Backcasting Latin America

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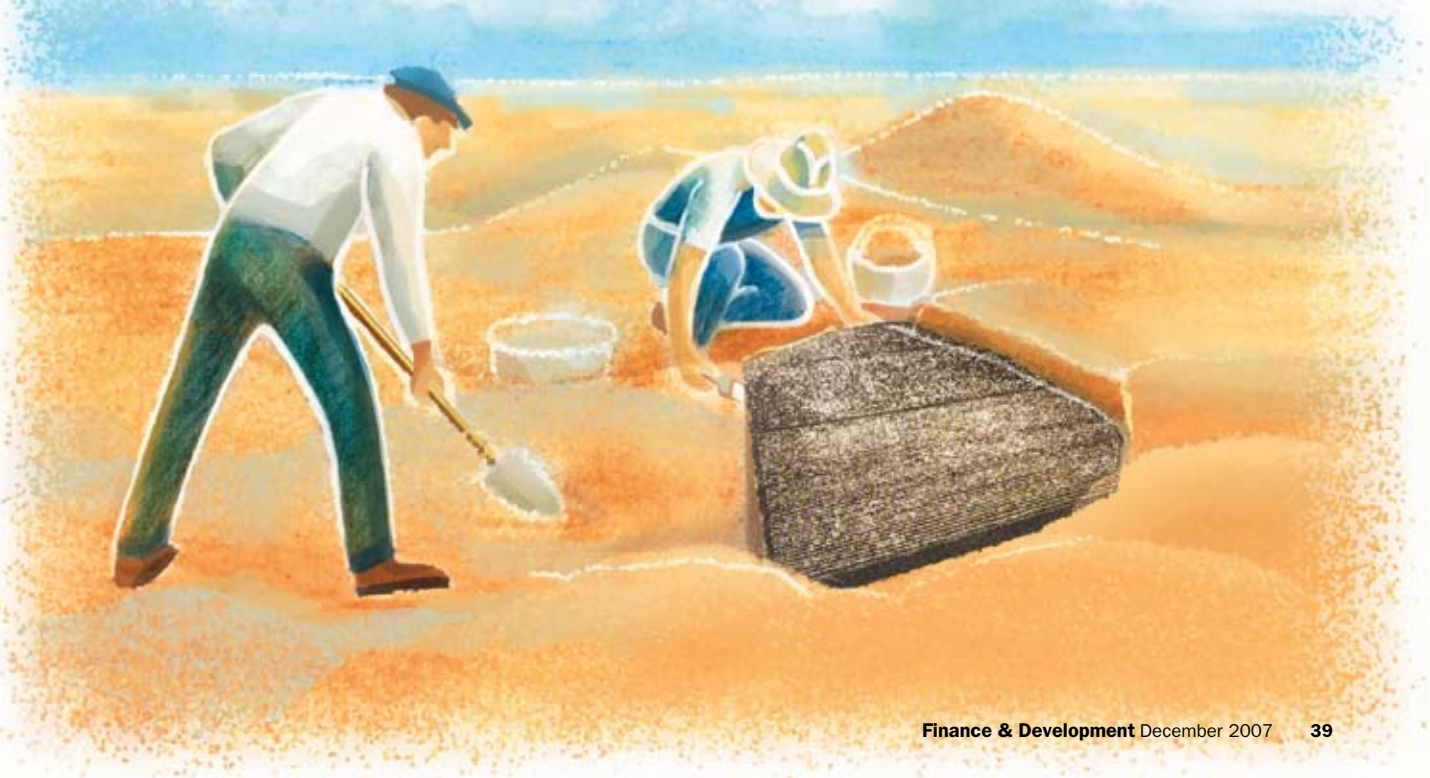
LATIN America is traditionally seen as economically volatile. Yet there has been relatively little work on the evolution of business cycles in the region and on how their main features compare with those of other countries and regions. That is somewhat surprising because business cycle volatility can be influenced by policy regimes, and Latin America has had a fair number of dramatic regime changes.

