end contains the details of the data we collected.

The first set of stylized facts is presented in Tables 1a and 1b, where the standard second moments studied in the literature are presented for the pool of 13 emerging economies that Aguiar and Gopinath (2007) studied. While Table 1a presents the statistics for the seven Latin American countries in our sample, Table 1b presents those of the Asian and African emerging economies. The first observation that deserves attention is that we do recover the same stylized facts that Aguiar and Gopinath (2007) stressed: business cycles in emerging economies are characterized by higher volatility of consumption relative to output, and a strong countercyclical trade balance share. The second relevant observation from these Tables is that in virtually all of the economies, the country specific interest rates, computed as the sum of the US TBills rate and the country specific EMBI, as in UY, are highly countercyclical, which is the stylized fact first noted by NP. Figures 1a and 1b corroborate this fact by showing that these interest rates are not only countercyclical but tend to lead the cycle.

A second set of stylized facts is presented in Tables 2a and 2b, where we report the correlations across countries of aggregate fluctuations measured as output deviations from Hodrick-Prescott trends. Once again we split the sample between the two regions. As it is evident from a first look at these results, aggregate fluctuations in these two regions have displayed a strong comovement across countries. This is in line with the evidence in Aiolfi et.al.(2006), who uncovered a sizeable common factor in the business cycle of a pool of Latin American economies. Arguably, our results would thus seem to indicate that such common trend exists not only in Latin American economies but also in other regions of emerging economies.

The third and final set of stylized facts is entirely devoted to the dynamics of emerging market spreads. As can easily observed from the time series of the EMBI spreads for the two regions in Figures 2a and 2b, there is a strong comovement between these variables. This is corroborated by the high and statistically significant correlation coefficients of the cyclical component of the country specific EMBIs in tables 3a/b. This lends support to the presence of a common regional trend in the observed measures of country specific spreads that is most likely explained by fluctuations in the risk aversion of world investors. Moreover, as Table 4 shows, these fluctuations may take place on a world wide level as the correlation among regional EMBI spreads also seems to be quite significant. Interestingly, the comovement across these regional risk measures has increased in the last decade perhaps as a result of the 2007/2008 world financial crisis.

To sum up, the analysis of the main business cycles's stylized facts observed in emerging market economies has pointed in the same direction as previous studies in that aggregate fluctuations are not only significantly more volatile relative to developed economies, but that they are characterized by even more volatile consumption and investment dynamics, and strong countercyclicality of trade balances and interest rates. Yet, we think we have also added another dimension in the main business cycle facts of emerging economies that has received little attention, if any, in the literature: the presence of a strong comovement in the aggregate fluctuations of these economies that is jointly characterized by a common regional trend in the spreads these economies face in world capital markets. In the following section we formalize this idea by including such a common trend in domestic interest rates within a multi-country-DSGE framework.

3. Model

This section builds and calibrates our multi-country small open economy model. The strategy we follow is simple, we modify the NP one-country business cycle model of an emerging economy in three key dimensions. First we augment the model to account for N emerging economies. Second, we explicitly model the presence of a common trend in the spreads these N economies face in world capital markets. Third, we modify NP´s calibration strategy so as to account now for the presence of such common trend. In what follows we build a two country version of our model, but the N-country case is laid out in the Appendix.

3.1. Firms

In building the model any variable X_i pertains to economy i but it should be understood that there exists a counterpart X_j that belongs to economy j. For the sake of brevity we elaborate only on the system of equations that pertains to economy i but the reader should keep in mind that a counterpart system of economy j belongs to the model too.

Firms in economy i produce the only good using a Cobb-Douglas technology:

$$Y_{i,t} = a_{i,t} K_{i,t}^{\alpha_i} \left[(1+\gamma_i)^t \, l_{i,t} \right]^{1-\alpha_i} \tag{3.1}$$

where $Y_{i,t}$ is output, $a_{i,t}$ is the stochastic and stationary total factor productivity process, $K_{i,t}$ is capital stock and $l_{i,t}$ is the amount of labor employed. The elasticities of output relative to capital and labor are also country-specific and are denoted, respectively, as $\alpha_{i,t}$ and $1-\alpha_{i,t}$. The term $(1+\gamma_i)^t$ indicates the deterministic growth rate of labor-augmenting technology that is also allowed to vary across countries.

Firms in country i rent capital and labor from households at marginal costs denoted by $r_{i,t}$ and $W_{i,t}$, respectively. As in NP, we assume firms need to borrow working capital at the beginning of each period because of a friction in the technology for transferring resources to the households that provide labor services. In order to finance working capital costs, the firm borrows in international capital markets at a rate $R_{i,t-1}$, the gross country specific interest rate prevalent at the end of last period, a fraction θ_i of the wage bill.

Profits of a representative firm in country i in period t, $\pi_{i,t}$, are therefore:

$$\pi_{i,t} = Y_{i,t} - W_{i,t} l_{i,t} - r_{i,t} K_{i,t} - (R_{i,t-1} - 1)\,\theta_i W_{i,t} l_{i,t} \tag{3.2}$$

with associated first order conditions:

$$r_{i,t} = \alpha_i a_{i,t} K_{i,t}^{\alpha_i - 1} \left[(1+\gamma_i)^t \, l_{i,t} \right]^{1-\alpha_i} \tag{3.3}$$

$$W_{i,t} \left[1 + (R_{i,t-1} - 1)\,\theta_i \right] = (1-\alpha_i)\, a_{i,t} K_{i,t}^{\alpha_i} \,(1+\gamma_i)^{t(1-\alpha_i)}\, l_{i,t}^{-\alpha_i} \tag{3.4}$$

3.2. Households

The representative household in country i supplies labor and rents capital in competitive markets, decides the levels of consumption, C_i, and capital, K_i, and purchases non-contingent, one period bonds, B_i, so as to maximize lifetime utility

$$\sum_{t=0}^{\infty} \beta_i \left\{ \frac{1}{1-\sigma} \left[C_{i,t} - \psi_i \left(1+\gamma_i\right)^t l_{i,t}^{v} \right]^{1-\sigma} \right\} \tag{3.5}$$

subject to a sequential budget constraint:

$$C_{i,t} + X_{i,t} + B_{i,t} + \frac{\kappa}{2} Y_{i,t} \left(\frac{B_{i,t}}{Y_{i,t}} - \bar{b}_i \right)^2 = W_{i,t} l_{i,t} + r_{i,t} K_{i,t} + B_{i,t-1} R_{i,t-1} \tag{3.6}$$

and a law of motion for capital

$$K_{i,t+1} = \left(1-\delta_i\right) K_{i,t} + X_{i,t} - \frac{\phi_i}{2} K_{i,t} \left(\frac{K_{i,t+1}}{K_{i,t}} - \left(1+\gamma_i\right) \right)^2 \tag{3.7}$$

where X_i is investment flow, δ_i is the rate of capital depreciation and ϕ_i is the parameter that governs the capital adjustment costs. We model bond holding costs along the lines of Uribe and Schmitt-Grohé (2003) so as to render bonds stationary with the term $\frac{\kappa}{2} Y_{i,t} \left(\frac{B_{i,t}}{Y_{i,t}} - \bar{b}_i \right)^2$, where $\bar{b}_i$ is country i´s bonds to income share in the long run.

First order conditions for the representative household determining optimal decisions in terms of consumption, labor, bond holdings and investment are, respectively:

$$\left[C_{i,t} - \psi_i \left(1+\gamma_i\right)^t l_{i,t}^{v} \right]^{-\sigma} = \left[\left(1+\gamma_i\right)^t \right]^{-\sigma} \lambda_{i,t} \tag{3.8}$$

$$\psi_i v \left(1+\gamma_i\right)^t l_{i,t}^{v-1} = \left[\left(1+\gamma_i\right)^t \right]^{-\sigma} W_{i,t} \tag{3.9}$$

$$\lambda_{i,t} \left[1 + \kappa \left(\frac{B_{i,t}}{Y_{i,t}} - \bar{b}_i \right) \right] = \beta_i \left(1+\gamma_i\right)^{-\sigma} R_{i,t} E_t \lambda_{i,t+1} \tag{3.10}$$

$$
\begin{aligned}
& 1+\phi_i\left(\frac{K_{i,t+1}}{K_{i,t}}-(1+\gamma_i)\right) \\
= \quad & \beta_i\,(1+\gamma_i)^{-\sigma}\,E_t\left[\frac{\lambda_{i,t+1}}{\lambda_{i,t}}\right]\left[\begin{array}{c} r_{i,t+1}+1-\delta_i-\frac{\phi_i}{2}\left(\frac{K_{i,t+2}}{K_{i,t+1}}-(1+\gamma_i)\right)^2+ \\ \phi_i\frac{K_{i,t+2}}{K_{i,t+1}}\left(\frac{K_{i,t+2}}{K_{i,t+1}}-(1+\gamma_i)\right) \end{array}\right]
\end{aligned} \tag{3.11}
$$

where $\lambda_{i,t}$ is the specific country Lagrange multiplier implicit in the household's problem.

3.3. Interest rates

Our modeling strategy for interest rates follows, to a large extent, that of NP. We assume that a large mass of international investors is willing to lend to the i´th emerging economy any amount at a rate $R_{i,t}$. Loans to this economy are risky assets because there can be default on payments to foreigners. In addition to this, and unlike NP´s approach, we also assume the presence of a common trend in the spread that investors demand over other risky assets across emerging economies. These assumptions create three sources of volatility in R_i. First, interest rates can change because the preference of international investors for risky assets might change over time. Second, even if preferences for risk remain constant, real interest rates may change as domestic conditions in country i change, modifying the default risk that investors perceive. Third, even if both domestic conditions and preferences for risk remain constant, the perceived default risk over country i may also change, thereby altering interest rates R_i, because the perceived risk over the region where country i is located changes. Importantly, this third source of volatility of interest rates that we are considering was not considered in previous studies of emerging market business cycles and is motivated by the strong comovement in country specific EMBI spreads over different regions documented in Section 2.

Formally, we capture these three sources of interest rate volatility as follows. We start by decomposing the interest rate faced by the i´th emerging economy in our model as

$$
R_{i,t}=R_t^{*}\cdot S_{i,t} \tag{3.12}
$$

where R^* measures world interest rates and captures foreign investor´s preference for risk, and $S_{i,t}$ measures the country spread over R^*. In the literature, R^* has been proxied by the U.S. rate for risky assets (as in NP) or the 3-month U.S. Treasury bill rate, as in UY, and modeled as an AR(1) process

$$\hat{R}_t^* = \rho_1 \hat{R}_{t-1}^* + \varepsilon_t^R, \quad \varepsilon_t^R \sim \left(0, \sigma_{\varepsilon_{\hat{R}^*}}^2\right) \tag{3.13}$$

where we denote $\hat{x}_{i,t}$ the log-deviation in the variable $X_{i,t}$ from its steady state level $\bar{X}_i$ and the shocks ε^R capture changes in world investors‘s appetite for risk.

Following both NP and UY, we proxy $S_{i,t}$ using data for country specific EMBIs, but we depart from these two studies by modeling S_i as

$$S_{i,t} = RS_t \cdot D_{i,t}$$

where RS_t captures the regional component and $D_{i,t}$ measures the country-specific spread that is assumed to react solely to changes in domestic conditions.

