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## Booms and busts in Latin America: The role of external factors

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RESEARCH DEPARTMENT  
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## **BOOMS AND BUSTS IN LATIN AMERICA: THE ROLE OF EXTERNAL FACTORS**

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## **Abstract**\*

This paper analyzes the relevance of external factors in average quarterly GDP growth for 1990-2006 in the seven largest Latin American countries (LAC7). Modeling the relationship between LAC7 GDP and several external factors, it is found that those factors account for a significant share of variance in LAC7 GDP growth, and that external shocks produce significant responses. Likewise, a significant share of recent LAC7 growth performance can be explained by an external factor “tailwind.” Also evaluated is the impact of deterioration in external financial conditions. Finally, the relevance of these findings for policy evaluation is emphasized. Growth performance, the strength or weakness of macroeconomic fundamentals and the impact of domestic macro and micro policies on growth can only be properly appraised by first filtering out the effects of external factors.

**JEL Classification:** F31, F32, F34, F41

**Keywords:** External Factors, Business Cycle, Growth, Sudden Stops, Terms of Trade, Latin America

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“All that glisters is not gold.”

William Shakespeare, *The Merchant of Venice* (II, vii)

## 1. Introduction and Motivation

In the early 1990s external capital flows began to return to Latin America after the drought that had followed the debt crisis of the 1980s. In most countries this renewal of capital inflows was associated with booming asset markets, real exchange rate appreciation, booming investment and strong growth performance. This phenomenon was largely attributed, both by the international community and policy makers alike, to the wave of fundamental reforms the region was undertaking, namely, trade liberalization, privatization, deregulation of domestic markets and the restructuring of external debt.

In the midst of the euphoria of the early 1990s, however, Calvo, Leiderman and Reinhart (1993) called attention to the fact that, although the region was engaging in a substantial reform process, capital was flowing to most Latin American countries despite wide differences in macroeconomic policies and economic performance across countries in the region. Their main argument was that domestic reforms alone could not possibly explain the renewal of capital inflows to the region, suggesting that external factors—a common shock to the whole region—were also playing a large role. At the time, they argued that falling US interest rates, a continuing recession and balance of payments developments in the US encouraged investors to seek better investment opportunities abroad and that “the present episode may well represent an additional case of financial shocks in the center affecting the periphery, an idea stressed by Díaz-Alejandro (1983, 1984).”

Using a sample of 10 Latin American countries, the empirical estimates of Calvo, Leiderman and Reinhart (1993) concluded that external factors accounted for a sizable share—50 percent—of the behavior of capital inflows to the region in the early 1990s.<sup>1</sup> A key concern in that study was that external factors could deteriorate just as easily as they had improved during the bonanza, with potentially dire consequences for the region.

A great deal has occurred since that seminal paper was written. The roller coaster ride that followed is illustrated in Figure 1, which depicts capital flows to Latin America and the

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<sup>1</sup> External factors also accounted for approximately 50 percent of the behavior of the real exchange rate in the early 1990s.

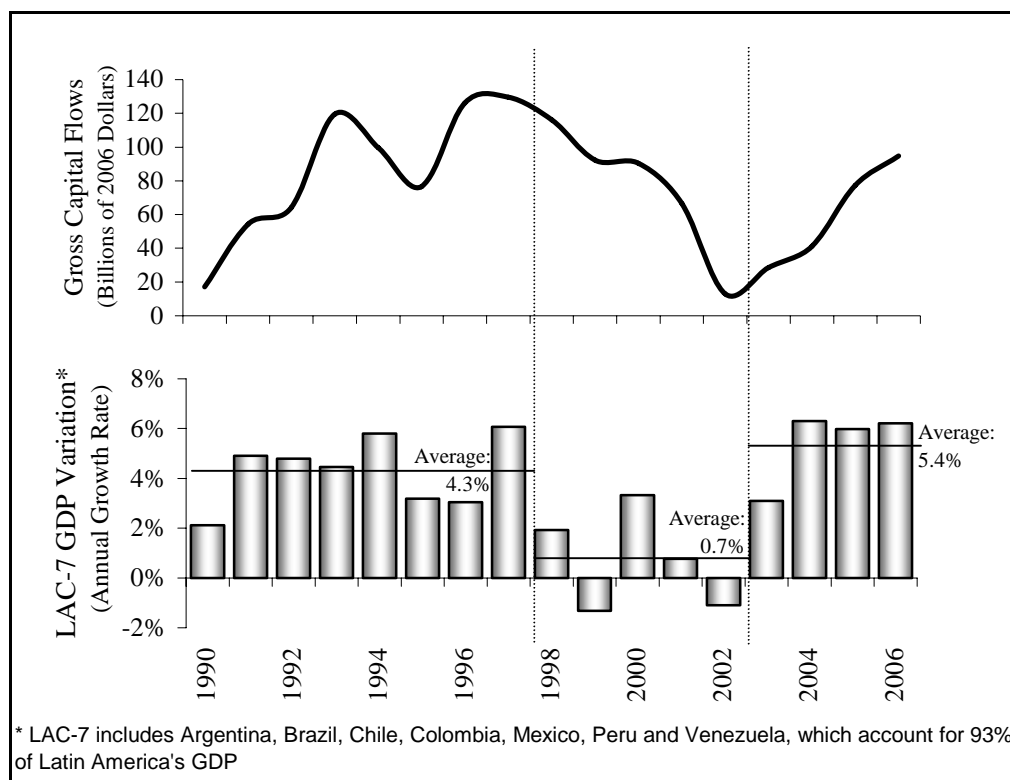
associated growth cycles. The Tequila crisis in 1995, and most importantly for Latin America, the Russian crisis of 1998 and the resulting collapse in capital inflows to the region, with dire economic consequences—vividly reported in Calvo and Talvi (2005)—validated the premonitory concerns raised by Calvo, Leiderman and Reinhart (1993). The drought in capital inflows to the region following the Russian crisis lasted until the end of 2002. Since then, external capital has returned to the region with a vengeance due to abundant international liquidity and a dramatic rise in commodity prices. The emergence of Asia and particularly China as a global player has dramatically changed the landscape for commodity and financial markets, in the latter case through the export of financial savings, in the former through a sharp increase in the demand for primary products. Not surprisingly, Latin American economies have since then been experiencing a new phase of booming asset prices, appreciating real exchange rates, booming investment and strong growth performance. *Déjà vu* all over again?

Fifteen years later it is time for a fresh look at Calvo, Leiderman and Reinhart's work.<sup>2</sup> The first aim of this paper is to expand their work in several directions, but also to answer new questions that emerge from our own analysis and the availability of a wealth of new information. First, and most obviously, we expand on the sample period, now extending from 1991 to 2006. Second, rather than attempting to account for the role of external factors in the behavior of capital inflows, we analyze the direct impact of external factors on the behavior of output performance, which is the ultimate variable of interest.

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<sup>2</sup> Of course, the literature has focused on the effects of external variables on growth (see for example, Calvo and Reinhart (2000), and Canova (2005), although few attempts have been made to tackle jointly the impact of external financial conditions, terms-of-trade shocks, and G7 industrial production growth. An exception is Österholm and Zettelmeyer (2007).

**Figure 1. Gross Capital Flows and Economic Performance in Latin America**



Third, we extend the menu of external factors to incorporate new developments in financial and commodity markets. To begin with, we incorporate into our analysis the vast development of a large international emerging bond market since the early 1990s. Emerging market bond spreads (commonly referred to as EMBI spreads)<sup>3</sup> allow us to directly observe variations in the market price of risky assets, which was not possible when most of the lending to Latin America was channeled through commercial banks. In fact, risky assets can move independently of movements in US Treasury rates. There are many recent examples of sharp changes in emerging market bond spreads (the Russian crisis being the most salient one) that occurred in the absence of major movements in US rates. As a matter of fact, the correlation between emerging market bond spreads and the US T-bond rate was 0.7 by end-1994 but then fell to  $-0.4$  by end-2000.

Another important difference with respect to the early 1990s has been sharp movements in terms of trade. As suggested by Calvo, Reinhart and Leiderman (1993), terms of trade in Latin America did not play major role in the early 1990s. This contrasts considerably with the 10

<sup>3</sup> The Emerging Market Bond Index (EMBI) is compiled by JP Morgan.

percent drop in terms of trade following the 1997 Asian crisis and the current surge between the first quarter of 2002 and the third quarter of 2006, when terms of trade increased by almost 50 percent. This led us to include terms of trade in our menu of external factors.

From a modeling perspective, this paper differs from Calvo, Leiderman and Reinhart (1993) in its empirical methodology. Rather than estimating a VAR for each individual country, we estimated a restricted Vector Error Correction Model (VECM) for an index that captures output behavior of the typical Latin American country.