The region potentially could provide answers to such questions as, how do major shifts in policy regimes affect the business cycle, and are common external factors key to cyclical outcomes, perhaps as much as or even more so than policy regimes? But lack of data, especially before World War II, has hampered such research. A new technique seeks to compensate for those data deficiencies by reconstructing, or backcasting, GDP data using methods similar to those that economists have employed to identify and forecast business cycles.

We know that Latin America has swung from policy regimes that were highly open to foreign trade and capital (in the half century before the Great Depression) to regimes that were extremely closed to such outside links (in the decades following the Great Depression). Then, starting in the 1970s and more decidedly from the late 1980s, there was a return to a vigorous process of financial and trade liberalization.

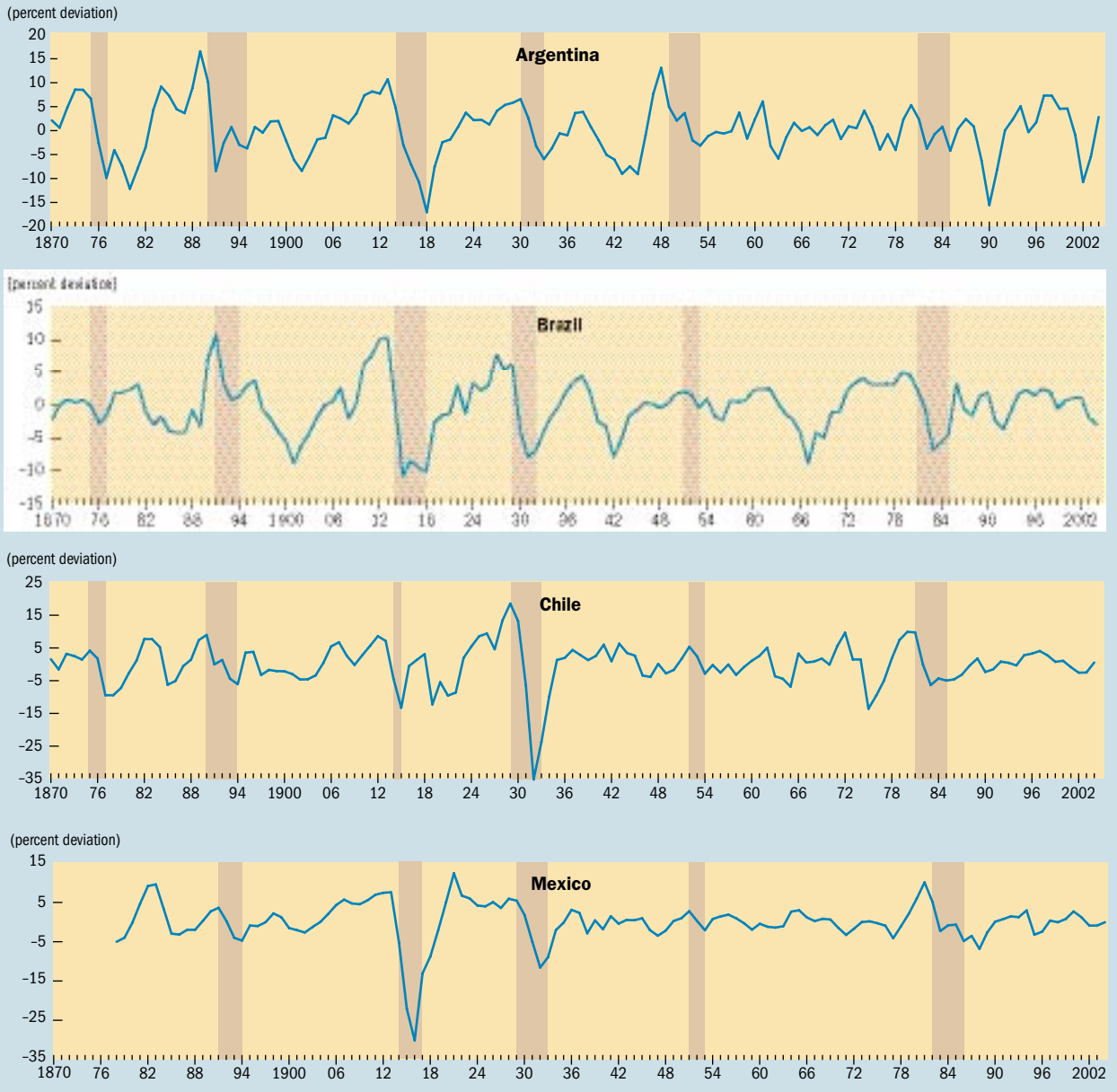
But there has been much debate over which, if any, of these contrasting regimes has made the Latin American economies more volatile and their shocks more persistent, magnifying both the risk and the depth of economic crises. One view, which goes back to Raul Prebisch (1950), sees cyclical volatility in the region as emanating, by and large, from financial and trade openness, because shocks to primary commodity prices and world interest rates, as well as the debt crises that often follow, tend to exacerbate output volatility. A contrasting view