In determining what drives fluctuations in $D_{i,t}$ we follow NP and assume that private domestic lenders always pay their debts but that in each period there is a probability that the local government will confiscate all the interest payments going from local borrowers to the foreign lenders. Fluctuations in the confiscation probability in country i around its steady state level are assumed to be driven by fundamental shocks to i‘s economy captured through TFP shocks, a_i, as

$$\hat{D}_{i,t} = -\bar{\eta}_i E_t\left(\hat{a}_{i,t+1}\right) + \varepsilon_{i,t}^{\hat{D}}, \quad \varepsilon_{i,t}^{\hat{D}} \sim \left(0, \sigma_{\varepsilon_i^{\hat{D}}}^2\right) \tag{3.14}$$

where $\bar{\eta}_i \geq 0$ is the elasticity of the country specific spread to expectations of deviations in total factor productivity, $\varepsilon_{i,t}^{\hat{D}}$ is a normally distributed independent shock, and $\hat{a}_i$ is the log deviation of TFP, assumed also to follow an AR(1) process

$$\hat{a}_{i,t} = \rho_{a,i} \hat{a}_{i,t-1} + \varepsilon_{i,t}^{\hat{a}}, \quad \varepsilon_{i,t}^{\hat{a}} \sim \left(0, \sigma_{\varepsilon_{\hat{a}_i}}^2\right) \tag{3.15}$$

The last, yet crucial, issue to resolve is what drives fluctuations in the regional component of the spread, RS. Fluctuations in this variable can be justified through many ways. One could postulate, for instance, the presence of significant informational asymmetries between foreign lenders and domestic borrowers whereby regional, yet not necessary domestic, events make the perceived probability of default by lenders increase. Under this hypothesis, events outside country i, but pertaining to the region where i is located, could motivate investors to modify the perceived probability of default in i. Calvo et.al. (1993), for example, argue that "*an important part*" of the large capital inflows to Latin America in the early 1990s that fueled an economic boom in the region is explained by the fundamental economic and political reforms undertook by many of these countries, despite the fact that many of these countries had not implemented the reforms with the same timing or had advanced in their internal reforms at the same pace: "*reforms in some countries give rise to expectations of future reforms in others*" Calvo et.al. (1993).

However, a complete model of the determination of fluctuations in the regional spread is beyond the scope of this paper because our main goal is to analyze the relation between a common regional component in interest rates and business cycles in emerging economies. Yet a minimal model of regional spread dynamics is needed to evaluate the empirical validity of such component. For that reason we assume these dynamics follow a simple AR(1) process[2]

$$\widehat{RS}_t = \rho_{RS}\widehat{RS}_{t-1} + \varepsilon_t^{RS}, \quad \varepsilon_t^{RS} \sim \left(0, \sigma^2_{\varepsilon^{RS}}\right) \tag{3.16}$$

where shocks through ε^{RS} capture changes in foreign investors's perceived risk of default in country i explained by regional events.

3.4. Equilibrium

Because we assume homogeneity across firms and households in country i, the macroeconomic aggregates are identical to those optimally chosen by the representative household and firm analyzed above. Thus net exports share can be defined as:

[2] In future versions of this work we intend to assess the robustness of our results to more complex dynamics of RS.

$$NX_{i,t} = \frac{\left(Y_{i,t} - C_{i,t} - X_{i,t} - \frac{\kappa}{2} Y_{i,t} \left(\frac{B_{i,t}}{Y_{i,t}} - \bar{b}_i \right)^2 \right)}{Y_{i,t}} \tag{3.17}$$

where we have taken into account that some resources are waisted in the process of adjusting the bond portfolio.

We are now ready to define an equilibrium allocation for our two country small open economy model. Given initial conditions for capital and bond holdings in the two countries

$$\{K_{i,0}, B_{i,0}, K_{j,0}, B_{j,0}\}$$

stochastic processes for the regional spread component and the world interest rate, and, in each country, of TFP

$$\{R_t^*, RS_t, a_{i,t}, a_{j,t}\}_{t=0}^{\infty}$$

an equilibrium is a sequence of allocations

$$\left\{ \begin{array}{c} Y_{i,t}, C_{i,t}, l_{i,t}, B_{i,t}, X_{i,t}, K_{i,t+1}, NX_{i,t} \\ Y_{j,t}, C_{j,t}, l_{j,t}, B_{j,t}, X_{j,t}, K_{j,t+1}, NX_{j,t} \end{array} \right\}_{t=0}^{\infty}$$

and prices

$$\{W_{i,t}, r_{i,t}, W_{j,t}, r_{j,t}\}_{t=0}^{\infty}$$

such that, for both countries, (i) the allocations solve the firms's and households problems at the equilibrium prices; and (ii) markets for factor inputs clear.

3.5. Calibration

In order to be able to qualitatively assess the role of a regional trend in the spread as a new driving force of business cycles in emerging economies we need to calibrate the parameters of the model and the stochastic processes. The calibration strategy we adopt follows closely the one in NP that we modify only to account for the presence of the regional component. A period in the model is assumed to be a quarter and, whenever data for emerging economies is needed for calibration, we use the emerging market dataset we built and presented in Section

2. We divide the set of parameters to be calibrated into three subsets: (i) a subset that we fix at identical values across countries; (ii) another subset that are non-country specific; and (iii) a final subset that are country specific.

3.5.1. Parameters identical across countries

As in NP, we set beforehand some parameters and assume they all take the same values across countries. First, the curvature of the period utility σ is set equal to 5. Second, the parameter υ governing the labor supply elasticity is set at 1.6, a value that is standard in business cycle analysis. Third, we take the stand that all the wage bill is paid in advance, $\theta_i = 1$[3]. Fourth, we set the persistence of the productivity process to $\rho_{a,i} = 0.95$. Fifth, the bond holding cost parameter κ is set to 10^{-5} only to guarantee that the model's bond holdings are stationary and a first order approximation around the non-stochastic steady state is valid.

3.5.2. Non country-specific parameters

We follow UY in using the 3-month U.S. Treasury Bills rate as a proxy for the world interest rates. The persistence of log deviations of this variable from its steady state, ρ_1, and the standard deviation of the shocks to this process, $\sigma^2_{\varepsilon_{\hat{R}^*}}$, are calibrated using OLS estimates from the AR(1) process in (3.13) from our dataset. The steady state value, $\bar{R}^*$, is calibrated using the long-run average in our dataset.

Crucial to our hypothesis, we need to calibrate $\rho_{\widehat{RS}}$ and $\sigma^2_{\varepsilon_{\widehat{RS}}}$, respectively, the persistence of log deviations of the regional spread from its steady state and the standard deviation of the shocks to this process. Given that our qualitative analysis presented in the following sections will mostly address the Latin American region, we use data from the Latin America Emerging Market Bond Index (LAEMBI) published by J.P Morgan and collected in our dataset. As with the world interest rate process, the two parameters are calibrated using OLS estimates from the AR(1) process in (3.16)[4].

[3] In future drafts we plan to assess the robustness of our results to these assumptions.

[4] In future versions of this work we intend to assess the robustness of our results to this strategy for calibrating $\rho_{\widehat{RS}}$ and $\sigma^2_{\varepsilon_{\widehat{RS}}}$. We also intend to implement our model to other emerging market economies outside the Latin American region.

3.5.3. Country-specific parameters

Three crucial parameters in the qualitative assessment of our results are those in (3.14) and (3.15), notably the elasticity of the country-specific component of the spread to domestic conditions, $\bar{\eta}_i$, the standard deviation of the shocks to this variable, $\sigma^2_{\varepsilon_{\hat{D}}}$, and the standard deviation of the shocks to TFP, $\sigma^2_{\varepsilon_{\hat{a}_i}}$. In calibrating these parameters we follow closely the strategy suggested in NP except that we modify it only to account for the presence of the regional component. First, we set $\sigma^2_{\varepsilon_{\hat{a}_i}}$ so that the simulated volatility of output matches that of output in country i. Second we choose $\bar{\eta}_i$ and $\sigma^2_{\varepsilon_{\hat{D}}}$ so that, given processes for TFP, world interest rates and regional trend in the spread, (3.15)-(3.13)-(3.16), the process for $\widehat{R}_i$ matches the persistence of the data counterpart of this variable as closely as possible. Formally, we set

$$\bar{\eta}_i^2 = \frac{\left(\sigma^2_{\hat{R}_i}\rho_{\hat{R}_i} - \sigma^2_{\hat{R}^*}\rho_1 - \rho_{\widehat{SR}}\sigma^2_{\widehat{SR}}\right)}{\rho^3_{\hat{a}}\sigma^2_{\hat{a}_i}} \tag{3.18}$$

$$\sigma^2_{\hat{D}_i} = \sigma^2_{\hat{R}_i} - \sigma^2_{\hat{R}^*} - \sigma^2_{\widehat{SR}} - \bar{\eta}_i^2\rho^2_{\hat{a}}\sigma^2_{\hat{a}_i} \tag{3.19}$$

where $\sigma^2_{\hat{R}_i}$ and $\rho_{\hat{R}_i}$ are, respectively, the empirical variance and serial correlation of $\hat{R}_i$; and

$$\sigma^2_{\widehat{SR}} = \frac{\sigma^2_{\varepsilon_{\widehat{SR}}}}{1-\rho^2_{\widehat{SR}}};\quad \sigma^2_{\hat{a}_i} = \frac{\sigma^2_{\varepsilon_{\hat{a}_i}}}{1-\rho^2_{\hat{a}}}$$

Two remarks are crucial for our modified strategy. First, note that whenever we set $\rho_{\widehat{SR}} = \sigma^2_{\widehat{SR}} = 0$ we recover the exact calibration suggested by NP. Thus, (3.18) and (3.19) show, analytically, that the presence of a common trend reduces the role that country specific macroeconomic conditions play in the evolution of the spread. The next section will try to assess the extent by which the presence of such a regional common trend reduces this role. Second, as it is evident by closely inspecting (3.18) and (3.19) provided that the regional component is highly persistent and/or its shocks exhibit a high volatility, the calibrated values for $\bar{\eta}_i^2$ and $\sigma^2_{\hat{D}_i}$ could in principle take complex and/or negative values. Thus we take a stand by assuming that if either or both of these two cases occur we set $\bar{\eta}_i^2 = \sigma^2_{\hat{D}_i} = 0$.

The parameters $\gamma_i, \beta_i, \psi_i, \alpha_i$ and δ_i are set so that the balanced growth paths in the model-based dynamics of country i are consistent with the long-run growth averages in the data. In particular, we calibrate γ_i so as to match the real growth rate of output observed for country i in our dataset; β_i so as to match the long-run average real interest rate for country i in the data, computed as $\bar{R}_i = \bar{R}^* \bar{S}_i$ where $\bar{S}_i$ is constructed as the long-run EMBI average for country i. The parameter ψ_i is calibrated so as to match an average time spent working of 20 percent of total time. As shown by NP, given that the parameter α_i is not exactly equal to one minus the labor share, we calibrate it as

$$Labor\ Share = \frac{1-\alpha_i}{1+(R_i-1)\,\theta_i}$$

where we assume a labor share of 60 percent across all countries. The country specific depreciation rate, δ_i, is set so as to match the average investment to output ratio observed in our dataset for country i.

The steady state asset holdings B_i is set to match the historical average of the ratio between net foreign assets and output which, in the model, are $\bar{b}_i - \theta_i W_i l_i / Y_i$. Following NP we compute the average net foreign asset positions for all the countries in our dataset by averaging foreign asset positions data in Lane and Milesi-Ferretti (2001). Lastly, the parameter ϕ_i that governs capital adjustment costs is set so as to match the observed volatility of investment relative to that of output´s in country i at business cycle frequencies.