Our analysis and new approach consequently allow us to address issues that were not raised previously by Calvo, Leiderman and Reinhart (1993). Those issues are clearly reflected in our second goal, which is to use the empirical findings of this paper to emphasize the relevance of incorporating external factors into policy evaluation in Latin America. Accounting for external factors is particularly important in assessing the region's growth performance, the strength or weakness of its economic fundamentals and the impact of macro and structural reforms on growth. In particular, our empirical framework lets us perform counterfactual exercises highlighting the fact that output dynamics could have been much different from observed outcomes—both at the time of the bust originated by the Russian crisis of 1998 and during the current boom—had external conditions remained within the dynamics implied by the empirical model.

The rest of the paper is organized as follows. In Section 2 we present the empirical model, estimation results and impulse-response functions. Our results confirm that external factors play a key role in explaining business fluctuations in Latin America and that changes in the external environment can lead to large changes in economic performance. In Section 3 we put the model to work to assess the recent performance of Latin America, including the collapse of 1998-2002 and the strong expansion observed in 2003-2006. We also use our empirical model to assess risks to the region posed by a potential episode of global financial turmoil resulting in a large re-pricing of risk. Finally, Section 4 concludes with the policy implications of our findings.



## 2. The Empirical Model

### 2.1 Estimation Strategy and Methods

In order to assess the role of external factors on Latin American growth we depart from a vector error-correction specification linking average Latin American GDP growth (henceforth LAC7 GDP growth) to a set of external variables. We use a GDP index that is a simple average of indices corresponding to the seven largest Latin American countries (Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela), which together account for 93 percent of Latin American GDP. We decided on a simple average instead of a weighted average to avoid overrepresentation of bigger countries, given that our goal is to assess performance for the average country in Latin America.

The set of external variables includes proxies for changes in external demand, terms of trade, and international financial conditions as follows:

$$\begin{aligned}\Delta y_t &= c + \alpha\beta' y_{t-1} + \Gamma\Delta y_{t-1} + \dots + \Gamma_{p-1}\Delta y_{t-p+1} + \varepsilon_t \\ y_t &= (gdp\_lat_t \quad ip\_x_t \quad tot\_lat_t \quad financ\_x_t \quad risk_t)'\end{aligned}\tag{1}$$

where  $gdp\_lat$  represents (the log of) LAC7 GDP,  $ip\_x$  is (the log of) an index of average industrial production in G7 countries,  $tot\_lat$  is (the log of) an index of regional terms of trade,  $finance\_x$  is the return on 10-year US T-bonds, and  $risk$  is the spread on high yield bonds over US T-bonds—a variable that is tightly linked to emerging market bond spreads (EMBI) but that is definitely more likely to be exogenous to Latin American GDP than EMBI. In this specification, matrix  $\alpha$  contains error-correction-adjustment coefficients, matrix  $\beta'y_{t-1}$  contains error correction terms, matrices  $\Gamma_j$  contain short-run-dynamics coefficients, and  $\varepsilon_t$  is a vector of reduced-form shocks. Definitions of variables and information sources are described in detail in the Data Appendix.

We include the latter two measures of financial conditions because evidence suggests that, although behavior of US T-bond returns may have been key in explaining capital flow behavior in the early 1990s, emerging market bond spreads took on a life of their own when they skyrocketed during the Russian crisis of 1998, signaling a change in risk perceptions by investors towards emerging markets that were not triggered by changes in US T-bond rates or rates in other central economies.

In such a setting, changes in each of the variables in  $y_t$  depend on previous changes in *all* variables in the model, as well as on previous-period deviations from any cointegrating relation there may exist. This specification allows for the inclusion of non-stationary  $I(1)$  variables, that under cointegration, will render model (1) stationary, as there will exist linear combinations of  $y_{t-1}$  that are stationary—and changes in  $I(1)$  variables are stationary by definition.

However, as it stands, this specification allows for potential endogeneity between LAC7 GDP and external variables, something that should be ruled out given that it is highly unlikely that LAC7 GDP will have an impact on external variables such as US interest rates. Therefore, estimation will involve imposing restrictions on the parameters of the model along two dimensions: 1) lagged changes in LAC7 GDP are not allowed to affect external variables—although lagged changes in LAC7 GDP can affect current changes in GDP; and 2) error correction terms are absorbed only by LAC7 GDP. The latter restriction is imposed to rule out cases in which GDP deviations from its long-run relationship with external variables ends up having an impact on external variables. This is equivalent to restricting matrices  $\alpha$  and  $\Gamma_j$  to be of the form:<sup>4</sup>

$$\alpha^* = \begin{pmatrix} \alpha_1 \\ 0 \\ 0 \\ 0 \\ 0 \end{pmatrix}, \Gamma_j^* = \begin{pmatrix} \Gamma_{j,1,1} & \Gamma_{j,1,2} & \Gamma_{j,1,3} & \Gamma_{j,1,4} & \Gamma_{j,1,5} \\ 0 & \Gamma_{j,2,2} & \Gamma_{j,2,3} & \Gamma_{j,2,4} & \Gamma_{j,2,5} \\ 0 & \Gamma_{j,3,2} & \Gamma_{j,3,3} & \Gamma_{j,3,4} & \Gamma_{j,3,5} \\ 0 & \Gamma_{j,4,2} & \Gamma_{j,4,3} & \Gamma_{j,4,4} & \Gamma_{j,4,5} \\ 0 & \Gamma_{j,5,2} & \Gamma_{j,5,3} & \Gamma_{j,5,4} & \Gamma_{j,5,5} \end{pmatrix} \quad (2)$$

so that the model to be estimated becomes:

$$\Delta y_t = c + \alpha^* \beta' y_{t-1} + \Gamma^* \Delta y_{t-1} + \dots + \Gamma_{p-1}^* \Delta y_{t-p+1} + \varepsilon_t \quad (3)$$

In practice, three issues need to be addressed before we can estimate model (3), namely, exploring the level of integration of the series, selecting the appropriate lag length for the VAR(p) process behind the model, and determining the existence (and quantity) of cointegrating relations.

We start by running unit root tests for each of the variables described in (1), both in levels and first differences. Results of augmented Dickey-Fuller (ADF) tests and Phillips-Perron (PP)

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<sup>4</sup> This example corresponds to the particular case in which there exists only one cointegrating vector, but it could be readily extended to a more general case.

tests are shown in Appendix Table 1, under different specifications regarding the inclusion of a constant and trend. The hypothesis of a unit root for each of the variables cannot be rejected at the 5 percent level for the sample at hand, whereas the hypothesis of a unit root in first differences is rejected at the same confidence level, rendering first differences stationary.

In terms of lag selection, we use standard optimal lag length tests, shown in Appendix Table 2, departing from a VAR in levels with five lags.<sup>5</sup> Most criteria, including those of Akaike and Hannan-Quin, as well as a likelihood ratio test, suggest an optimal length of two lags. This implies the inclusion of one lag in the model in differences.

We use Johansen's full information maximum likelihood (FIML) method to test for the number of cointegrating relations between the five variables in the model. We report trace and maximum eigenvalue statistics in Appendix Table 3.<sup>6</sup> Both tests reject the hypothesis of no cointegration but do not reject the existence of one cointegrating relation at the 5 percent level. Given these results, estimation of model (3) is carried out assuming one cointegrating relation.

For computational simplicity reasons, given the difficulties involved in efficient estimation with restrictions in both loading coefficients and short-term parameters, we follow Lütkepohl and Kratzig (2004) in that we estimate cointegrating vector  $\beta$  in a first stage (including restrictions in  $\alpha$  as indicated by  $\alpha^*$ ), and then proceed with estimation of system (3) in a second stage by feasible generalized least squares, imposing both exclusion restrictions as indicated by  $\alpha^*$ ,  $I_j^*$  and values for  $\beta$  obtained in the first stage.<sup>7</sup> Treating the first-stage estimator of  $\beta$  as fixed in a second-stage estimation can be justified on the grounds that convergence of cointegrating parameters is faster than that of short-term parameters.

## 2.2 Estimation Results

We estimate system (3) with information ranging from 1991:I to 2006:III. Given the optimal lag structure determined previously, estimates are obtained for the period ranging from 1991:III to

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<sup>5</sup> We choose this initial lag length given that our data are quarterly and we want to obtain a parsimonious representation.

<sup>6</sup> These tests assume that all variables have deterministic linear trends, and that the cointegrating relation has a constant but no trend. The specification of the model to be estimated below is consistent with these assumptions. Alternative assumptions including a trend in the cointegrating relation, or both quadratic trends in all variables and a trend in the cointegrating relation yield similar results for the maximum eigenvalue test. Results differ for the trace statistic. However, given the sharper alternative hypothesis of the maximum eigenvalue test, we keep results of this test for selection of the number of cointegrating relations.