Looking back at the business cycle in one of the most volatile regions requires reconstructing GDP data



Unearthing parallel cycles

Based on "backcasted" data, the GDPs of the four largest Latin American countries show similar deviations from trend between 1870 and 2004, suggesting a common influence on output.



Source: Aiolfi, Catão, and Timmerman (2006).

maintains that openness mitigates policy-induced volatility because of its disciplinary effects—open economies face a less acute employment and inflation trade-off (Romer, 1993) and higher costs of debt repudiation (Rose, 2005). A key question, then, is which view wins out when measured against the data?

Another important issue is the extent to which closer international links have contributed to some commonality in business cycle behavior across the region and how commonality has evolved. This is of particular relevance to the IMF, which has responsibility for multilateral surveillance to ensure global financial stability. It is also relevant for institutions such as the World Bank and the Inter-American Development Bank, which have significant portfolio exposure to the region. The strength of common business cycle factors could account for what are perceived as virulent "contagion" episodes, which make it extremely difficult for the countries to repay their debts at around the same time. Moreover, the stronger the common business cycle factor in a region, the smaller the value of risk sharing among the countries. That would

affect the soundness of such policy initiatives as creation of a regional development bank or cooperation among regional central banks to provide liquidity during financial crises.

Creating a new set of data

To address these questions from a broader historical perspective, researchers need business cycle indicators that span the various policy regimes. Such historical GDP data have been unavailable or unreliable for Latin America, notably for pre–World War II years, and the deficient data can produce inaccurate inferences from interperiod comparisons of cyclical behavior in these countries, leading to potentially misleading conclusions about crucial policy issues.

Against this background, we developed a new methodology for real GDP reconstruction that seeks to fill this data gap (Aiolfi, Catão, and Timmerman, 2006). In this new methodology, we show that reasonably accurate estimates of the aggregate business cycle can be constructed from a sensible combination of macroeconomic, financial, and sectoral indicators for which there are data stretching far back in time, at least for the largest Latin American economies. Underpinning this new methodology is the idea that a cross section of economic variables shares a similar factor structure. That is, fluctuations in any individual economic variable (such as manufacturing output, investment, or money supply) stem from the combination of a common factor that affects all individual economic variables in an economy plus a component that is specific to that variable. That approach is implicit in the pioneering business cycle work of Burns and Mitchell (1946)—which sought to identify the aggregate business cycle by looking at comovements across a wide range of economic variables—and has been more rigorously formalized in a recent econometric literature (Stock and Watson, 2002). While these models have typically been used for forecasting purposes, we show that they can also be used for backcasting—that is, to reconstruct aggregate indices of economic activity (see box).

We use this methodology to reconstruct historical real GDP estimates for four Latin American countries—Argentina, Brazil, Chile, and Mexico (the LA-4)—spanning 1870–2004 (see chart). Because these four countries accounted for some 70 percent of Latin America's GDP over the past century or so, this sample is reasonably representative of the region's overall macroeconomic performance.