4. Results

This section presents the main quantitative results of our work by assessing the business cycle dynamics implied by the model presented in the previous section. In particular we evaluate the role played by the new driving force we introduce and the extent by which it modifies the relevance of other driving forces and/or propagation mechanisms implied by the benchmark reference, the NP model.

We divide our results into two subsections. First we run a Monte Carlo-type experiment where we simulate data with our two-country model in order to answer the following two questions: (i) can our model simulate business cycle dynamics that resemble those of emerging economies?; and (ii) what are the effects over the key driving forces and amplification mechanisms postulated by the NP model? Second, we extend our model to a seven-country model and calibrate it using data on the seven Latin American economies in our dataset. We then assess the performance of the model to reproduce business cycles in these economies and the role played by the common trend in this performance.

4.1. A Monte Carlo-type of Experiment

The results of the Monte Carlo experiment are presented in Tables 5, 6 and 7. Table 5, documents the calibrated parameters used in the experiment, which were chosen so as to reproduce averages of the 7 Latin American countries and reports the simulated second moments comparing them to empirical averages.

Table 6 exhibits results in 4 panels. The first panel reports the calibrated parameters $\sigma^2_{\varepsilon_{\widehat{RS}}}, \rho_{\widehat{RS}}, \sigma^2_{\varepsilon_{\hat{a}_i}}, \phi_i, \bar{\eta}_i, \sigma^2_{\hat{D}_i}$ that are key in determining the role played by each of the driving forces in the model. The calibration is done for two polar cases. First we assume that the researcher that observes the simulated data does not incorporate the presence of a common trend in the calibration process, i.e. as in NP. Second, we present results for the calibration when the common trend has been taken into account. This allows us to assess what are the effects of the common trend over the key driving forces and amplification mechanisms postulated by the NP model. The following two panels in Table 6 report the one step ahead forecast error variance decomposition of output under the two calibration strategies. And the last panel reports a counterfactual analysis, akin to the one computed in NP, where we assess the drop in output volatility if, separately, (i) the propagation mechanism by which domestic conditions affect domestic spreads is "turned off", i.e. $\bar{\eta}_i = \sigma^2_{\hat{D}_i} = 0$; and (ii) the common trend is turned off, i.e. $\sigma^2_{\varepsilon_{\widehat{RS}}} = \rho_{\widehat{RS}} = 0$. These counterfactuals are also computed for the two calibration strategies. Lastly, Table 7 presents the results of the two calibration strategies by comparing the model-based second moments for each case and compares them to the observed ones from Latin American averages.

The following key results emerge from the Monte Carlo experiment. First, as it is evident from Table 5, the model with a common trend can reproduce some of the main stylized facts of business cycles in emerging economies. On one hand the model with a common trend can account for the strong volatility of consumption, countercyclicality of trade balance and interest rates. On the other hand, and perhaps more important for our investigation, the model does a good job in matching the strong correlations of output and domestic interest rates across emerging economies documented in section 2.

The second result of interest is conveyed in the first panel of Table 6 where one can see that the presence of a common trend modifies virtually all the calibration values for the parameters $\sigma^2_{\varepsilon_{\hat{a}_i}}, \phi_i, \bar{\eta}_i, \sigma^2_{\hat{D}_i}$. This is of course not a surprise because we had analytically shown in (3.18) and (3.19) that these parameters would be modified with the presence of a common trend. What is interesting from the results reported in the upper panel of Table 6 is that not all these parameters are uniformly affected. Moving from the (correct) calibration with a common trend to the (counterfactual) one without it only moderately increases the volatility of the TFP shocks, from 1.05% to 1.14%, and leaves virtually unaltered the capital adjustment cost parameter, from 50 to 49. However, we do not observe such a mild change in the other two parameters, $\bar{\eta}_i$ and $\sigma^2_{\hat{D}_i}$. While for the former, the increase is close to 21%, from 0.39 to 0.47, the latter more than doubles in size, from 0.69% to 1.66%. In other words, our experiment shows that not taking into account a common trend could greatly overestimate the true role of the extent by which internal conditions matter for the domestic spread.

The third result is an extension of the previous one and is concerned with the relevance of foreign forces in shaping the dynamics of output. According to the results in the second and third panels in Table 6, moving from the (counterfactual) case of no common trend to the (correct) one with it, implies that common forces behind the variance decomposition of output in emerging economies may account for virtually nothing, 2% counting only the role played by R^*, to close to one fourth, 22%. In the same direction, results reported in the fourth panel of Table 6 show that when we eliminate the contribution of domestic conditions to country risk fluctuations, i.e. setting $\bar{\eta}_i = \sigma^2_{\hat{D}_i} = 0$, the drop in the variance of output goes from 16.7% in the (counterfactual) case without a common trend, to only 7.8% in the (correct) one with it. While the drop in the latter case when the common trend is eliminated, $\sigma^2_{\varepsilon_{\widehat{RS}}} = \rho_{\widehat{RS}} = 0$, is almost twice, 13.7%.

The fourth result worth commenting comes from Table 7, where it is clear that both cases, with or without the presence of a common trend, can account well for the *individual* second moments that characterize business cycles in emerging economies. However, the second moments that are not equally matched in both cases are the strong correlations of output and interest rates observed in the data. Clearly, as the last two rows of Table 7 indicate, only the model with a common trend can bring the model closer to these two dimensions of the data. For example, while the (counterfactual) case without a common trend implies that virtually no correlation exists between business cycles in the two artificial emerging economies, $\rho(Y_i, Y_j) = 3\%$, the (correct) case with a common trend implies a much higher correlation, $\rho(Y_i, Y_j) = 29\%$, far more in line with that observed, on average, between the seven Latin American economies. Summing up, then, while the presence of a common trend does not seem to be a prerequisite for matching individual second moments in emerging economies, it does seem to be one when trying to match *joint* second moments, which as argued in section 2, is another key property of business cycles in these economies.-

4.2. The case of Latin America

We now augment our framework to a seven-country model and calibrate it using data on the seven Latin American economies in our dataset. We then assess the performance of the model to reproduce the business cycle dynamics observed in these economies and the role played by the common trend in that performance. The results of this second experiment are reported in Tables 8 through 14. The results reported in Table 8 are the three subset of parameters calibrated in our analysis following the methodology explained at the end of Section 3. The three panels reported in Table 9 conduct variance decomposition analysis of output and counterfactual experiments in the same spirit as those in the Monte Carlo exercise presented above. Table 10 presents individual second moments for each of the seven countries and Tables 11 and 12 report, respectively, the correlations of interest rates and output between the seven countries. Table 13 simply presents second moment averages across the seven countries. All tables display the data and model based second moments, where the latter are reported for two cases, with and without a common trend. Table 14 compares the model performance with and without a common trend both across all second moments and across countries.

The following key results emerge from this experiment. First, a striking result in the lower panels of Table 8 is that in four out of the seven Latin American countries (Chile, Colombia, Mexico and Peru) the calibrated values of the two parameters that determine the degree by which domestic conditions make country risk vary, $\bar{\eta}_i$ and $\sigma^2_{\hat{D}_i}$, drop to zero when a common trend in included in the model. In other words, once a common regional trend in the spread process of these countries is taken into account the role played by domestic conditions when trying to reproduce their business cycle dynamics entirely vanishes. In Brazil, while there is still a role played by internal conditions, the drop in absolute value for these parameters is nonetheless substantial when a common trend is included as $\bar{\eta}_{BRA}$ and $\sigma^2_{\hat{D}_{BRA}}$ drop, respectively, from 0.63 and 1.15% to 0.40 and 0.60%. Interestingly, in Argentina the role of the common trend does not seem to matter much as neither of the two parameters are affected. The same can be said about Ecuador, although this is a problematic case since we were unable to fully match this country's business cycle dynamics in the first place.

The second result of interest comes from Table 9 where the variance decomposition of output for each country yields a relevance of the common spread that ranges from a low 4.4% for Argentina to 17.7% for Chile with an average of 12.2% across the seven countries. In the counterfactual analysis we find that removing the common trend process in Mexico and Peru would lower the variance of output by 5%, and by 7% or 8% in Colombia and Chile, respectively, while in none of these four countries we find an impact by removing the propagation mechanism that makes country risk react to domestic conditions. In Brazil we find that removing the common trend could reduce the variance by 8.4% while removing the propagation mechanism embedded in $\bar{\eta}$ and $\sigma^2_{\hat{D}}$ would have a slightly bigger impact, reducing the variance by 9.7%. In sharp contrast, Argentinian output would see the variance of output reduced by half if this propagation mechanism is removed but only by 1% if the common trend is reduced in line with the previous finding by NP in Argentina.

Third, Tables 10 to 13 allow us to assess the model performance in terms of the country-specific and joint second moments, with and without the presence of a common trend. Overall, the results seem to go in the same direction as those from the Monte Carlo experiment in two dimensions. First, the presence of a common trend does not reduce the overall fit of the model when it comes to country-specific second moments, particularly the large volatility of consumption, and investment and countercyclical interest rates and trade balance shares. Second, the common trend does bring the model based comovement in output between the economies considered much more in line with the data than the model that does not consider such a common factor. Results reported in Table 14 reiterate the fact the model with a common trend does not, in the overall, worsen the performance of the model based dynamics when compared to the data. Table 14a shows that in six out of the seven countries we consider the sum of squared deviations with respect to the data across all individual moments is actually lower when we consider a common trend relative to the case when we don't. Table 14b does similar comparison except that here we assess the performance of the two cases for each second moment across the seven countries considered. With the important exceptions of the correlations in output and interest rates, the two cases deliver similar performance, but in the overall the model with a common trend outperforms the model without it in nine out of the fifteen moments presented. And the two moments where the match to the data is significantly improved is the correlations in output and interest rates across countries. This is further explored in Tables 14c/d where the deviations in interest rates and output correlations are presented for each of the seven countries considered. In five out of the seven countries, the deviations in cross interest rate correlations are minimum in the case with a common trend. And in the case of cross output correlations the model with a common trend outperforms the model without one in all seven countries.

5. Concluding Remarks

Recent research in emerging market's business cycles has shown that fluctuations in the interest rates faced by domestic agents in foreign capital markets are a powerful driving force behind these aggregate fluctuations. Proof of this has been given by showing that only when open economy DSGE models are submitted to volatile shocks in the interest rate processes can they replicate the distinctive dynamics that we observe in the data. Searching for an explanation to this volatile interest rates, the literature has postulated that they can be traced back to a deep connection between country risk spreads and internal macroeconomic conditions.

This work has presented evidence in favor of volatile interest rates being such a powerful driving force behind business cycles in emerging economies. Yet we question the generalized validity of the deep connection between internal macroeconomic conditions and country risk fluctuations as the sole explanation for such volatile interest rates. Our argument is simple and straightforward: if internal conditions matter as much as it has been emphasized elsewhere then aggregate fluctuations in output and country specific interest rates in emerging economies should not be as closely interlinked across countries as we observe in the data. Indeed such high comovement at business cycle frequencies, we argue, has been left out of the analysis until now. Following this observation, we then postulate that a common trend across emerging market country risks must be an important omitted factor behind fluctuations in country interest rates. To formalize our claim, we build a multi-country-emerging-market-economy model driven by fluctuations in interest rates that share a common factor and show that it is a crucial element in bringing the model closer to the data. However, in not all the countries we analyze the common trend is a significant driving force. Argentina and Ecuador appear to be two countries where internal conditions matter much more for the evolution of country risk. So this calls for a country specific analysis.