<sup>7</sup> First stage estimation of  $\beta$  is carried out via FIML.

2006:III. We first describe results obtained in the first stage for the cointegrating vector, shown in Appendix Table 4. All coefficients display expected signs, indicating that increases in T-bond rates and in high yield spreads (a proxy for EMBI spreads) are associated with long-run falls in LAC7 GDP, while increases in terms of trade or in G7 output levels are associated with long-run increases in LAC7 GDP. All coefficients are significant at the 1 percent level (and high-yield spreads are significant at the 5 percent level). Second-stage estimation results are displayed in Appendix Table 5. The loading factor accompanying changes in LAC7 GDP is negative and significant at the 1 percent level, indicating system stability, as LAC7 GDP deviations from its long-run relation with cointegrating companions are self-correcting. It is worth mentioning that this parsimonious representation, including external factors and lagged growth, explains 54 percent of the variance of LAC7 GDP growth in Latin America.

### ***2.3 Impulse-Response Functions***

In order to assess the performance of the model, we conduct impulse-response analysis to explore LAC7 GDP behavior to shocks in external variables. In order to identify structural shocks by Choleski decomposition of the variance-covariance matrix we need to specify a particular ordering of variables. A first ordering assuming that external real variables are largely predetermined relative to external financial variables leads to the following external ordering: G7 industrial production, terms of trade, US T-bond rates and High Yield spreads. This ordering is quite similar to that used in the literature for the identification of monetary policy reaction functions.<sup>8</sup> We also assume that LAC7 GDP can react contemporaneously to external variables. However, for robustness reasons, additional specifications described below test for other orderings, including scenarios in which LAC7 GDP does not react to external financial variables.

Given the high non-linearity of VEC impulse-response functions, and the fact that in small samples inference using asymptotic variances may not be very reliable, we opt for residual-based bootstrapping methods instead.<sup>9</sup> These methods basically consist of sampling centered residuals coming from the original estimation, which are used to compute bootstrap time series that, in turn, are employed to produce new estimates of model parameters. Iteration of this procedure (1,000 replications for the standard case) produces a distribution of model parameters and their associated impulse-response functions that can be used to obtain confidence

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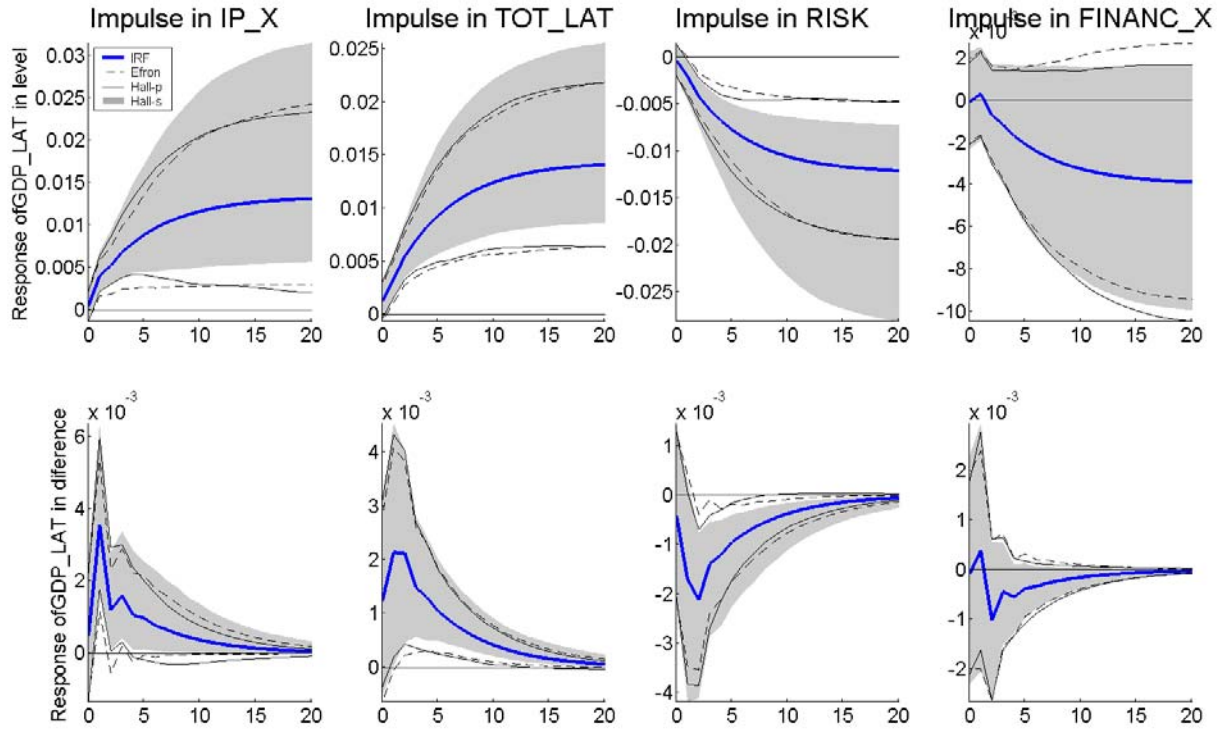
<sup>8</sup> See, for example, Christiano, Eichenbaum and Evans (1999).

<sup>9</sup> See, for example, Kilian (1998).

intervals at any desired level of coverage. We display three measures for confidence intervals: the standard percentile (or Efron's) method, Hall's percentile method, and Hall's percentile-t method.<sup>10</sup> All measures are computed at the 5 percent confidence level.

Responses of LAC7 GDP to one standard deviation-impulses in external variables are shown in Figure 2 both for levels (in logs) and LAC7 GDP growth rates (log changes). An element worth highlighting is the stability of the system, which converges in levels to particular values, while growth rates converge to zero. For this particular ordering, all responses are significant at the 5 percent level (irrespective of the confidence interval type chosen), except for responses to T-bond rates, which are significant at the 15 percent level when using studentized confidence intervals.

**Figure 2- LAC7 GDP Responses to One-standard-deviation Shocks**



*Note:* Responses in levels correspond to GDP logs. Responses in differences are quarterly and are not annualized.

As expected, positive shocks to G7 industrial production generate a positive response from LAC7 GDP. A one standard deviation shock to G7 industrial production (equivalent to an

<sup>10</sup> Hall's percentile-t method involves additional computation of the bootstrap variance of impulse responses; for this exercise, we make 100 additional replications within each bootstrap replication, bringing total replications to 100,000. See Hall (1992), and Lütkepohl and Kratzig (2004) for a description of these procedures.

increase of about 0.6 percent on impact) leads to a short-run response in quarterly LAC7 GDP growth as high as 0.36 percent in the first quarter after the shock (i.e., for every 1 percent increase in G7 industrial production, there is a response in LAC7 GDP growth as high as 0.6 percent).<sup>11</sup> It should be noted that, for all variables, convergence to steady state occurs after approximately 20 periods. For this reason, we also report differences between current GDP and the value this variable would have attained in the absence of a shock 20 periods after the original disturbance. For the case of an initial positive shock of one standard deviation in G7 industrial production, the difference between current LAC7 GDP and no-shock LAC7 GDP is close to 1.3 points of GDP after 20 quarters.

Similarly, a positive terms-of-trade shock of one standard deviation (an increase of almost 2 percentage points) generates an increase in quarterly LAC7 GDP growth as high as 0.21 percent in the second quarter following the shock (i.e., for every one-percent increase in terms of trade, there is an increase in quarterly LAC7 GDP growth as high as 0.11 percent).<sup>12</sup> Following a 2 percent increase in terms of trade, the difference between current LAC7 GDP and no-shock LAC7 GDP is about 1.4 percentage points after 20 periods.

Likewise, a one-standard-deviation shock in high-yield spreads (61 basis points) leads to a change in short-run quarterly LAC7 GDP growth as low as -0.21 percent in the second quarter after the shock (i.e., for every 100 basis points in high-yield spreads there is a response in short-run quarterly LAC7 GDP growth as low as -0.36 percent). The difference between current LAC7 GDP and no-shock LAC GDP after 20 periods is about -1.2 percentage points.

Finally, an increase in US T-bond rates of one standard deviation (36 basis points) causes a fall in quarterly LAC7 GDP growth of about 0.1 percent in the second quarter after the shock (or equivalently, for every 100bps increase in US T-bond rates there is a fall in quarterly LAC7 GDP growth of about 0.33 percent). This one standard deviation shock eventually builds into a

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<sup>11</sup> Growth rates are not annualized. For comparison purposes, quarterly steady state growth is roughly 0.8 percent.