"The stronger the common business cycle factor in a region, the smaller the value of risk sharing among the countries."

A backcast for Latin America

So what did our backcasting show? First, ***during the high-openness era before 1930, average business cycle volatility in LA-4 countries was typically much greater than in advanced economies and many emerging market peers.*** In particular, cyclical volatility was substantively greater than in other "new world" primary commodity exporters such as Australia and

Filling in the missing GDP

How did we go about constructing the missing GDP data for the four largest economies in the region (Argentina, Brazil, Chile, and Mexico) during the period 1870–2004? We used a technique called backcasting to put together 130 years or so of reliable GDP data for each country.

The missing GDP data for each country were built from about 25 available economic statistics for which long time-series data exist, such as manufacturing output, agricultural output, output of some service industries, investment, and financial data, including on the money supply and domestic interest rates. The technique is based on the notion that the value of each economic indicator can be derived from three fundamental influences: its own past behavior, economywide (or common) influences that affect all the statistics (some more strongly than others), and influences specific to that statistic only (such as a drought's effect on agriculture). Each economy was represented by about 25 equations, one for each of the variables.

Using a classical statistical technique called "principal components," economywide factors were extracted, yielding a weight (or coefficient) for each individual time series—the more strongly the common factor explains the behavior of the indicator, the higher the weight. These common factors were then correlated with the good GDP data that have existed since World War II. After the correlations were established and coefficients determined, they were applied to the common factors to reconstruct, or backcast, missing GDP data.

The methods used are similar to those analysts use to predict, or forecast, future GDP. Several tests were used to assess the accuracy of the technique, including applying it to U.S. data. As a test, we applied the method to the U.S. business cycle and compared the results with the good U.S. GDP data that existed. The method did a good job of gauging the timing and magnitude of U.S. business cycles before World War II.

Next, we used those GDP data to find what, if any, common economic factors drove the aggregate output of all the countries simultaneously. Because there were weak economic or financial relationships among the countries for most of the period, any factor affecting regional cyclical behavior was likely to come from outside the region.

To find the factor or factors that had an effect on the entire region, the data from the four economies were combined as if they were one. Techniques similar to those used to find the common factors that helped predict each country's GDP cycle were used to isolate influences that affected the region's business cycles. The two most important correlations, not unexpectedly, were with output and interest rates in advanced countries, although their importance has changed over time.

Canada and clearly much higher than that of the U.S. economy, which also had a large primary producing sector.

Second, the longer-range data show that ***there is not an unconditional positive relationship between business cycle volatility and openness.*** It has been widely argued that the inward-looking regimes that dominated the four decades after the Great Depression—characterized by import substitution, larger governments, and stringent trade and capital

"Recent trends toward greater cross-border capital flows within the region may not be very beneficial in terms of risk diversification for individual countries."

account restrictions—distorted relative prices and, as a result, dragged down long-run growth either contemporaneously, as in Argentina, or later, as in Brazil and Mexico following the 1982 debt crisis (Taylor, 1998). Yet the data show that these inward-looking regimes were instrumental in reducing output volatility during a period when world output and real interest rate volatility were at their highest.

Still, volatility in Latin America has declined to historic lows precisely over the past 15 years or so, at the same time that the countries have moved toward greater trade and financial openness and despite some major financial crises, such as Mexico's 1994 "Tequila" crisis and Argentina's default in 2001. That the LA-4 business cycle declined to historic lows during the more open regimes of the past two decades, when the business cycle in advanced economies has undergone a "great moderation," suggests that openness can enhance or inhibit cyclical volatility depending on other factors, such as the volatility of the world economy.