We nonetheless leave many issues unresolved. The first and most important issue that deserves further attention is the reason why such common factor arises. While we postulated that information asymmetries may play a role, a formalization of such idea would be worth pursuing. Second, our results call into question models that simultaneously endogenize default risk and business cycles (e.g. Mendoza and Yue, 2008) so an obvious extension could be reproduce such a framework where an endogenous common factor is determined. Finally, our model is silent with respect to optimal stabilization policy, but clearly some sort of policy coordination seems to be desirable to curtail the predominance of common risk factors across emerging market economies.

6. Appendix

6.1. Data Appendix

We built a wide panel data set with National Accounts and EMBI country information. National Accounts data comes from the International Monetary Fund's International Financial Statistics and The Economic Commission for Latin America and the Caribbean (ECLAC). EMBI information comes from Global Financial Data. All variables except EMBI have been X-12 seasonally adjustes and log-detrended using the Hodrick Prescott filter. We use ECLAC's data only for recovering National Accounts for Ecuador after the third quarter of 1993. Data Description Table shows ranges for each series in every country data used.

In all tables and calibrations involved in this paper, we calculates output Y_{it} without including government expenditure to make it consistent with our model. Frequency in EMBI data have several changes within countries and therefore, we transform it all to quarterly data. For six countries, Argentina, Brazil, Colombia, Ecuador, Turkey and South Africa we have data at daily and monthly frequency over different periods. We have daily data only for Mexico, Peru and Philippines. The rest of EMBI country data has monthly frequency except in the case of Thailand which we take quarterly directly from UY.

6.2. The Two Country Loglinearized Model

Here, we present the normalized model in order to find variables with a balanced growth path, and then the loglinearized model in order to solve the model around the steady state.

The Normalized Model for country "i":

To achieve a balanced growth path, the model needs to be normalized by $(1+\gamma_i)^t$, so that the firm's problem (3.1), (3.3) and (3.4) are now:

$$y_{i,t} = a_{i,t} k_{i,t}^{\alpha_i} l_{i,t}^{1-\alpha_i} \tag{6.1}$$

$$r_{i,t} = \alpha_i a_{i,t} k_{i,t}^{\alpha_i - 1} l_{i,t}^{1-\alpha_i} \tag{6.2}$$

$$\left(1+\left[R_{i,t-1}-1\right]\theta_i\right)w_{i,t}=\left(1-\alpha_i\right)a_{i,t}k_{i,t}^{\alpha_i}l_{i,t}^{-\alpha_i} \tag{6.3}$$

where, for example, $y_{i,t}\equiv Y_{i,t}/(1+\gamma_i)^t$ and lower case letters recover variables that trend along a balanced growth path (this convention applies except of interest rates $R_{i,t}$).

For the household, the equivalent equation (**??**), (3.7),(3.8),(3.9), (3.10), (3.11) and (3.17) are:

$$c_{i,t}+x_{i,t}+b_{i,t}+\frac{\kappa}{2}y_{i,t}\left(\frac{b_{i,t}}{y_{i,t}}-\bar{b}_i\right)^2=w_{i,t}l_{i,t}+r_{i,t}k_{i,t}+\frac{b_{i,t-1}R_{i,t-1}}{1+\gamma_i} \tag{6.4}$$

$$x_{i,t}=\left(1+\gamma_i\right)k_{i,t+1}-\left(1-\delta_i\right)k_{i,t}+\frac{\phi_i}{2}\left(1+\gamma_i\right)^2k_{i,t}\left(\frac{k_{i,t+1}}{k_{i,t}}-1\right)^2 \tag{6.5}$$

$$c_{i,t}-\psi_i l_{i,t}^{v}=\lambda_{i,t}^{-\frac{1}{\sigma}} \tag{6.6}$$

$$\psi_i v l_{i,t}^{v-1}=w_{i,t} \tag{6.7}$$

$$\lambda_{i,t}\left[1+\kappa\left(\frac{b_{i,t}}{y_{i,t}}-\bar{b}_i\right)\right]=\beta_i R_{i,t}\left(1+\gamma_i\right)^{-\sigma}E_t\lambda_{i,t+1} \tag{6.8}$$

$$\begin{aligned} & 1+\phi_i\left(1+\gamma_i\right)\left(\frac{k_{i,t+1}}{k_{i,t}}-1\right) \\ = \quad & \beta_i\left(1+\gamma_i\right)^{-\sigma}E_t\left[\frac{\lambda_{i,t+1}}{\lambda_{i,t}}\right]\left[\begin{array}{c} r_{i,t+1}+1-\delta-\frac{\phi_i}{2}\left(1+\gamma_i\right)^2\left(\frac{k_{i,t+2}}{k_{i,t+1}}-1\right)^2 \\ +\phi_i\left(1+\gamma_i\right)^2\left(\frac{k_{i,t+2}^2}{k_{i,t+1}^2}-\frac{k_{i,t+2}}{k_{i,t+1}}\right) \end{array}\right] \end{aligned} \tag{6.9}$$

$$NX_{i,t}=\left(y_{i,t}-c_{i,t}-x_{i,t}\right)/y_{i,t} \tag{6.10}$$

The Log-linearized Model for the country "i":

Once we have the normalized model, the loglinearized version is achieved using a first order approximation around the non-stochastic steady state level. To find this approximation we use the rules described in Uhlig (1997) .

In the firm's problem, the equations for output, labor and capital demand are:

$$\hat{y}_{i,t} \approx \hat{a}_{i,t} + \alpha_i \hat{k}_{i,t} + (1-\alpha_i)\,\hat{l}_{i,t} \tag{6.11}$$

$$\hat{r}_{i,t} \approx \hat{a}_{i,t} + (\alpha_i - 1)\,\hat{k}_{i,t} + (1-\alpha_i)\,\hat{l}_{i,t} \tag{6.12}$$

$$\hat{w}_{i,t} \approx \hat{a}_{i,t} + \alpha_i \hat{k}_{i,t} - \alpha_i \hat{l}_{i,t} - \frac{\theta_i \bar{R}_i}{1+\left[\bar{R}_i - 1\right]\theta_i}\hat{R}_{i,t-1} \tag{6.13}$$

For the households, the equations in the normalized model order are:

$$\begin{aligned} \hat{c}_{i,t} \;\approx\;& \frac{\bar{w}_i \bar{l}}{\bar{c}_i}\left(\hat{w}_{i,t} + \hat{l}_{i,t}\right) + \frac{\bar{r}_i \bar{k}_i}{\bar{c}_i}\left(\hat{r}_{i,t} + \hat{k}_{i,t}\right) + \frac{\bar{b}_i \bar{R}_i}{\bar{c}_i(1+\gamma_i)}\hat{b}_{i,t-1} + \\ & \frac{\bar{b}_i \bar{R}_i}{\bar{c}_i(1+\gamma_i)}\hat{R}_{i,t-1} - \frac{\bar{x}_i}{\bar{c}_i}\hat{x}_{i,t} - \frac{\bar{b}_i}{\bar{c}_i}\hat{b}_{i,t} \end{aligned} \tag{6.14}$$

$$\hat{x}_{i,t} \approx \frac{(1+\gamma_i)\,\bar{k}_i}{\bar{x}_i}\hat{k}_{i,t+1} - \frac{(1-\delta_i)\,\bar{k}_i}{\bar{x}_i}\hat{k}_{i,t} \tag{6.15}$$

$$-\hat{\lambda}_{i,t} \approx \sigma \bar{\lambda}_i^{\frac{1}{\sigma}} \bar{c}_i \hat{c}_{i,t} - \sigma \bar{\lambda}_i^{\frac{1}{\sigma}} \psi_i \bar{l}^{\upsilon} \upsilon \hat{l}_{i,t} \tag{6.16}$$

$$\hat{w}_{i,t} = (\upsilon - 1)\,\hat{l}_{i,t} \tag{6.17}$$

$$\hat{b}_{i,t} \approx E_t\left[\frac{\hat{\lambda}_{i,t+1}}{\kappa \bar{b}_i} + \frac{\hat{R}_{i,t}}{\kappa \bar{b}_i} - \frac{\hat{\lambda}_{i,t}}{\kappa \bar{b}_i} + \hat{y}_{i,t}\right] \tag{6.18}$$

$$\begin{aligned} E_t\left[\hat{r}_{i,t+1}\right] \;\approx\;& \frac{\phi_i(1+\gamma_i)\,\bar{R}_i}{\bar{r}_i}\left(\hat{k}_{i,t+1} - \hat{k}_{i,t}\right) - \frac{\phi_i(1+\gamma_i)^2}{\bar{r}_i}E_t\left(\hat{k}_{i,t+2} - \hat{k}_{i,t+1}\right) \\ & - \frac{\bar{R}_i}{\bar{r}_i}E_t\left[\hat{\lambda}_{i,t+1} - \hat{\lambda}_{i,t}\right] \end{aligned} \tag{6.19}$$

$$nx_{i,t} \approx \left(1 - \overline{NX}\right) \hat{y}_{i,t} - \frac{\bar{x}_i}{y_i} \hat{x}_{i,t} - \frac{\bar{c}_i}{y_i} \hat{c}_{i,t} \tag{6.20}$$

The equations from (6.11) to (6.20) plus the equations given for the interest rate form the loglinearized model.

The multi-country model's size is as large as the researcher wants it by only allowing the subindex "i" to increase as much as wanted. However, a key issue is that all countries must be interconnected in the preferred routine to solve the model. These interconnections are given by the common trend process and the international interest rate.

Here we present a step-by-step adaptation of our multicounty model to Uhlig's matrices format. Off course, this means the way in which we create the A, B, C, D, F, G, H,J,K,L,M and N Uligh's matrices from our model equations.

3. The Ulihg's representation

I. First get the log-linearized equations for any country. It is (6.11)-(6.20) and the interest rate equations.

II. Define three vectors as:

$\hat{\mathbf{x}}_{i,t} =: \left[\hat{k}_{i,t+1}, b_{i,t}, R_{i,t}\right]'$; *The Endogenous State Variables*

$\hat{\mathbf{y}}_{i,t} = \left[\hat{c}_{i,t}, \hat{y}_{i,t}, \hat{l}_{i,t}, \hat{w}_{i,t}, \hat{r}_{i,t}, \hat{x}_{i,t}, \hat{D}_{i,t}, \hat{\lambda}_{i,t}, \widehat{nx}_{i,t}, \hat{S}_{i,t}\right]'$; *The Endogenous Variables*

$\hat{\mathbf{z}}_{i,t} = \left[\hat{a}_{i,t}, \hat{S}^{D}_{i,t}\right]'$; *The Exogenous State Variables*

where $\widehat{S}^{D}_{i,t} = \rho_{D,i}\widehat{S}^{D}_{i,t-1} + \varepsilon^{\hat{D}}_{i,t}$,with $\varepsilon^{\hat{D}}_{i,t} \sim \left(0, \sigma^2_{\varepsilon^{\hat{D}}_i}\right)$ and $\rho_{D,i} = 0$ is an additional equation implicitly given for being suitable the model in the Uhlig's format.

III. Define the size of each vector: $\underset{n\times 1}{\hat{\mathbf{x}}_{i,t}}, \underset{r\times 1}{\hat{\mathbf{y}}_{i,t}}, \underset{m\times 1}{\hat{\mathbf{z}}_{i,t}}$. In this case, $n = 3, r = 10$ and $m = 2$.