<sup>12</sup> As described in the Data Appendix, we use a first-principal-component weighted average of (the logs of) terms of trade of LAC7 countries. Principal components are a weighted average of standardized series. In this case, series used to obtain the first principal component are the logs of each country's terms of trade. However, the resulting principal component is difficult to interpret in terms of percentage changes in terms of trade. For this reason, we perform appropriate re-weighting so that (excluding the impact of means used for standardization in the value of the principal component) the resulting series still has unit covariance with the original principal component but can now be interpreted as a weighted average of the logs of each country's terms of trade. Changes in this series can therefore be interpreted as changes in (weighted) average terms of trade.

difference of -0.4 percent between current LAC7 GDP and no-shock LAC7 GDP after 20 periods (however, as indicated earlier, this response is significant only at the 15 percent level).

Robustness exercises indicate that impulse-response results vary only slightly for different orderings of external variables. They are shown in Appendix Figures 1, 2, and 3. For these other orderings, practically all responses are significant at the 5 percent level, whether confidence intervals are computed by the percentile method, Hall's percentile method, or the studentized method. Results for impulse responses to T-bond rates are now significant at the 5 percent level for orderings shown in Appendix Figures 1 and 2.

We also address the issue that average LAC7 GDP may display a lag in reacting to financial variables by changing the ordering of LAC7 GDP so that it stands in between real and financial variables. However, for this particular case we also need to restrict the variance-covariance matrix so that shocks to LAC7 GDP do not contemporaneously affect any of the financial variables. Results are shown in Appendix Figure 4, and they indicate that responses do not differ greatly from those described above.

### **3. Putting the Model to Work: Growth Performance and Global Financial Risks**

Given the pivotal role played by external factors in accounting for business fluctuations in Latin America, we now use the model estimated in the previous section to raise relevant issues in the current policy debate in Latin America: the assessment of recent growth performance and the possible impact of global financial turmoil that results from a large re-pricing of risk.

#### ***3.1 Assessing Recent Performance in LAC: 1998-2006***

In recent years Latin America has been experiencing its highest growth rates since the early 1970s, and there is a great deal of speculation on the reasons for this excellent performance. Governments typically interpret this bonanza as an indication of the success of current policies. However, it could also be conjectured that the recent growth spurt may largely reflect the impact of very favorable external conditions. We use our estimated model to tackle this issue by comparing in-sample forecasted GDP levels with observed GDP levels for the period 2003-2006.

We pick this particular period because it reflects the external bonanza depicted by skyrocketing terms of trade (that increased by around 50 percent) and a dramatic fall in high-

yield spreads (330 basis points). We take as a benchmark a passive scenario where the dynamics of external variables for the period 2003-2006 are the forecasts implied by the model from the perspective of end-2002. These forecasts would have anticipated an improvement in external conditions, with higher terms of trade, lower spreads and US interest rates, albeit of a much smaller magnitude than the actual improvements in external conditions that took place during this period interval.<sup>13</sup> Panel A of Figure 3 shows observed (log) LAC7 GDP levels (full line), along with the conditional forecast for GDP (dashed line) starting in the first quarter of 2003, together with its 90 percent confidence interval.<sup>14</sup> It can clearly be seen that observed LAC7 GDP performance stands above and outside the forecast interval, even though the forecast interval already relies on quite favorable external conditions. As a matter of fact, average observed LAC7 GDP growth between the fourth quarter of 2002 and the third quarter of 2006 stands at 5.6 percent per year, whereas average forecasted LAC7 GDP growth for the same period is 3.8 percent—a difference of almost 2 percentage points.<sup>15</sup> These results also suggest that the growth rate gap would have been even higher had external conditions remained closer to those prevailing at end-2002

Panel A of Figure 3 also includes the forecast for LAC7 GDP conditional on the *observed* values of external variables (the dotted line), together with a 90 percent confidence interval. This is useful in two dimensions. First, it shows that the model has relatively good predictive power in that actual LAC7 GDP always lies within the forecast interval. Second, it shows that shocks to LAC7 GDP cannot account for the difference in GDP forecasts that results from the alternative paths for external variables previously described. These results point to the very favorable draw in external conditions that the region was exposed to, and thus the higher than normal growth rates in LAC7 GDP that were observed as a result.

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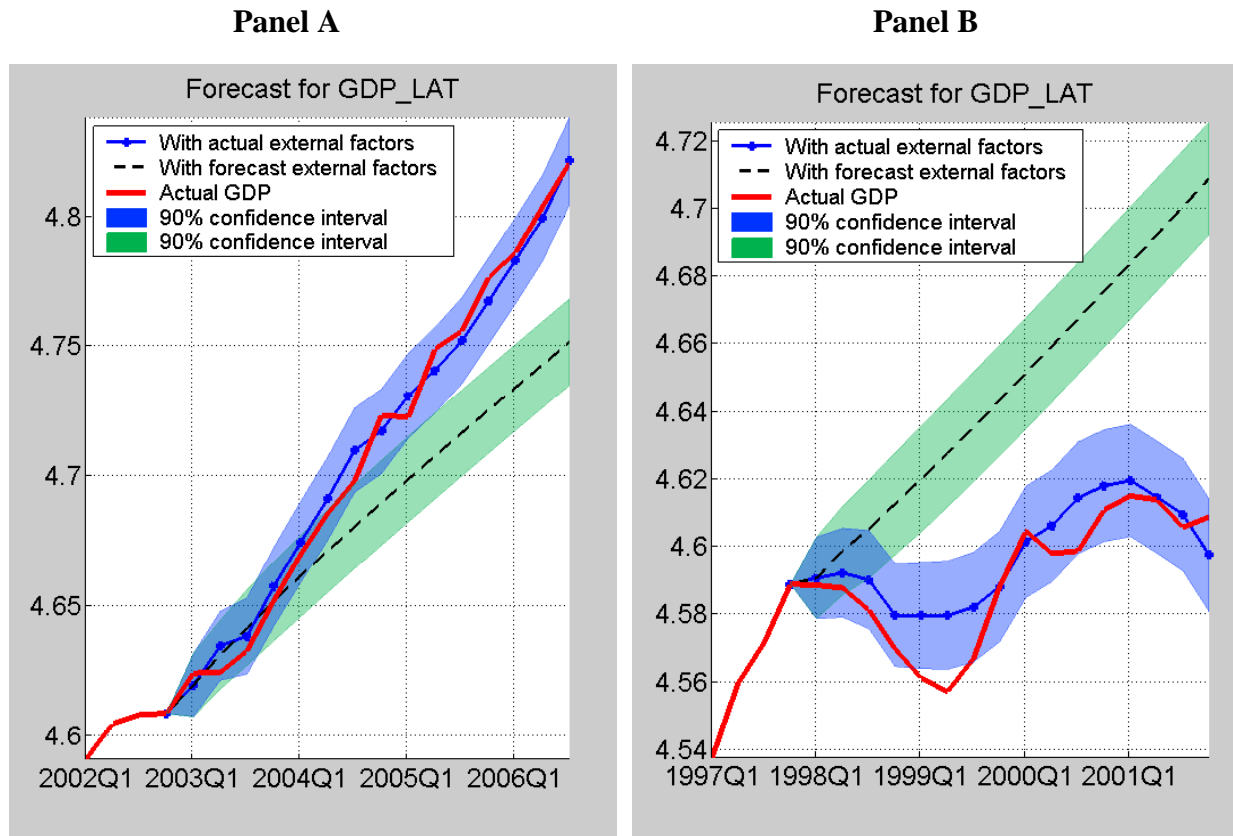
<sup>13</sup> Given that we used a principal-component-weighted average for the terms of trade, this implies an increase in this weighted variable of 8.5 percent between 2002:IV and 2006:III, a fall in high yield spreads of 109 basis points between the same dates, a decrease in US T-bond rates of 50 basis points, and average growth of G7 industrial production of 2.1 percent. This contrasts with observed increases of 24.5 percent in principal-component-weighted terms of trade, a fall of 446 basis points in high yield spreads, an increase of 89 basis points in US T-bond rates, and average growth of G7 industrial production of 2.4 percent.

<sup>14</sup> That is, we forecast the path for GDP conditional on the paths of external variables, allowing for uncertainty in GDP.

<sup>15</sup> Even if we were to take the most optimistic GDP forecast for end-2006, corresponding to the upper bound of its confidence interval, LAC7 GDP growth for the period would be 4.2 percent, still 1.4 percentage points below observed LAC7 GDP growth.



**Figure 3. GDP Forecasts Conditional on External Variables: Bonanza vs. Crisis**



*Note:* Values expressed in logs.