Third, ***when the LA-4 economies were hit by a shock, such as a rise in world interest rates, the impact on output persisted for a long time.*** As with cyclical volatility, cyclical persistence was highest before 1929 and declined during the heyday of inward-looking regimes through 1970 before rising and declining again. Over the whole 1870–2004 period, cyclical persistence in the LA-4 countries remained above the advanced economy average, as well as above the respective averages for other emerging market groups. Because persistence boosts the effects of output shocks, the result was deeper and more prolonged cycles.

The bottom line is that greater openness is not unconditionally associated with either higher cyclical volatility or persistence. Other factors are also at play.

A common regional cycle

Against this background, a question that arises is whether there is a significant business cycle factor common to these economies with effects that are impervious to national differences in policies and policy regimes. Our methodology allows us to gauge this common factor (and its tendency to impel greater cyclical synchronicity across the region) by pooling the various sectoral, macroeconomic, and financial series of each country and extracting from them any factors common to all. The backcasted GDP for the LA-4 countries showed that business cycles in each country bear some similarity in timing and magnitude, suggesting that the four countries were experiencing common regional influences. Until recently, the countries had few trade and financial linkages with each other (nearly all their trade was with Europe or the United States). So the effort was to find common external factors.

What did we find? Certainly, several major cyclical turning points have been roughly simultaneous across the LA-4—notably, the downturns associated with the famous Barings crisis of 1890, World War I, the 1929 Wall Street crash, and the debt crisis that began in 1982. The regional factor correlates relatively consistently with the individual countries' cycles throughout 1870–2004 (see table, upper panel). Such correlations did weaken somewhat during the closed regimes of 1930–70, but not by much—which is striking because the weak linkages should have resulted in little regional commonality. The supposedly stringent trade and capital controls in effect during the period should have sharply reduced common external influences, and the insignificant intraregional trade could not account for common cyclical behavior.

The correlation of a common regional (or world) factor with individual country cycles strengthened again follow-

The common factor

For most of the period from 1870 to 2004, changes in GDP in Latin America were heavily affected by a common, outside influence. . .

	1878–1929	1930–70	1971–87	1988–2004
Argentina	0.68	0.56	0.29	0.80
Brazil	0.80	0.66	0.63	0.60
Chile	0.70	0.82	0.84	0.74
Mexico	0.86	0.75	0.83	0.43
Median	0.75	0.71	0.73	0.67

. . . that turned out to be mainly output changes and interest rate movements in foreign economies, largely the United States and Europe.

	1880–1929	1930–70	1971–2004
Foreign real interest rate[1]	–0.19	–0.20	–0.23
Foreign output[2]	0.23	0.12	0.42

Source: Aiolfi, Catão, and Timmerman (2006).
Note: The closer the values are to 1 in the upper panel, the greater the correlation of the respective country cycle with the common GDP movement in the LA-4 region.
[1]Three-month bond rate (or short-maturity equivalent) in the United Kingdom and the United States. The sign indicates the direction of the impact. A 1 percentage point rise in foreign interest rates in 1880–1929, for example, resulted in a 0.19 percent decline in LA-4 GDP relative to trend.
[2]Output gap measured as weighted real GDP (in deviations from trend) in G-8 countries. An increase in the output gap (the amount that real GDP is below its trend) in foreign economies results in an increase in the output gap in LA-4 countries. A 1 percent rise in the G-8 countries spelled a 0.42 percent rise in LA-4 countries during 1971–2004.

ing the various external shocks of the 1970s and 1980s, but declined again in 1988–2004. In this latter period, our estimates point to some decoupling by Chile and, more dramatically, by Mexico from that world factor. Yet our calculations also show that the common regional factor is still far from negligible for both countries.

What drives this common regional factor? It was advanced economy output and real interest rates that clearly had a significant bearing on the common regional cycle during the pre-1930 policy regimes. A 1 percentage point increase in the external output gap (that is, when output in foreign countries falls a percentage point below its trend) typically increased the output gap in the LA-4 countries by some 0.23 percentage point. Increases in the real external interest rate have a similarly sized depressing effect (see table, lower panel).

"Volatility in Latin America has remained higher than in Asia and emerging Europe, and persistence has been higher than in any other region, including Africa and the Middle East."