IV. Write the model in the Uhlig´s matrix form taking the appropriate equations set in order to form:

$$0 = \underset{[10\times3]}{A_i}\underset{[3\times1]}{\mathbf{x}_{i,t}} + \underset{[10\times3]}{B_i}\underset{[3\times1]}{\mathbf{x}_{i,t-1}} + \underset{[10\times10]}{C_i}\underset{[10\times1]}{\mathbf{y}_{i,t}} + \underset{[10\times2]}{D_i}\underset{[2\times1]}{\mathbf{z}_{i,t}}$$

$$0 = E\_t[\underset{[3\times3]}{F_i}\underset{[3\times1]}{\mathbf{x}_{i,t+1}} + \underset{[3\times3]}{G_i}\underset{[3\times1]}{\mathbf{x}_{i,t}} + \underset{[3\times3]}{H_i}\underset{[3\times1]}{\mathbf{x}_{i,t-1}} + \underset{[3\times10]}{J_i}\underset{[10\times3]}{\mathbf{y}_{i,t+1}} + \underset{[3\times10]}{K_i}\underset{[10\times1]}{\mathbf{y}_{i,t}} + \underset{[3\times2]}{L_i}\underset{[2\times1]}{\mathbf{z}_{i,t+1}} + \underset{[3\times2]}{M_i}\underset{[2\times1]}{\mathbf{z}_{i,t}}]$$

$$\underset{[2\times1]}{\mathbf{z}_{i,t+1}} = \underset{[2\times2]}{N_i}\underset{[2\times1]}{\mathbf{z}_{i,t}} + \underset{[2\times1]}{\boldsymbol{\varepsilon}_{i,t}}$$

V. Define the non-country set of variables:

$$\hat{\mathbf{z}}_t = \left[\hat{R}_t^*, \widehat{SR}_t\right]' \forall i$$

VI. Create aggregates of $A, ..., N$ from $A_i, ..., N_i$ for $i = 1, ..., k$, where k is the number of countries.

a. Form A, B and C in this way:

$$A = \begin{bmatrix} \underset{10\times3}{A_1} & \underset{10\times3}{\mathbf{0}} & \cdots & \underset{10\times3}{\mathbf{0}} \\ \underset{10\times3}{\mathbf{0}} & \underset{10\times3}{A_2} & \cdots & \vdots \\ \vdots & \vdots & \ddots & \underset{10\times3}{\mathbf{0}} \\ \underset{10\times3}{\mathbf{0}} & \cdots & \underset{10\times3}{\mathbf{0}} & \underset{10\times3}{A_k} \end{bmatrix}, B = \begin{bmatrix} \underset{10\times3}{B_1} & \underset{10\times3}{\mathbf{0}} & \cdots & \underset{10\times3}{\mathbf{0}} \\ \underset{10\times3}{\mathbf{0}} & \underset{10\times3}{B_2} & \cdots & \vdots \\ \vdots & \vdots & \ddots & \underset{10\times3}{\mathbf{0}} \\ \underset{10\times3}{\mathbf{0}} & \cdots & \underset{10\times3}{\mathbf{0}} & \underset{10\times3}{B_k} \end{bmatrix}, C = \begin{bmatrix} \underset{10\times3}{C_1} & \underset{10\times3}{\mathbf{0}} & \cdots & \underset{10\times3}{\mathbf{0}} \\ \underset{10\times3}{\mathbf{0}} & \underset{10\times3}{C_2} & \cdots & \vdots \\ \vdots & \vdots & \ddots & \underset{10\times3}{\mathbf{0}} \\ \underset{10\times3}{\mathbf{0}} & \cdots & \underset{10\times3}{\mathbf{0}} & \underset{10\times3}{C_k} \end{bmatrix}$$

b. Now form D in this way:

$$D = \begin{bmatrix} \underset{10\times2}{D_1} & \underset{10\times2}{\mathbf{0}} & \cdots & \underset{10\times2}{\mathbf{0}} & \underset{10\times2}{D_{common}} \\ \underset{10\times2}{\mathbf{0}} & \underset{10\times2}{D_2} & \cdots & \underset{10\times2}{\mathbf{0}} & \underset{10\times2}{D_{common}} \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ \underset{10\times2}{\mathbf{0}} & \underset{10\times2}{\mathbf{0}} & \cdots & \underset{10\times2}{D_k} & \underset{10\times2}{D_{common}} \end{bmatrix}$$

where D_{common} is a partitioned matrix so that:

$$\begin{bmatrix} \underset{10\times2}{D_i} & \underset{10\times2}{D_{common}} \end{bmatrix} \begin{bmatrix} \underset{2\times1}{z_{i,t}} \\ \underset{2\times1}{z_t} \end{bmatrix} \forall i$$

and as you can see D_{common} have coefficients for each country commons in all countries (that multiplies the vector $\hat{z}_t$).

c. Form F, G, H, J and K in the same way that A, B or C. Is trivial note that you must form L and M in the same way of D.

d. An special case is the N matrix.

$$N = \begin{bmatrix} \underset{2\times2}{N_1} & \underset{2\times2}{\mathbf{0}} & \cdots & \cdots & \underset{10\times2}{\mathbf{0}} \\ \underset{2\times2}{\mathbf{0}} & \underset{2\times2}{N_2} & \cdots & \cdots & \underset{10\times2}{\mathbf{0}} \\ \vdots & \vdots & \ddots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \underset{2\times2}{N_k} & \underset{10\times2}{\mathbf{0}} \\ \underset{10\times2}{\mathbf{0}} & \underset{10\times2}{\mathbf{0}} & \cdots & \underset{10\times2}{\mathbf{0}} & \underset{2\times2}{N_{common}} \end{bmatrix}$$

where N_{common} is a partitioned matrix so that:

$$\begin{bmatrix} \underset{2\times2}{N_1} & \underset{2\times2}{0} \\ \underset{2\times2}{0} & \underset{2\times2}{N_{common}} \end{bmatrix} \begin{bmatrix} \underset{2\times1}{z_{i,t}} \\ \underset{2\times1}{z_t} \end{bmatrix} \forall i$$

and again as you can see N_{common} have coefficients for each country commons in all countries (that multiplies the vector $\hat{z}_t$). For the variance-covariance matrix in the multi-country model note that this matrix has the same structure in each variable-country than N.

VII. Verify the generalized structure:

$$0 = \underset{[10k\times3k]}{A}\underset{[3k\times1]}{\mathbf{X}_t} + \underset{[10k\times3k]}{B}\underset{[3k\times1]}{\mathbf{X}_{t-1}} + \underset{[10k\times10k]}{C}\underset{[10k\times1]}{\mathbf{Y}_t} + \underset{[10k\times(2k+2)]}{D}\underset{[(2k+2)x1]}{\mathbf{Z}_t}$$

$$\begin{aligned} 0 \;=\; & E\_t[\underset{[3k\times3k]}{F}\underset{[3k\times1]}{\mathbf{X}_{t+1}} + \underset{[3k\times3k]}{G}\underset{[3k\times1]}{\mathbf{X}_t} + \underset{[3k\times3k]}{H}\underset{[3k\times1]}{\mathbf{X}_{t-1}} + \underset{[3k\times10k]}{J}\underset{[10k\times1]}{\mathbf{Y}_{t+1}} \\ & + \underset{[3k\times10k]}{K}\underset{[10k\times1]}{\mathbf{Y}_t} + \underset{[3k\times(2k+2)]}{L}\underset{[(2k+2)x1]}{\mathbf{Z}_{t+1}} + \underset{[3k\times(2k+2)]}{M}\underset{[(2k+2)x1]}{\mathbf{Z}_t}] \end{aligned}$$

$$\underset{[(2k+2)\times1]}{\mathbf{Z}_{t+1}} = \underset{[(2k+2)\times(2k+2)]}{N}\underset{[(2k+2)\times1]}{\mathbf{Z}_t} + \underset{[(2k+2)\times1]}{\boldsymbol{\varepsilon}_t}$$

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TABLES AND FIGURES

Table 1a. Second Moments in Business Cycle Dynamics: Latin American Economies

Moment	Argentina	Brazil	Chile	Colombia	Ecuador	Mexico	Perú	Average
σ_y	0.0499	0.0238	0.0222	0.0241	0.0231	0.0267	0.0306	0.029
σ_c	0.0614	0.0222	0.0261	0.0241	0.0252	0.0359	0.0294	0.032
σ_x	0.1615	0.0872	0.0990	0.1120	0.1632	0.0801	0.1001	0.115
σ_{nx}	0.0307	0.0105	0.0336	0.0172	0.0437	0.0166	0.0187	0.024
σ_R	0.0904	0.0235	0.0122	0.0139	0.0645	0.0135	0.0136	0.033
$\rho_{y,c}$	0.9132	0.7049	0.1873	0.7612	0.5700	0.7181	0.6288	0.641
$\rho_{y,x}$	0.8118	0.6219	0.6542	0.8095	0.7147	0.7920	0.8496	0.751
$\rho_{y,nx}$	-0.6203	-0.0471	-0.0042	-0.6019	-0.4004	-0.5392	-0.1911	-0.343
$\rho_{y,R}$	-0.5243	-0.4000	-0.1552	-0.0153	-0.4807	-0.0391	-0.3283	-0.278
$\rho_{R,c}$	-0.5765	-0.2295	-0.5620	0.0352	-0.5089	0.1095	-0.1753	-0.273
$\rho_{R,x}$	-0.5721	-0.4462	-0.5108	0.1000	-0.4883	-0.0583	-0.3565	-0.333
$\rho_{R,nx}$	0.6319	0.2768	0.5145	-0.1798	0.4133	-0.1454	0.2643	0.254

Note: Observed and simulated series have been Hodrick Prescott filtered. See the Data Appendix for details about the coverage, range and source of each country time series. σ=: Standard deviations; ρi,j=: Correlation between variables i and j.

Table 1b. Second Moments in Business Cycle Dynamics: Non-Latin American Economies

Moment	Korea	Malaysia	Philippines	South Africa	Thailand	Turkey	Average
σ_y	0,0306	0,0306	0,0261	0,0199	0,0377	0,0449	0,032
σ_c	0,0425	0,0436	0,0154	0,0174	0,0355	0,0424	0,033
σ_x	0,1017	0,1718	0,0790	0,0791	0,1627	0,1619	0,126
σ_{nx}	0,0330	0,0500	0,0354	0,0133	0,0464	0,0265	0,034
σ_R	0,0125	0,0159	0,0123	0,0107	0,0110	0,0156	0,013
$\rho_{y,c}$	0,8626	0,5041	0,0150	0,7521	0,7815	0,8742	0,632
$\rho_{y,x}$	0,9107	0,7746	0,0490	0,7450	0,7747	0,8317	0,681
$\rho_{y,nx}$	-0,7608	-0,4873	0,7236	-0,2625	-0,4444	-0,5121	-0,291
$\rho_{y,R}$	-0,7069	-0,5834	0,2562	0,0230	-0,4739	-0,3804	-0,311
$\rho_{R,c}$	-0,7955	-0,4650	-0,1030	-0,0012	-0,6460	-0,4815	-0,415
$\rho_{R,x}$	-0,7821	-0,5722	-0,2660	0,0376	-0,5893	-0,3966	-0,428
$\rho_{R,nx}$	0,8321	0,5256	0,3165	-0,0001	0,5667	0,5750	0,469

Note: Observed and simulated series have been Hodrick Prescott filtered. See the Data Appendix for details about the coverage, range and source of each country time series. σ=: Standard deviations; ρi,j=: Correlation between variables i and j.