By the same token, one could ask what would have happened to GDP performance had the Russian crisis of 1998 and the substantial deterioration in external conditions not taken place. Panel B of Figure 3 shows the same type of exercise previously described, only this time it is performed for the period 1998-2001. Thus, we take as a benchmark a passive scenario where the dynamics of external variables for the period 1998-2001 are the forecasts implied by the model from the perspective of end-1997. This exercise suggests that LAC7 GDP behavior would have been very different had external conditions remained within the dynamics implied by the passive scenario (shown by the dashed line in Panel B): while average LAC7 GDP growth observed between the fourth quarter of 1997 and the last quarter of 2001 was only 0.5 percent per year, the passive forecast suggests that average LAC7 GDP growth would have been almost 3 percent for the same period. Once again, uncertainty about shocks to LAC7 GDP would not be able to

eliminate differences in the paths of LAC7 GDP resulting from these alternative paths for external conditions.

These exercises reveal that differences in the dynamics of external factors can account for large and significant differences in growth performance. This is a key finding that we will take up in the next section on the role of external factors and policy evaluation.

### ***3.2 Assessing Latent Risks: Impact of Global Financial Turmoil on LAC Performance***

Another relevant question revolves around the impact that financial turmoil could trigger on activity levels. The region has recently been exposed to several episodes of financial volatility, but so far these have been short-lived, recovery in financial variables has been relatively fast, and little impact has been felt on Latin America's economic activity. However, events like the Debt Crisis of the early 1980s and the Russian crisis of 1998 still linger in the region's memory. What would happen if history were to repeat itself?

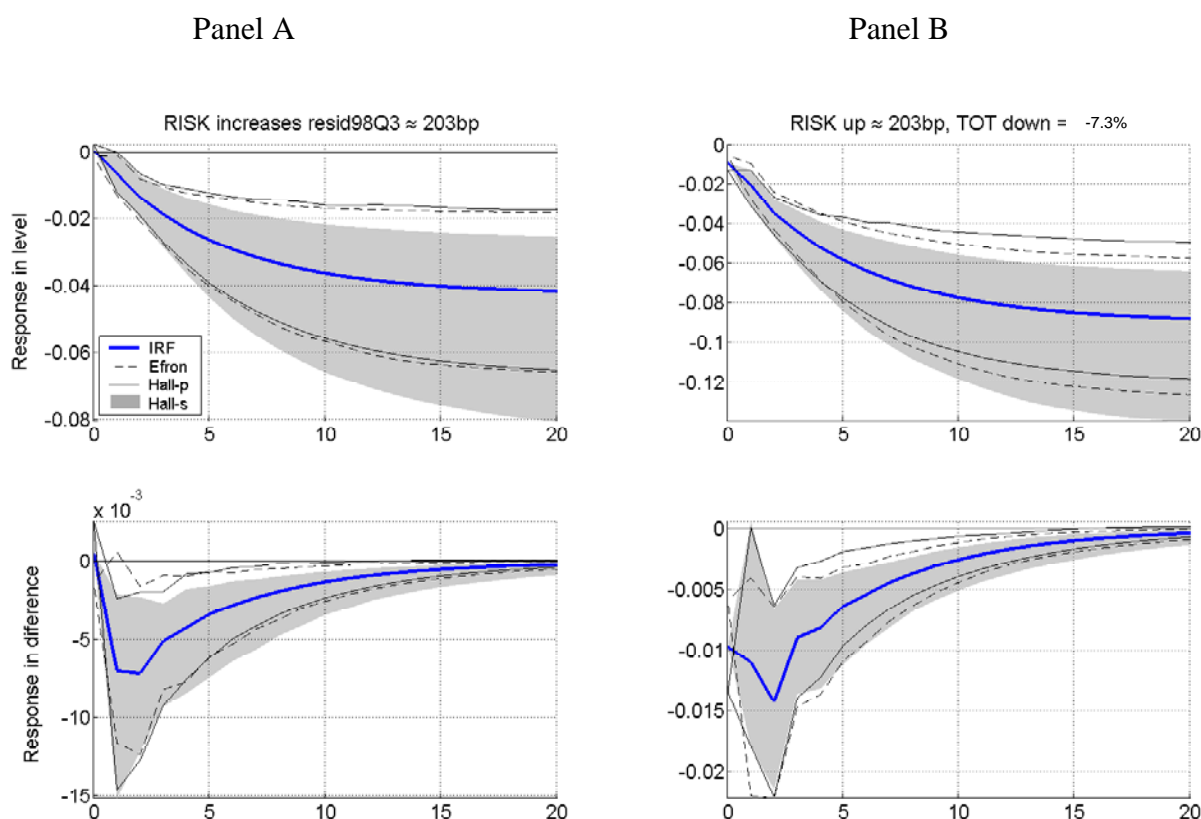
#### ***3.2.1 Sudden Stop in Capital Flows***

In order to assess the impact of an episode of global financial turmoil, a first exercise we perform is to consider the magnitude of reduced-form shocks to high yield spreads that occurred during the third quarter of 1998, right at the time of the Russian crisis. We select this particular point in time because it represents a very stressful period for Latin America, triggered by external conditions that impacted heavily on LAC7 countries. Residuals from our reduced-form estimation indicate that the shock to high-yield spreads was roughly 200 basis points for that quarter. Interestingly, this is the largest shock in the sample—it exceeds three standard deviations—and it highlights the large and unexpected nature of the Sudden Stop episode of 1998, providing support for the hypotheses offered in Calvo (1998), Calvo, Izquierdo and Talvi (2003), Calvo, Izquierdo and Mejía (2004) and Calvo and Talvi (2005).

Figure 4, Panel A depicts the response in LAC7 GDP that results from a reduced-form impulse of 200 bps (3.3 standard deviations) in high yield spreads. It suggests that quarterly GDP growth could fall by as much as 0.7 percent in the second quarter following the shock, or 2.8 percent on an annualized basis. After 20 quarters, the gap between current GDP and no-shock GDP amounts to 4.2 percentage points. If instead of using the reduced form residual one were to interpret the observed increase in high-yield spreads around the time of the Russian crisis

as the size of the shock—roughly 300 basis points—this time quarterly growth could fall as much as 1.1 percent on a quarterly basis, or 4.3 percent on an annualized basis.

**Figure 4. GDP Responses to Alternative Shock Scenarios**



*Note:* Responses in levels correspond to GDP logs. Responses in differences are quarterly and are not annualized.

### 3.2.2 Sudden Stop to Capital Flows Cum Terms of Trade Deterioration

So far we have only focused on financial shocks. Yet, to the extent that terms-of-trade performance has been unusually favorable for the region in recent years—recall cumulative growth of 50 percent between 2002 and 2006—there could be room for a substantial correction. Perhaps because of fears that an episode of global financial turmoil could have an impact on global demand (something that did not happen at the time of the Russian crisis), recent episodes of financial turmoil have been associated with falls in commodity prices (a 100 basis points

increase in high-yield spreads has been associated with a decline in terms of trade of roughly 3.6 percent). If this relationship were to hold during a large financial meltdown, then a shock to high-yield spreads of 203 basis points (i.e., 3.3 standard deviations) could materialize together with a terms-of-trade shock representing a quarterly fall of roughly 7.3 percent (or 3.6 standard deviations).<sup>16</sup> The size of the terms-of-trade shock may sound large, but it should be balanced against the dramatic increase in the terms of trade recorded in recent times. Panel B of Figure 4 shows the impact of this combined shock, which yields a fall in quarterly LAC7 GDP growth as large as 1.4 percent, or an annualized rate of 5.6 percent.

The effects of such a slowdown could be truly substantial. To illustrate this point, consider the evolution of LAC7 GDP that would be consistent with impulse responses displayed in Panel B of Figure 4. Assuming that LAC7 GDP was growing at its steady state rate (around 0.8 percent per quarter) prior to the shock, the impact of the combined shock would lead to LAC7 GDP dynamics like those displayed in Figure 5 (the dotted line). According to the response of the model, LAC7 GDP would enter a recessionary phase, with a recovery to pre-crisis levels in about 8 quarters. However, given the size of confidence intervals, this recessionary period could vary widely. What is clear is that in any case there would be a significant separation from the path followed by LAC7 GDP in the absence of the combined shock (full line).