Interestingly, this external interest rate effect stays at roughly the same magnitude through the post-1930 inward-looking regimes, suggesting that capital controls were not particularly effective in cutting off linkages with core financial markets in advanced countries. In contrast—and consistent with the role of protectionist trade policies and sharply lower trade shares in GDP in all countries in the region—the impact of changes in external output was reduced by about half, to 0.12 percentage point. This is sharply reversed in the post-1970s period, when the regional cycle becomes far more responsive to world output—a 1 percentage point change in external activity affects LA-4 output by 0.42 percentage point. Output and interest rate cycles in the United States and other advanced countries have moderated over the past two decades, and performance in the LA-4 implies that such a "great moderation" has also had a significant dampening effect on business cycles in those four countries.

Limits to regional arrangements

The evidence also suggests that the scope for regional risk sharing is relatively limited. From this perspective, recent trends toward greater cross-border capital flows within the region may not be very beneficial in terms of risk diversification for individual countries, even though there may be important gains on other fronts. Such limited scope for regional risk sharing also means that there is a potentially important role for lender-of-last-resort arrangements with countries and institutions that have funding sources outside the region.

More stable world interest rates and greater business cycle moderation in advanced countries have been important to the recent benign external environment for developing countries in general and Latin America in particular. Years of plenty can be the right time to evaluate performance relative to historical benchmarks. The data suggest there has been much improvement. This is certainly consistent with better policy management and institutional reforms that have reduced the scope for distorting government intervention and for instability that is policy induced. Yet the data also suggest that some of these improvements (notably the fall in business cycle volatility) reflect exceptionally favorable external conditions. That the decline in cyclical volatility is not solely the preserve of Latin America, but has been observed across a wide spectrum of emerging markets, underscores this point.

Moreover, Latin America's business cycle performance still lags behind that of other emerging market peers (notably Asia). Volatility in Latin America has remained higher than in Asia and emerging Europe, and persistence has been higher than in any other region, including Africa and the Middle East. These differences in cyclical indicators are important because higher cyclical persistence, coupled with the likelihood of large shocks, tends to raise interest rate spreads and the incidence of debt crises and, hence, drag down economic growth (Catão, Fostel, and Kapur, 2007). ■

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References:

Aiolfi, Marco, Luis A.V. Catão, and Allan Timmerman, 2006, "Common Factors in Latin America's Business Cycles," IMF Working Paper 06/49 (Washington: International Monetary Fund).

Burns, Arthur F., and Wesley C. Mitchell, 1946, Measuring Business Cycles *(New York: National Bureau of Economic Research).*

Catão, Luis A.V., Ana Fostel, and Sandeep Kapur, 2007, "Persistent Gaps, Volatility Types and Default Traps," IMF Working Paper 07/148 (Washington: International Monetary Fund).

Kose, M. Ayhan, Eswar S. Prasad, and Marco E. Terrones, 2006, "How Do Trade and Financial Integration Affect the Relationship Between Growth and Volatility?" Journal of International Economics, *Vol. 69, pp. 176–202.*

Prebisch, Raul, 1950, The Economic Development of Latin America and Its Principal Problems *(New York: United Nations Economic Commission for Latin America).*

Romer, David, 1993, "Openness and Inflation: Theory and Evidence," Quarterly Journal of Economics, *Vol. 108, pp. 869–903.*

Rose, Andrew K., 2005, "One Reason Countries Pay Their Debts: Renegotiation and International Trade," Journal of Development Economics, *Vol. 7, pp. 189–206.*

Stock, James H., and Mark W. Watson, 2002, "Macroeconomic Forecasting Using Diffusion Indexes," Journal of Business and Economic Statistics, *Vol. 20, pp. 147–62.*

Taylor, Alan M., 1998, "On the Costs of Inward-Looking Development: Price Distortions, Growth and Divergence in Latin America," Journal of Economic History, *Vol. 58, pp. 147–84.*