Table 2a. Correlations between Output Fluctuations in Latin American Economies

Country	Argentina	Brazil	Mexico	Colombia	Chile	Ecuador
Brazil	0.291**					
Mexico	0.698***	0.424***				
Colombia	0.016	0.429***	0.209*			
Chile	0.657***	0.571***	0.737***	0.619***		
Ecuador	0.315***	0.249**	0.173	0.502***	0.517***	
Perú	0.279**	0.378***	0.095	0.518***	0.532***	0.215*

Note: Series have been Hodrick Prescott filtered. See the Data Appendix for details about each variable series range and source. Output is measured without goverment expenditure. *** Indicates Pvalue significance at 1%,
** Indicates Pvalue significance at 5%, * Indicates Pvalue significance at 10%

Table 2a. Correlations between Output Fluctuations in Non-Latin American Economies

Country	Turkey	South Africa	Thailand	Philippines	Malaysia
South Africa	0.122				
Thailand	0.054	0.383***			
Philippines	0.047	0.136	-0.005		
Malaysia	0.368***	0.408***	0.736***	0.229**	
Korea	0.048	0.342***	0.680***	0.122	0.690***

Note: Series have been Hodrick Prescott filtered. See the Data Appendix for details about each variable series range and source. Output is measured without goverment expenditure. *** Indicates Pvalue significance at 1%,** Indicates Pvalue significance at 5%, * Indicates Pvalue significance at 10%.

Table 3a. Correlations between Interest Rate Fluctuations in Latin American Economies

Country	Argentina	Brazil	Mexico	Colombia	Chile	Ecuador	Perú	Region
Brazil	0.294**							
Mexico	-0.140	0.576***						
Colombia	0.098	0.721***	0.814***					
Chile	-0.231	0.499***	0.904***	0.868***				
Ecuador	0.078	0.439***	0.429***	0.452***	0.434***			
Perú	-0.051	0.721***	0.755***	0.934***	0.887***	0.454***		
Region	0.279**	0.878***	0.661***	0.812***	0.669***	0.518***	0.837***	
All Emerging	0.037	0.762***	0.739***	0.771***	0.761***	0.605***	0.816***	0.88***

Note: Series have been Hodrick Prescott filtered. See the Data Appendix for details about each variable range and source. *** Indicates Pvalue significance at 1%, ** Indicates Pvalue significance at 5%, * Indicates Pvalue significance at 10%.

Table 3b. Correlations between Interest Rate Fluctuations in Non Latin American Economies

Country	Turkey	South Africa	Thailand	Philippines	Malaysia	Korea	Region
South Africa	0.665***						
Thailand	-0.267	0.420**					
Philippines	0.664***	0.771***	0.570***				
Malaysia	0.664***	0.736***	0.649***	0.844***			
Korea	-0.249	0.510***	0.815***	0.660***	0.870***		
Region	0.648***	0.802***	0.746***	0.934***	0.947***	0.908***	
All Emerging	0.723***	0.637***	-0.030	0.642***	0.663***	-0.042	0.58***

Note: Series have been Hodrick Prescott filtered. See the Data Appendix for details about each variable range and source. *** Indicates Pvalue significance at 1%, ** Indicates Pvalue significance at 5%, * Indicates Pvalue significance at 10%.

Table 4. Correlations across Regional EMBIs

	Full Range of Dataset		
Region	**Latin America**	**Asia**	**East and North Africa**
Asia	0.57***		
East and North Africa	0.72***	0.32**	
All Emerging	0.88***	0.58***	0.49***
	2000-2010		
Asia	0.61***		
East amd North Africa	0.80***	0.38**	
All Emerging	0.95***	0.75***	0.73***

Note: Series have been Hodrick Prescott filtered. See the Data Appendix for details about each variable series range and source. *** Indicates Pvalue significance at 1%, ** Indicates Pvalue significance at 5%, * Indicates Pvalue significance at 10%.

Table 5. Monte Carlo Experiment: Parameter Calibration and Second Moments

Parameters used when simulating data under the hypothesis of		Simulated Moments		Data Moments
ρ_a	0.95	σ_y	0.0293	0.0286
ρ_1	0.77	σ_c	0.0369	0.0320
$\sigma_{\varepsilon R}$	0.66%	σ_x	0.1168	0.1147
σ	5.00	σ_{nx}	0.0313	0.0244
θ	1.00	σ_R	0.0255	0.0331
ν	1.6	$\rho_{y,c}$	0.9585	0.6405
κ	0.0001	$\rho_{y,x}$	0.7758	0.7505
$\bar{S}$	1.07	$\rho_{y,nx}$	-0.6314	-0.3435
$\bar{R}$	1.01	$\rho_{y,R}$	-0.4106	-0.2775
$\bar{l}$	0.20	$\rho_{R,c}$	-0.6269	-0.2725
Labor Share	0.6	$\rho_{R,x}$	-0.8130	-0.3332
γ	0.0082	$\rho_{R,nx}$	0.9227	0.2537
x/y	0.2495	$\rho_{R(t),R(t-1)}$	0.5180	0.7111
nx/y	-0.403	$\rho_{y(i),y(j)}$	0.2848	0.4011
ρ_D	0.00	$\rho_{R(i),R(j)}$	0.8920	0.4730

Note: Simulated moments are averages from 500 simulated random draws. All series in the simulated excerise have been Hodrick Prescott filtered.
Here σi is the Standar Deviation in variable "i", and the pure σ is the elasticity in the utility function.
ρi,j=: i,j Correlation

Table 6. Monte Carlo Experiment: Parameters, Variance Decompositions and Counterfactual Experiment

Parameters		**Calibration using simulating data and not assuming a common trend**	**Calibration using simulating data and assuming a common trend**
$\sigma_{\varepsilon SR}$		0.0%	2.00%
ρ_{SR}		0.00	0.70
$\sigma_{\varepsilon a}$		1.14%	1.05%
ϕ		48.5	50.0
η		0.47	0.39
$\sigma_{\varepsilon D}$		1.66%	0.69%
One-step ahead forecast error variance decomposition of output when not assuming a common			
$\sigma_{\varepsilon a}$	$\sigma_{\varepsilon D}$	$\sigma_{\varepsilon R^*}$	$\sigma_{\varepsilon SR}$
86,1899	11,6938	2,1163	0,0000
One-step ahead forecast error variance decomposition of output when assuming a common trend			
$\sigma_{\varepsilon a}$	$\sigma_{\varepsilon D}$	$\sigma_{\varepsilon R^*}$	$\sigma_{\varepsilon SR}$
75,7190	2,1902	2,2524	19,8384
Counterfactual analysis: assessing the drop in variance of output			
Simulated	No Common Trend with $\eta=\sigma_{\varepsilon D}=0$	Common Trend with $\eta=\sigma_{\varepsilon D}=0$	Common Trend with $\rho_{SR}=\sigma_{\varepsilon SR}=0$
0,0293	0,0244	0,0270	0,0253
	-16,7%	-7,8%	-13,7%

Table 7. Monte Carlo Experiment: Second Moments

Parameters	Model Based Moments when not assuming a common Trend	Model Based Moments when assuming a common Trend
σ_y	0.0293	0.0293
σ_c	0.0348	0.0369
σ_x	0.1170	0.1168
σ_{nx}	0.0272	0.0313
σ_R	0.0190	0.0255
$\rho_{y,c}$	0.9882	0.9585
$\rho_{y,x}$	0.8780	0.7758
$\rho_{y,nx}$	-0.8122	-0.6314
$\rho_{y,R}$	-0.3280	-0.4106
$\rho_{R,c}$	-0.4054	-0.6269
$\rho_{R,x}$	-0.5718	-0.8130
$\rho_{R,nx}$	0.6484	0.9227
$\rho_{R(t),R(t-1)}$	0.1378	0.5180
$\rho_{y(i),y(j)}$	0.0317	0.2848
$\rho_{R(i),R(j)}$	0.1713	0.8920

Note: Simulated moments are averages from 500 random draws. All series in the simulated excerise have been Hodrick Prescott filtered.
σ=: Standar Deviation
ρi,j=: i,j Correlation

Table 8. Seven Latin American Economies: Structural Parameters

1. Non Country Specific Parameters							
ρ_a	0,95	$\bar{a}$	1,00	σ	5,00	$\bar{l}$	0,20
θ	1,00	v	1,60	Labor Share	0,60	$\bar{R}^*$	1.00787^0.25
κ	10^(-5)	ρ_1	0.76987	$\sigma_{\varepsilon R^*}$	0.00663		

	Argentina	Brazil	Chile	Colombia	Ecuador	Mexico	Perú
2. Data Calibrated Parameters							
$\bar{s}$	1,0404	1,0159	1,0025	1,0103	1,0330	1,0073	1,0080
γ	0,0087	0,0082	0,0081	0,0074	0,0084	0,0061	0,0105
x/y	0,2228	0,2184	0,2559	0,2442	0,3112	0,2653	0,2285
nx/y	-0,1984	-0,3296	-0,5129	-0,1908	-0,7206	-0,3563	-0,5066
	Calibration without a common trend						
3. Endogenous Parameters Calibrated							
$\sigma_{\varepsilon a}$	0,0105	0,009	0,0099	0,0106	0,0001	0,0119	0,0139
ϕ	50	115	27	60,5	9,4	127	26
η	2,6069	0,6380	0,1512	0,1810	185,2651	0,2039	0,1310
$\sigma_{\varepsilon D}$	0,0336	0,0115	0,0040	0,0067	0,0294	0,0038	0,0064
	Calibration with a common trend						
4. Endogenous Parameters Calibrated							
$\sigma_{\varepsilon a}$	0,011	0,009	0,009	0,010	0,000	0,012	0,014
ϕ	49	84	28	56	9	98	25
η	2,572	0,400	0,000	0,000	179,792	0,000	0,000
$\sigma_{\varepsilon D}$	0,032	0,006	0,000	0,000	0,028	0,000	0,000

Table 9. Seven Latin American Economies: Variance Decomposition and Counterfactual Analysis

	One-step ahead forecast error variance decomposition of output when not assuming a common trend			
	$\sigma_{\varepsilon a}$	$\sigma_{\varepsilon D}$	$\sigma_{\varepsilon R^*}$	$\sigma_{\varepsilon SR}$
ARG	76,6	22,4	1,0	0
BRA	88,4	8,6	3,0	0
CHI	95,0	1,1	3,9	0
COL	94,3	2,7	2,9	0
ECU	47,2	49,1	3,7	0
MEX	97,1	0,7	2,2	0
PER	96,4	1,5	2,1	0
	One-step ahead forecast error variance decomposition of output when assuming a common trend			
	$\sigma_{\varepsilon a}$	$\sigma_{\varepsilon D}$	$\sigma_{\varepsilon R^*}$	$\sigma_{\varepsilon SR}$
ARG	75,199	20,422	0,964	3,415
BRA	82,613	2,807	3,178	11,402
CHI	82,308	0,000	4,049	13,643
COL	86,111	0,000	3,070	10,819
ECU	42,728	42,263	3,598	11,411
MEX	89,517	0,000	2,280	8,203
PER	90,528	0,000	2,178	7,294
	Counterfactual analysis: assessing the drop in variance of output			
	Observed	No Common Trend $\eta=\sigma_{\varepsilon D}=0$	Common Trend $\eta=\sigma_{\varepsilon D}=0$	Common Trend $\rho_{SR}=\sigma_{\varepsilon SR}=0$
ARG	0,0499	0,0230	0,0248	0,0494
		-53,9%	-50,3%	-1,0%
BRA	0,0238	0,0196	0,0215	0,0218
		-17,6%	-9,7%	-8,4%
CHI	0,0222	0,0214	0,0223	0,0204
		-3,6%	0,5%	-8,1%
COL	0,0241	0,0228	0,0241	0,0224
		-5,4%	0,0%	-7,1%
MEX	0,0267	0,0254	0,0268	0,0254
		-4,9%	0,4%	-4,9%