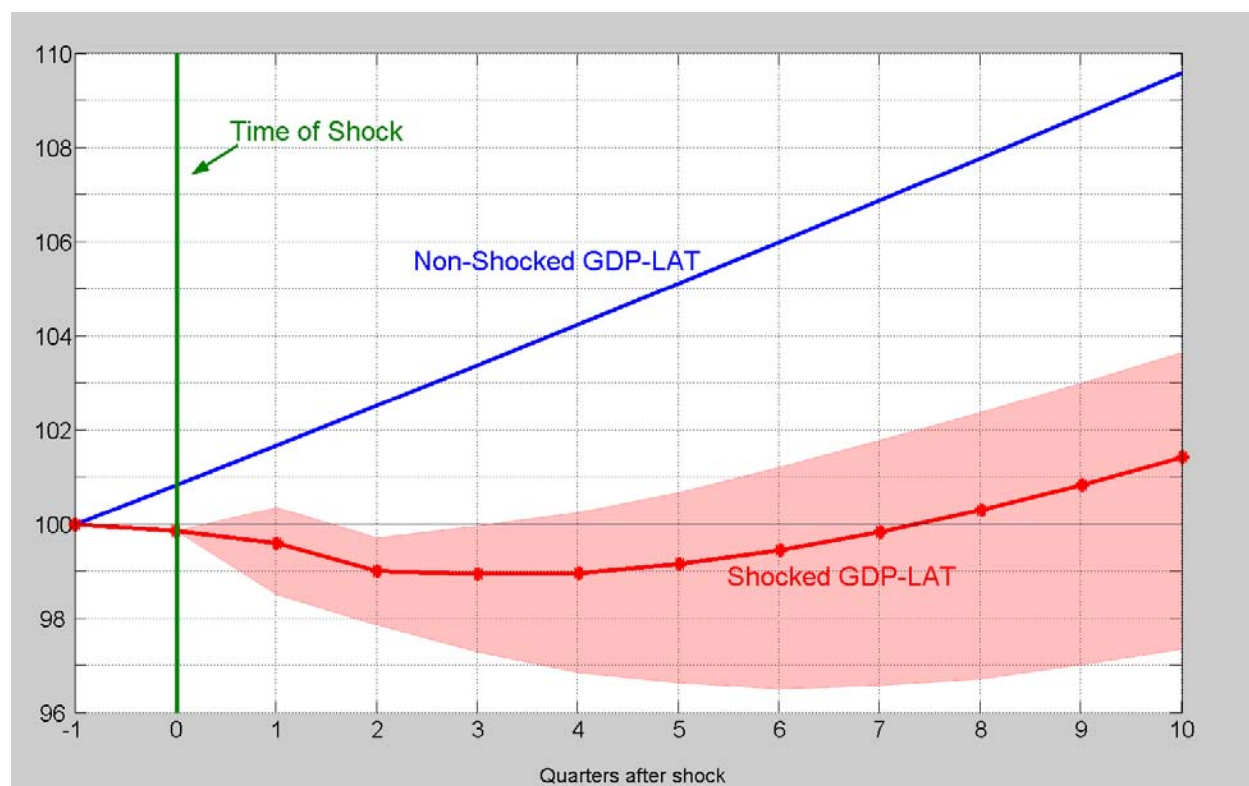
Given our empirical model's predicted pattern of adjustment to large adverse external financial shocks, with terms of trade spillovers, it is interesting to note that this response of GDP is very much in line with two recent contributions to the analysis of output behavior in times of external financial crises. First, as noted by Calvo, Izquierdo and Talvi (2006), bounce-backs to pre-crisis output levels following a systemic Sudden Stop could be quite fast (on average, about 8 quarters for the emerging-market episodes in their sample). However, recovery to the pre-crisis trend is highly unlikely or may take a very long time, a key feature highlighted by Cerra and Saxena (2005). A possible explanation for this behavior has been suggested by Calvo, Izquierdo and Talvi (2006), and it lies in the nature of the changes in the sources of financing in times of external financial crisis. As the authors document, when external credit becomes very expensive or unavailable, much of the financing in economies that bounce back from large

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<sup>16</sup> The rationale here would be that the correlation between shocks to high-yield spreads and terms of trade would be different in a future crisis from that observed in the data, given that financial turmoil within the sample period was not associated with substantial impact on aggregate demand in industrial countries.

output contractions comes from the postponement of investment projects, thus reducing future output capacity.

**Figure 5. Evolution of GDP Level Consistent with Impulse-Response in Panel B (Sudden Stop cum Terms of Trade Shock)**



The fact of the matter is that this exercise is also highly relevant for policy evaluation , as fluctuations in external fundamentals can dramatically change the path of output. Thus, evaluating the strength of macroeconomic fundamentals, such as fiscal policy and public debt, while failing to take into account for cycles in external conditions can lead to highly misleading conclusions. We take up this topic in the next section.

#### **4. Concluding Remarks: the Role of External Factors and Policy Evaluation**

Extending in various directions the seminal work of Calvo, Leiderman and Reinhart (1993), we have established that external factors play a key role in accounting for economic fluctuations in Latin America. We also put our estimated vector error correction model to work to perform two useful exercises: first, to assess recent growth performance in Latin America during the bust (1998-2002) and boom (2003-2006) cycles, and, second, to assess the impact of and adverse

change in the currently extremely favorable financial conditions for emerging economies. These two exercises stress the relevance of our findings for policy evaluation. Growth performance, strength or weakness of macroeconomic fundamentals, and the impact of domestic macro and micro policies on growth can only be properly appraised by first filtering out the effects of external factors. Failing to do so can lead to highly misleading conclusions.

The first of our two exercises revealed that differences in the dynamics of external factors can account for large and significant differences in growth performance. Without neglecting the possibility of diverse domestic policy responses to external shocks, it is clear that care should be exercised when passing judgment on the stagnation and crisis period, 1998-2002, and the current exceptional expansion period, 2003-2007. It may just happen that during the latter Latin America had an exceptionally good draw on external variables relative to past experience, while during the former, the draws on external variables were exceptionally bad. This means the region might be currently surfing on a wave of unjustified euphoria on the part of multilaterals and policymakers alike.

As a corollary of this exercise, it follows that a great deal of care should be taken when evaluating the success or failure of domestic macro policies and reforms. A period of stagnation and even crisis, such as the one that followed the Debt Crisis of the 1980s and the Russian crisis of 1998, may not necessarily be a reflection of bad policy, but a consequence of very adverse external conditions. Conversely, a sustained period of high growth may not be the consequence of good policies, but the result of a string of good luck. In sum, given the large incidence of external conditions in Latin America's business cycles, the judgment of the success—or failure—of economic policies and performance should not be made in a vacuum, but rather, by factoring in external conditions before signaling thumbs up—or down.

Our second exercise revealed that a reversal in external financial conditions of a magnitude observed in the past will have a large impact on Latin America's GDP. Thus, to properly evaluate the strength of macroeconomic fundamentals such as the fiscal stance, it is key to incorporate the dynamics of external factors and their impact on Latin America's GDP. For example, an unusually favorable external environment will be associated with high commodity prices, low interest rates spreads, strong growth performance, improvement in the fiscal position and declining public debt levels. In such a scenario, the actual levels of fiscal balances and public debt could be completely misleading as indicators of the fiscal stance. A proper assessment of

the strength of the fiscal position and the burden of public debt should account for cycles in external factors. Thus, calculating structural fiscal balances and structural levels of public debt on which to base fiscal policy decision-making should become the first order of business for policymakers in the region.<sup>17</sup> To the best of our knowledge, only Chile has an explicit fiscal rule that uses a structural fiscal balance measure as a target of fiscal policy.<sup>18</sup>

Finally, although this is not an exercise reported in the paper, it is crucial to distinguish between transitions that are a by-product of level effects and sustained growth. The nature of the estimated model in this paper suggests that one-time increases in commodity prices or reductions in interest rates spreads generate level effects on output, which may translate into relatively prolonged above-average growth phases given frictions implicitly captured by the error correction term. However, these should not be confused with sustained growth. The current bonanza may yield above-average growth for some time, but its effects may eventually dissipate as frictions are corrected, even if external factors remain as favorable as they are today.

In summary, given the importance of external factors in Latin America's business cycle fluctuations, policy evaluation should be conducted keeping these factors in mind, or otherwise there may be substantial room for misjudgment. It is particularly important that the economics profession make an effort to incorporate these issues into the public debate and into our performance indicators. If not, it may be very easy to praise those lucky enough to ride the bonanza, and punish the unlucky, regardless of their abilities.

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<sup>17</sup> See, for example, Izquierdo, Ottonello, and Talvi (2008) for a recent contribution. The paper reports that in recent years, due to the exceptional growth performance, Latin America's actual fiscal position has improved significantly (from an aggregate deficit of 2.6 percent of GDP in 2002 to a surplus position of 1.1 of GDP in 2006) and public debt has been reduced by 13 percentage points of GDP in the same period. However, when they compute structural fiscal balances—using Chile's methodology—and structural levels of public debt rather than actual levels, the picture that emerges is completely the opposite. During the current expansion, the aggregate structural fiscal balance of the region has deteriorated due to strong increases in public spending. Analogously, structural debt levels have been rising, not falling.

<sup>18</sup> See, for example, Marcel et al. (2003).

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## Data Appendix

We used quarterly data ranging from 1991Q1 through 2006Q3. Countries included in the definition of Latin America are: Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela, which account for 93 percent of Latin America's GDP and to which we refer to as LAC7. Variables were constructed as follows:

**GDP\_LAT:** Measure of seasonally adjusted real GDP of LAC7 countries, and it is computed as (the log of) the simple average of seasonally adjusted real GDP indices of each of the LAC7 countries. GDP data in levels is obtained from national sources.

**TOT\_LAT:** First-principal-component weighted average of (the logs of) terms of trade of LAC7 countries. Principal components are a weighted average of standardized series. In this case, series used to obtain the first principal component are the logs of each country's terms of trade. However, the resulting principal component is difficult to interpret in terms of percentage changes in terms of trade. For this reason, we perform appropriate re-weighting so that (excluding the impact of means used for standardization in the value of the principal component) the resulting series still has unit covariance with the original principal component, but can now be interpreted as a weighted average of the logs of each country's terms of trade, and, therefore, changes in this series can be interpreted as changes in (weighted) average terms of trade. Terms of trade data in levels are obtained from national sources (except for Venezuela, for which terms of trade are computed based on export price data from the International Financial Statistics database, International Monetary Fund IFS, and own estimations of import prices).

**IP\_X:** (the log of) the weighted average of industrial production indices of G7 countries, weighted by PPP-adjusted GDP. Industrial production indices are obtained from the International Financial Statistics database, International Monetary Fund.

**FINANC\_X:** yield on 10-year US Treasury bonds. Source: US Federal Reserve.

**RISK:** Spread of US high yield bonds over US Treasuries. Source: Bloomberg.

**Appendix Table 1. Unit Root Tests**

	ADF Tests			Philip-Perron Tests		
	No constant	Constant	Constant and trend	No constant	Constant	Constant and trend
GDP_LAT	6.3669 1.0000	-0.6712 0.8461	-2.2692 0.4441	5.2978 1.0000	-0.6865 0.8424	-2.1272 0.5209
IP_X	2.0837 0.9906	-0.6424 0.8530	-2.3481 0.4026	3.0162 0.9992	-0.2226 0.9295	-1.8830 0.6517
TOT_LAT	1.2066 0.9402	0.1871 0.9696	-1.2530 0.8899	1.4671 0.9635	1.2281 0.9980	-0.6168 0.9744
RISK	-1.8847 0.0572	-2.6004 0.0983	-2.5843 0.2887	-1.7774 0.0718	-2.7069 0.0785	-2.6791 0.2487
FINANC_X	-1.6182 0.0991	-2.1175 0.2386	-4.5627 0.0026	-1.5130 0.1212	-2.1725 0.2182	-3.1937 0.0949
$\Delta$ GDP_LAT	-2.4522 0.0148	-4.3787 0.0008	-4.3484 0.0050	-5.4818 0.0000	-8.1054 0.0000	-8.0577 0.0000
$\Delta$ IP_X	-3.2731 0.0014	-3.9597 0.0029	-3.9068 0.0173	-3.2029 0.0018	-3.9597 0.0029	-3.9068 0.0173
$\Delta$ TOT_LAT	-5.3817 0.0000	-5.5343 0.0000	-5.8119 0.0000	-5.3817 0.0000	-5.5466 0.0000	-5.8086 0.0000
$\Delta$ RISK	-7.1032 0.0000	-7.1520 0.0000	-7.1682 0.0000	-7.1104 0.0000	-7.1556 0.0000	-7.1693 0.0000
$\Delta$ FINANC_X	-5.2492 0.0000	-5.4383 0.0000	-5.4680 0.0001	-6.3588 0.0000	-6.3865 0.0000	-6.3849 0.0000

*Note:* For each variable, two values are shown. The first is the test statistic and the second is its p-value.

**Appendix Table 2. VAR (in Levels) Lag Order Selection Criteria**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	671.110	NA	1.07e-16	-22.57999	-22.40393	-22.51126
1	1046.690	674.7710	7.44e-22	-34.46406	<b>-33.40768*</b>	-34.05169
2	1082.714	<b>58.61631*</b>	<b>5.22e-22*</b>	<b>-34.83778*</b>	-32.90109	<b>-34.08177*</b>
3	1099.178	23.99776	7.31e-22	-34.54841	-31.73141	-33.44876
4	1122.460	29.99107	8.50e-22	-34.49019	-30.79287	-33.04690

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

**Appendix Table 3. Johansen Cointegration Test**

Trend assumption: Linear deterministic trend					
Series: GDP_LAT IP_X TOT_LAT RISK FINANC_X					
Lags interval (in first differences): 1 to 1					
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5% Critical Value	Prob.**	
None *	0.518087	89.81496	69.81889	0.0006	
At most 1	0.317251	45.28551	47.85613	0.0855	
At most 2	0.227842	22.00624	29.79707	0.2981	
At most 3	0.084809	6.233684	15.49471	0.6679	
At most 4	0.013477	0.827704	3.841466	0.3629	
<b>Trace test indicates 1 cointegrating eqn(s) at the 0.05 level</b>					
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	5% Critical Value	Prob.**	
None *	0.518087	44.52945	33.87687	0.0019	
At most 1	0.317251	23.27927	27.58434	0.1619	
At most 2	0.227842	15.77256	21.13162	0.2384	
At most 3	0.084809	5.405980	14.26460	0.6899	
At most 4	0.013477	0.827704	3.841466	0.3629	
<b>Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level</b>					
* denotes rejection of the hypothesis at the 0.05 level					
**MacKinnon-Haug-Michelis (1999) p-values					

**Appendix Table 4. Vector Error Correction Estimates  
with Restrictions on Loading Factors**

Sample (adjusted): 1991Q3 2006Q3

Cointegrating Eq:	CointEq1
GDP_LAT(-1)	1.000000
IP_X(-1)	-0.595445 (0.09736) [-6.11567]
TOT_LAT(-1)	-0.718617 (0.10668) [-6.73645]
RISK(-1)	1.029924 (0.37706) [ 2.73149]
FINANC_X(-1)	2.752342 (0.61745) [ 4.45759]
Constant	1.388440

**Appendix Table 5. VEC Representation (Two-stage procedure)**

Sample range: 1991 Q3, 2006 Q3, T = 61

Lagged endogenous term:

		d(GDP_LAT7)	d(IP_X)	d(TOT_LAT7)	d(RISK)	d(FINANC_X)
-----						
d(GDP_LAT7_ADJ)(t-1)		-0.326 (0.093) {0.000} [-3.508]	--- ( ) { } [ ]	--- ( ) { } [ ]	--- ( ) { } [ ]	--- ( ) { } [ ]
d(IP_X)	(t-1)	0.386 (0.145) {0.008} [2.669]	0.578 (0.116) {0.000} [4.971]	0.569 (0.387) {0.141} [1.471]	0.052 (0.119) {0.662} [0.438]	0.024 (0.069) {0.728} [0.347]
d(TOT_LAT7)	(t-1)	-0.035 (0.055) {0.530} [-0.629]	0.022 (0.041) {0.589} [0.540]	0.106 (0.136) {0.435} [0.780]	0.000 (0.042) {0.995} [0.006]	0.022 (0.024) {0.367} [0.901]
d(RISK)	(t-1)	-0.080 (0.157) {0.611} [-0.509]	-0.267 (0.116) {0.022} [-2.298]	-0.572 (0.386) {0.138} [-1.484]	0.262 (0.119) {0.028} [2.195]	-0.206 (0.069) {0.003} [-2.987]
d(FINANC_X)	(t-1)	0.597 (0.315) {0.058} [1.894]	0.159 (0.243) {0.514} [0.653]	1.312 (0.809) {0.105} [1.622]	0.460 (0.250) {0.065} [1.842]	0.022 (0.145) {0.879} [0.153]
-----						

Deterministic term:

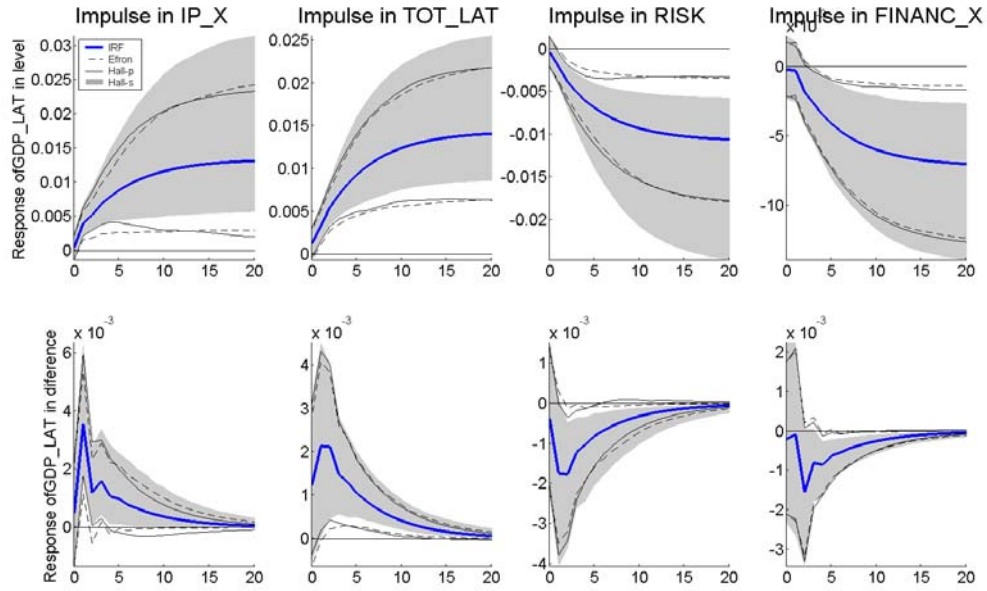
		d(GDP_LAT7)	d(IP_X)	d(TOT_LAT7)	d(RISK)	d(FINANC_X)
-----						
CONST		0.0095 (0.002) {0.000} [-5.989]	0.002 (0.001) {0.050} [1.962]	0.002 (0.003) {0.593} [0.534]	0.000 (0.001) {0.754} [-0.314]	-0.001 (0.001) {0.118} [-1.561]
-----						

Loading coefficients:

		d(GDP_LAT7)	d(IP_X)	d(TOT_LAT7)	d(RISK)	d(FINANC_X)
-----						
ec1(t-1)		-0.241 (0.039) {0.000} [-6.107]	--- ( ) { } [ ]	--- ( ) { } [ ]	--- ( ) { } [ ]	--- ( ) { } [ ]
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## Appendix Figure 1. LAC7 GDP Responses to One-Standard-Deviation Shocks

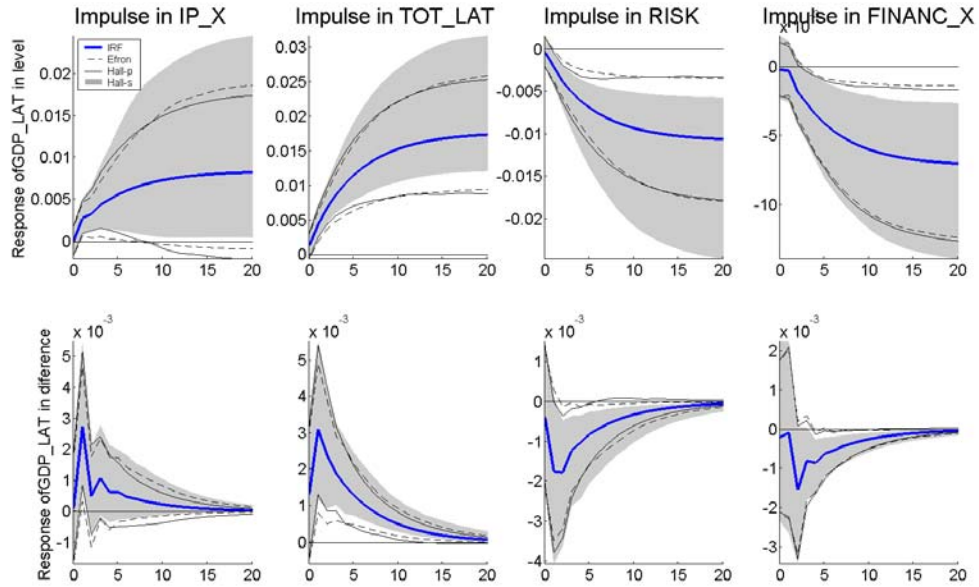
(Ordering of variables: IP\_X, TOT\_LAT, Risk, Financ\_X, LAC7 GDP)



*Note:* Responses in levels correspond to GDP logs. Responses in differences are quarterly and are not annualized.

## Appendix Figure 2 . LAC7 GDP Responses to One-standard-deviation Shocks

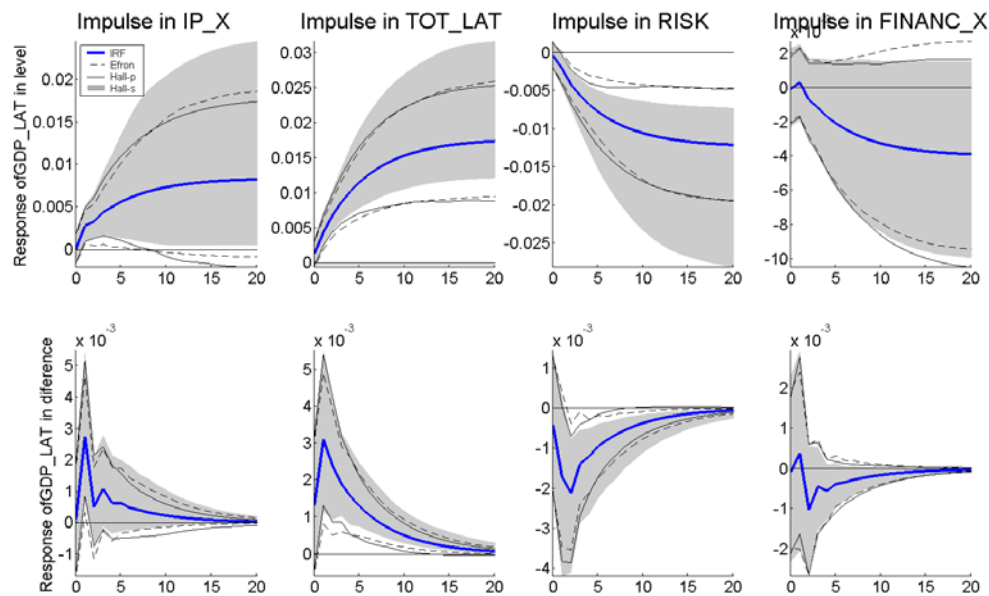
(Ordering of variables: TOT\_LAT, IP\_X, Risk, Financ\_X, LAC7 GDP)



*Note:* Responses in levels correspond to GDP logs. Responses in differences are quarterly and are not annualized.

### Appendix Figure 3. LAC7 GDP Responses to One-Standard-Deviation Shocks

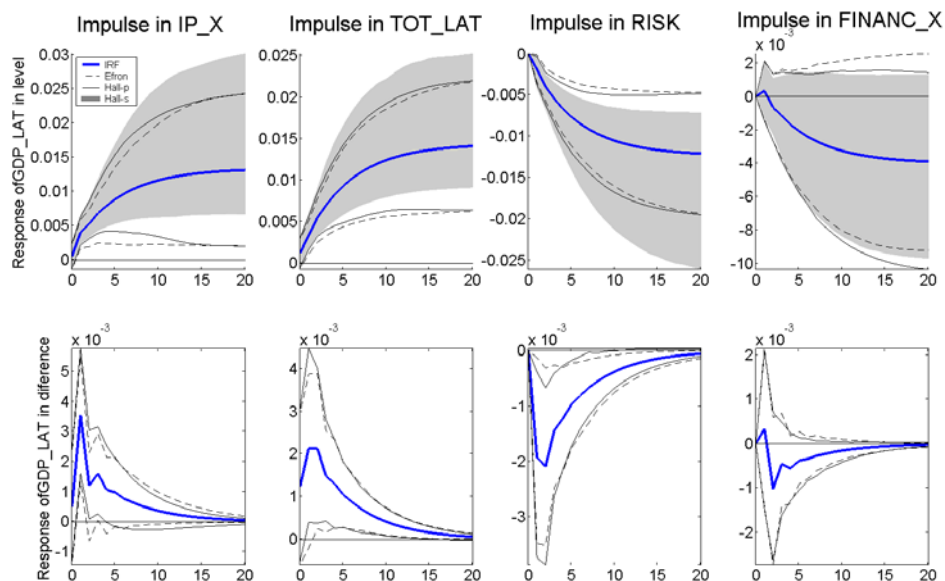
(Ordering of variables: TOT\_LAT, IP\_X, Financ\_X, Risk, LAC7 GDP)



*Note:* Responses in levels correspond to GDP logs. Responses in differences are quarterly and are not annualized.

### Appendix Figure 4 – LAC7 GDP Responses to One-standard-deviation Shocks

(Ordering of variables: IP\_X, TOT\_LAT, LAC7 GDP, Financ\_X, Risk - Covariance Matrix is restricted to rule out contemporaneous impact of GDP on external variables))



*Note:* Responses in levels correspond to GDP logs. Responses in differences are quarterly and are not annualized.