Table 10. Seven Latin American Economies: Second Moments

Moment	Data	NP	FZ	Data	NP	FZ	Data	NP	FZ	Data	NP	FZ
	Argentina			Brazil			Chile			Colombia		
σ_y	0,050	0,050	0,050	0,024	0,024	0,024	0,022	0,022	0,022	0,024	0,024	0,024
σ_c	0,061	0,088	0,088	0,022	0,031	0,028	0,026	0,022	0,026	0,024	0,021	0,021
σ_x	0,161	0,160	0,161	0,087	0,087	0,087	0,099	0,097	0,099	0,112	0,112	0,112
σ_{nx}	0,031	0,062	0,062	0,010	0,020	0,019	0,034	0,041	0,051	0,017	0,023	0,033
σ_R	0,090	0,047	0,048	0,023	0,015	0,018	0,012	0,009	0,016	0,014	0,010	0,016
$\rho_{y,c}$	0,913	0,919	0,920	0,705	0,991	0,971	0,187	0,954	0,884	0,761	0,965	0,886
$\rho_{y,x}$	0,812	0,775	0,771	0,622	0,913	0,849	0,654	0,768	0,285	0,810	0,827	0,274
$\rho_{y,nx}$	-0,620	-0,647	-0,643	-0,047	-0,869	-0,708	-0,004	-0,615	-0,061	-0,602	-0,603	0,079
$\rho_{y,R}$	-0,524	-0,503	-0,508	-0,400	-0,469	-0,407	-0,155	-0,294	-0,208	-0,015	-0,295	-0,203
$\rho_{R,c}$	-0,577	-0,678	-0,681	-0,229	-0,550	-0,583	-0,562	-0,452	-0,476	0,035	-0,455	-0,552
$\rho_{R,x}$	-0,572	-0,772	-0,769	-0,446	-0,645	-0,719	-0,511	-0,787	-0,976	0,100	-0,703	-0,976
$\rho_{R,nx}$	0,632	0,777	0,775	0,277	0,716	0,870	0,515	0,880	0,968	-0,180	0,844	0,936
$\rho_{R(t),R(t-1)}$	0,817	0,344	0,367	0,685	0,273	0,462	0,713	0,484	0,524	0,621	0,350	0,524
	Ecuador			Mexico			Peru					
σ_y	0,023	0,051	0,051	0,027	0,027	0,027	0,031	0,031	0,031			
σ_c	0,025	0,066	0,066	0,036	0,023	0,022	0,029	0,027	0,027			
σ_x	0,163	0,163	0,161	0,080	0,080	0,080	0,100	0,101	0,098			
σ_{nx}	0,044	0,073	0,071	0,017	0,015	0,028	0,019	0,031	0,043			
σ_R	0,064	0,037	0,038	0,013	0,009	0,016	0,014	0,010	0,016			
$\rho_{y,c}$	0,570	0,769	0,777	0,718	0,973	0,877	0,629	0,967	0,898			
$\rho_{y,x}$	0,715	0,416	0,419	0,792	0,895	0,258	0,850	0,816	0,303			
$\rho_{y,nx}$	-0,400	-0,067	-0,075	-0,539	-0,589	0,259	-0,191	-0,567	0,100			
$\rho_{y,R}$	-0,481	-0,138	-0,158	-0,039	-0,408	-0,185	-0,328	-0,271	-0,152			
$\rho_{R,c}$	-0,509	-0,501	-0,516	0,110	-0,564	-0,540	-0,175	-0,400	-0,449			
$\rho_{R,x}$	-0,488	-0,734	-0,744	-0,058	-0,737	-0,976	-0,356	-0,704	-0,967			
$\rho_{R,nx}$	0,413	0,722	0,730	-0,145	0,936	0,872	0,264	0,850	0,947			
$\rho_{R(t),R(t-1)}$	0,747	0,252	0,294	0,764	0,510	0,524	0,631	0,365	0,524			

Note: NP refers to the model without a common trend, and FZ to that with a common trend. Series in simulated have been Hodrick Prescott filtered as in the data.
σ=: Estándar Deviation
ρi,j=: i,j Correlation

Table 11. Seven Latin American Economies: Interest Rates Correlations

	DATA						
Country	Arg	Bra	Chi	Col	Ecu	Mex	Per
Arg	1,00	0,29	-0,23	0,10	0,08	-0,14	-0,05
Bra		1,00	0,50	0,72	0,44	0,58	0,72
Chi			1,00	0,87	0,43	0,90	0,89
Col				1,00	0,45	0,81	0,93
Ecu					1,00	0,43	0,45
Mex						1,00	0,75
Per							1,00
	Model without a common trend						
Arg	1,00	0,08	0,15	0,12	0,03	0,14	0,13
Bra		1,00	0,45	0,39	0,11	0,44	0,39
Chi			1,00	0,66	0,19	0,75	0,68
Col				1,00	0,16	0,64	0,58
Ecu					1,00	0,18	0,16
Mex						1,00	0,66
Per							1,00
	Model with a common trend						
Arg	1,00	0,30	0,33	0,33	0,14	0,33	0,33
Bra		1,00	0,90	0,90	0,38	0,90	0,90
Chi			1,00	1,00	0,42	1,00	1,00
Col				1,00	0,42	1,00	1,00
Ecu					1,00	0,42	0,42
Mex						1,00	1,00
Per							1,00

Note: Simulated series are Hodrick Prescott filtered as in the data.

Table 12. Seven Latin American Economies: Output Correlations

	DATA						
Country	Arg	Bra	Chi	Col	Ecu	Mex	Per
Arg	1,00	0,29	0,66	0,02	0,31	0,70	0,28
Bra		1,00	0,57	0,43	0,25	0,42	0,38
Chi			1,00	0,62	0,52	0,74	0,53
Col				1,00	0,50	0,21	0,52
Ecu					1,00	0,17	0,21
Mex						1,00	0,10
Per							1,00
	Model without a common trend						
Arg	1,00	0,02	0,03	0,02	0,02	0,02	0,02
Bra		1,00	0,05	0,04	0,03	0,04	0,04
Chi			1,00	0,05	0,04	0,04	0,05
Col				1,00	0,03	0,04	0,04
Ecu					1,00	0,03	0,03
Mex						1,00	0,03
Per							1,00
	Model with a common trend						
Arg	1,00	0,09	0,10	0,09	0,06	0,08	0,08
Bra		1,00	0,20	0,18	0,11	0,16	0,15
Chi			1,00	0,20	0,13	0,18	0,17
Col				1,00	0,11	0,16	0,15
Ecu					1,00	0,10	0,10
Mex						1,00	0,13
Per							1,00

Note: Simulated series have been Hodrick Prescott filtered as in the data.

Table 13. Seven Latin American Economies: Average Second Moments

Moment	Data	No Common Trend	Common Trend
σ_y	0,0286	0,0327	**0,0327**
σ_c	0,0320	0,0398	**0,0397**
σ_x	0,1147	**0,1143**	0,1140
σ_{nx}	0,0244	**0,0380**	0,0439
σ_R	0,0331	0,0198	**0,0241**
$\rho_{y,c}$	0,6405	0,9339	**0,8875**
$\rho_{y,x}$	0,7505	**0,7727**	0,4512
$\rho_{y,nx}$	-0,3435	-0,5652	**-0,1499**
$\rho_{y,R}$	-0,2775	-0,3397	**-0,2602**
$\rho_{R,c}$	-0,2725	**-0,5144**	-0,5423
$\rho_{R,x}$	-0,3332	**-0,7260**	-0,8754
$\rho_{R,nx}$	0,2537	**0,8179**	0,8711
$\rho_{R(t),R(t-1)}$	0,7111	0,3683	**0,4598**
$\rho_{y(i),y(j)}$	0,4011	0,0334	**0,1305**
$\rho_{R(i),R(j)}$	0,4730	**0,3380**	0,6397

Note: Simulated series have been Hodrick Prescott filtered as in the data.
σ =: Standar Deviation
$\rho_{i,j}$ =: i,j Correlation

Table 14a. Seven Latin American Economies: Average Deviations from Data by Country

Country	No Common Trend	Common Trend
Argentina	2,0368	**1,9948**
Brazil	311,4817	**205,6033**
Chile	20910,4137	**199,8827**
Colombia	626,9654	**586,8715**
Ecuador	7,5091	**7,3286**
Mexico	**317,7487**	349,1317
Perú	7,5091	**7,3286**

Note: Deviations with respect to data have been calculated across the 12 individual moments. Deviations are measured as squared percentage deviations from the data.

Table 14b. Seven Latin American Economies: Average Deviations from Data by Second Moment

Moment	No Common Trend	Common Trend
σ_y	0,0202	**0,0199**
σ_c	0,0593	**0,0565**
σ_x	**0,0000**	**0,0000**
σ_{nx}	**0,3093**	0,6374
σ_R	0,1601	**0,0734**
$\rho_{y,c}$	0,2098	**0,1487**
$\rho_{y,x}$	**0,0009**	0,1590
$\rho_{y,nx}$	0,4170	**0,3175**
$\rho_{y,R}$	0,0501	**0,0039**
$\rho_{R,c}$	**0,7883**	0,9805
$\rho_{R,x}$	**1,3899**	2,6490
$\rho_{R,nx}$	**4,9482**	5,9246
$\rho_{R(t),R(t-1)}$	0,2325	**0,1250**
$\rho_{y(i),y(j)}$	7,7367	**5,9062**
$\rho_{R(i),R(j)}$	4,5621	**3,8079**

Note: Deviations with respect to data have been calculated as the sum of all country deviations per each second moment. Deviations are measured as squared percentage deviations from the data, except in the last two second moments reported where we use absolute deviations.

Table 14c. Seven Latin American Economies: Deviations in Interest Rate Correlations

Country	No Common Trend	Common Trend
Argentina	**1,116**	1,721
Brazil	1,386	**1,160**
Chile	**1,241**	1,323
Colombia	1,386	**0,834**
Ecuador	1,456	**0,215**
Mexico	**1,079**	1,337
Perú	1,460	**1,025**
Total Sum	**9,124**	**7,616**

Note: Country deviations respect to data have been calculated as the sum of all interest rate correlation deviations across all the other countries. Deviations are computed as absolute deviations.

Table 14d. Seven Latin American Economies: Deviations in Output Correlations

Country	No Common Trend	Common Trend
Argentina	2,142	**1,908**
Brazil	2,121	**1,438**
Chile	3,374	**2,643**
Colombia	2,080	**1,545**
Ecuador	1,804	**1,365**
Mexico	2,137	**1,606**
Perú	1,814	**1,307**
Total Sum	**15,473**	**11,812**

Note: Country deviations respect to data have been calculated as the sum of all output correlation deviations across all the other countries. Deviations are computed as absolute deviations.

Figure 1a. Serial Correlations between Output and Interest Rates in Latin American Economies

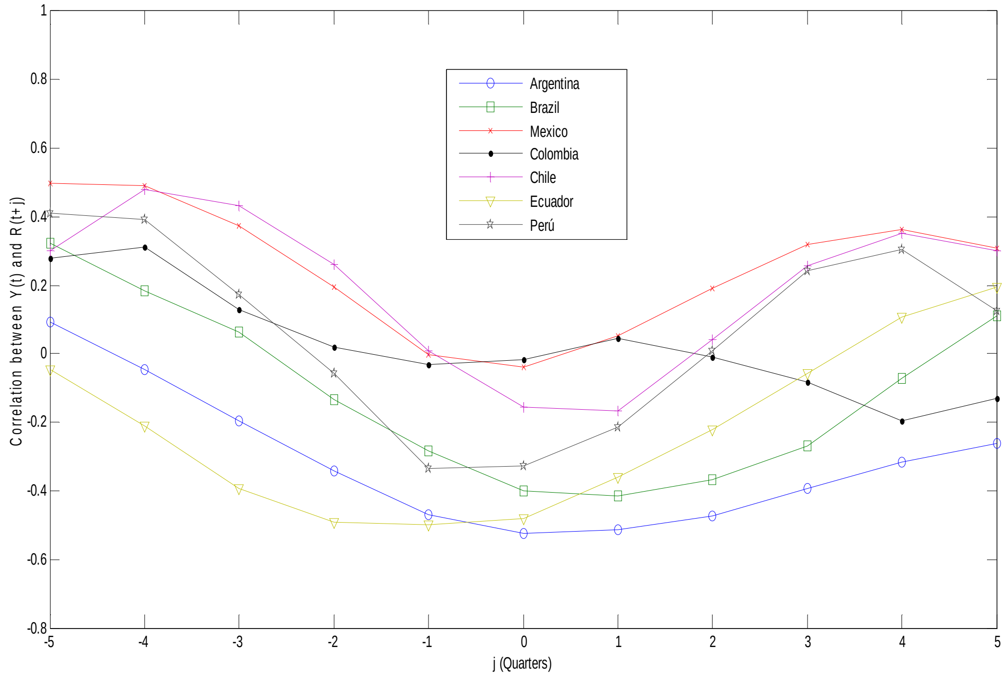


Figure 1b. Serial Correlations between Output and Interest Rates in Non-Latin American Economies

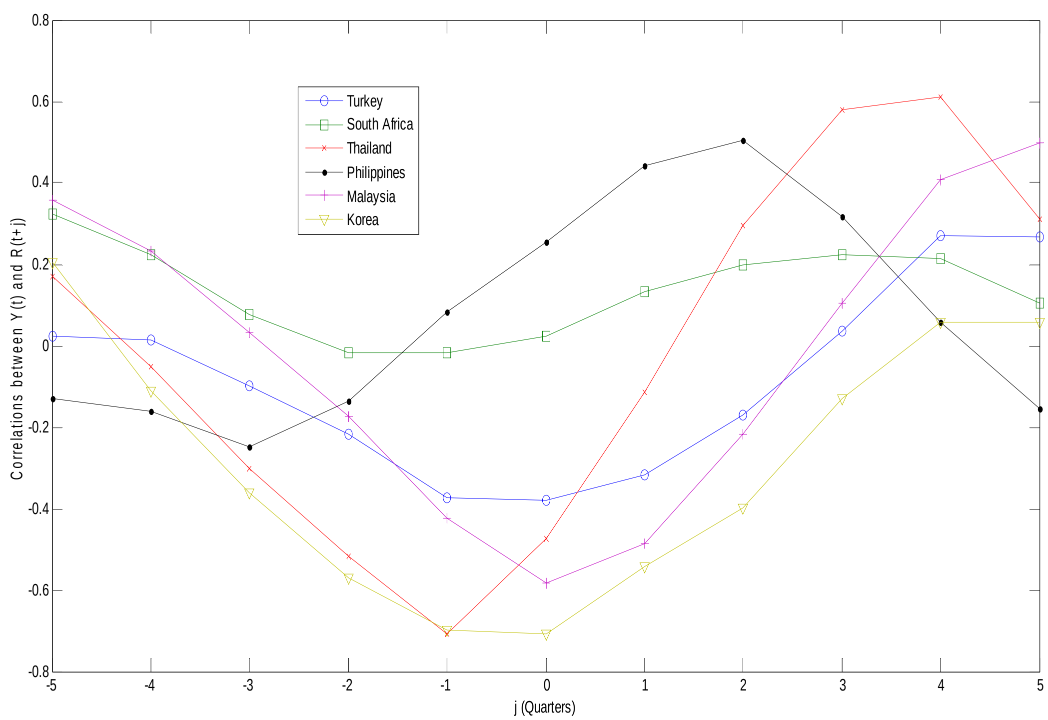


Figure 2a. EMBI spread times series in Latin American Economies

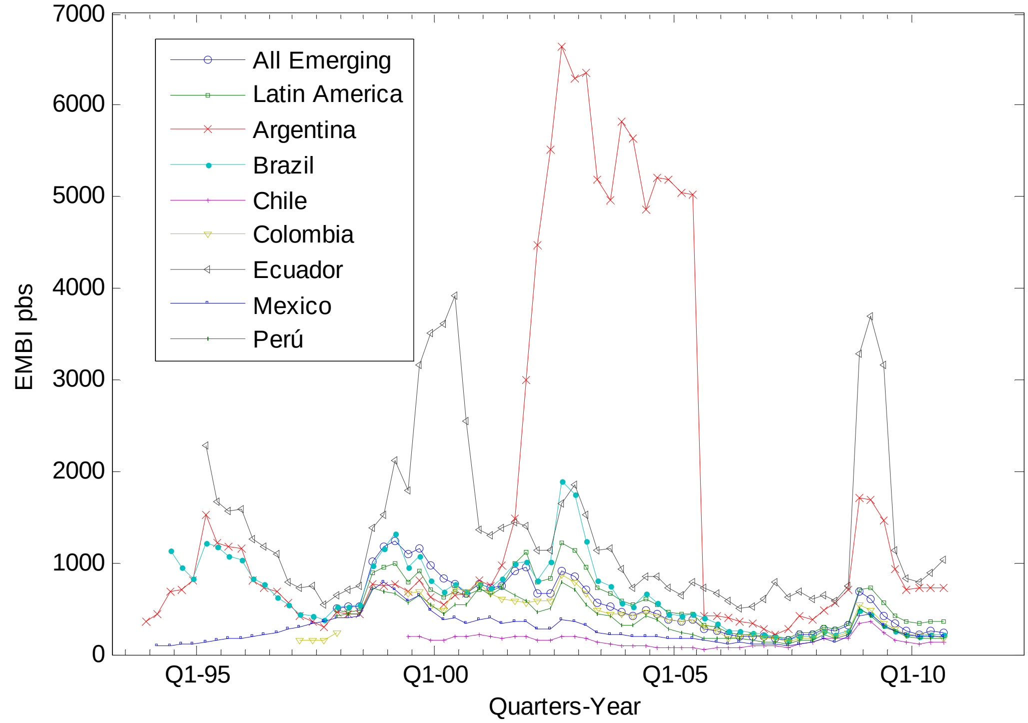
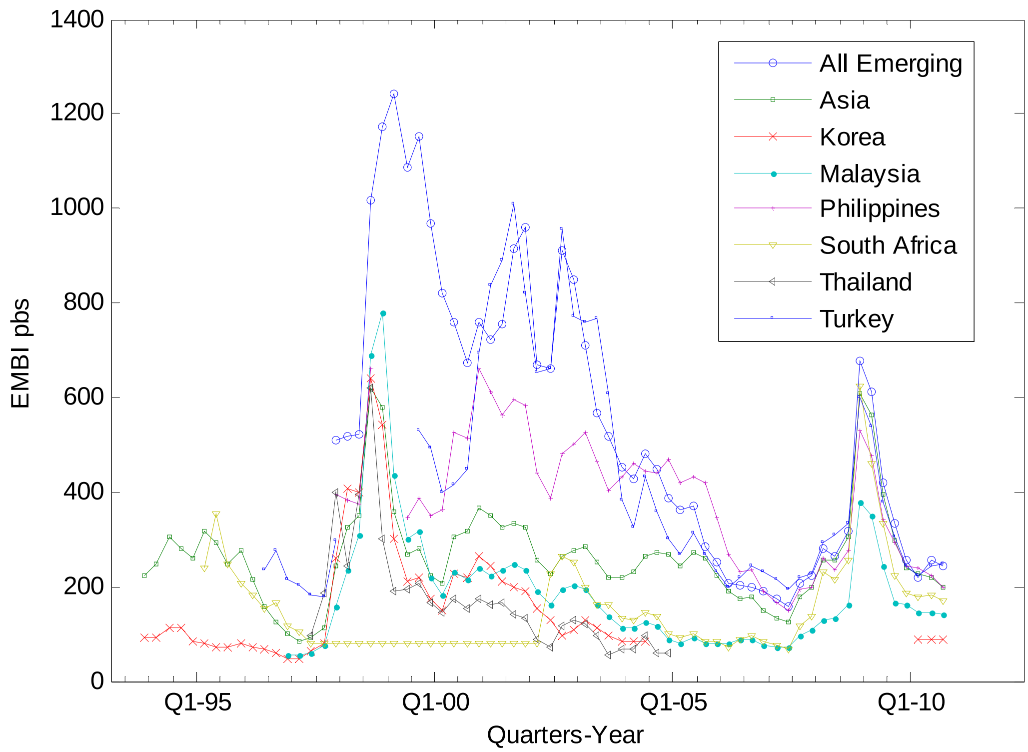


Figure 2b. EMBI spread times series in Non Latin American Economies



Data Descripition

LATAM				NON-LATAM			
Country	Item	Min date	Max date	Country	Item	Min date	Max date
Argentina	National Accounts	Q1 1993	Q3 2010	Turkey	National Accounts	Q1 1990	Q3 2010
	EMBI	Q4 1993	Q3 2010		EMBI	Q3 1999	Q3 2010
Brazil	National Accounts	Q1 1995	Q3 2010	South Africa	National Accounts	Q1 1990	Q3 2010
	EMBI	Q1 1994	Q3 2010		EMBI	Q1 1995	Q3 2010
Chile	National Accounts	Q1 1996	Q4 2009	Thailand	National Accounts	Q1 1993	Q3 2010
	EMBI	Q2 1999	Q3 2010		EMBI	Q2 1997	Q4 2004
Colombia	National Accounts	Q1 1994	Q2 2010	Philippines	National Accounts	Q1 1990	Q1 2010
	EMBI	Q2 1999	Q3 2010		EMBI	Q2 1999	Q3 2010
Ecuador	National Accounts	Q1 1991	Q3 2010	Malaysia	National Accounts	Q1 1991	Q3 2010
	EMBI	Q1 1995	Q3 2010		EMBI	Q4 1996	Q3 2010
Mexico	National Accounts	Q1 1990	Q3 2010	Korea	National Accounts	Q1 1990	Q3 2010
	EMBI	Q1 1994	Q3 2010		EMBI	Q4 1993	Q2 2004
Perú	National Accounts	Q1 1990	Q3 2010				
	EMBI	Q4 1997	Q3 2010				