3. To Hike or Not to Hike: Is That an Option for Latin America? Assessing Monetary Policy Autonomy

While Latin America experiences a sharp economic slowdown, a stronger U.S. economy is setting the stage for the Federal Reserve to continue normalizing its monetary stance. This chapter quantifies the likely impact and possible risks for domestic financial conditions in Latin America, and explores to what extent its central banks will be able to keep rates aligned with domestic objectives. It also sheds light on the policies that can serve to enhance monetary autonomy in the future.

As the U.S. economic outlook strengthens, the Federal Reserve is preparing to raise policy rates for the first time in almost a decade. After several years of policy rates at the zero lower bound, unconventional operations, and long-term rates and term premiums at historically low levels, many market analysts and policymakers are anxious about the global implications of the normalization of U.S. monetary policy.

While the upcoming tightening reflects an improving U.S. economic outlook and is among the most analyzed and anticipated monetary policy moves in recent history—suggesting that market participants have already priced it in to a large extent—it could still generate sudden disruptions in global financial markets. First, the actual move by the Federal Reserve may lead agents to revise upward their expectations about the future path of U.S. short-term rates, in turn raising longer-term yields. Second, the lift-off could be accompanied by uncertainty about the future rate path and increased risk aversion, both drivers of global term premiums.

This prospective change in global conditions finds Latin America amid a persistent deceleration in economic activity with rising unemployment. While structural factors explain part of the slowdown, many economies in the region are now estimated to be operating below potential. Thus, keeping domestic monetary conditions neutral or supportive would generally seem appropriate where inflation expectations are well-anchored (see Chapter 2).

Despite this context, monetary policy committees throughout the region have been considering the possibility of raising rates in their recent meetings. And, in fact, a quick glance at international data suggests that interest rates do co-move strongly with external financial conditions and with U.S. policy rates in particular. This raises the broader question of whether, in a highly integrated global financial system, monetary authorities around the world have full autonomy to tailor policy rates to their domestic macroeconomic conditions.[1]

Can monetary authorities in Latin America avoid a tightening of financial conditions that is not warranted by the domestic cycle? Or will tightening alongside the Federal Reserve become a necessity?

This chapter attempts to address this question by measuring the degree of monetary autonomy in Latin America since the early 2000s, exploring policies that can help to increase it, and shedding light on the likely impact and risks associated with U.S. monetary policy normalization.

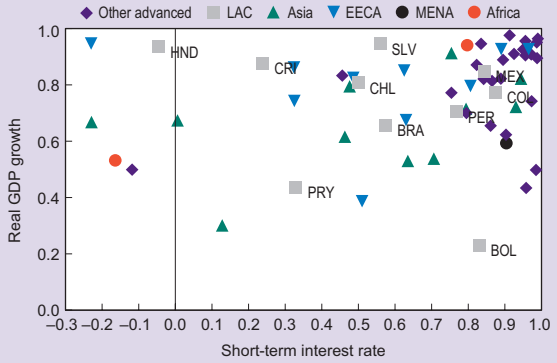
Co-movement in Financial Conditions: A First Glance

How do financial conditions in Latin America move in relation to global financial conditions and, in

Note: Prepared by Carlos Caceres, Yan Carrière-Swallow, and Bertrand Gruss. Steve Brito and Genevieve Lindow provided outstanding research assistance. Ishak Demir provided valuable contributions to the chapter. See Caceres, Carrière-Swallow, and Gruss (forthcoming) for technical details.

[1] The debate on the ability of open economies to implement autonomous monetary policies in the context of a highly integrated global financial system has intensified recently. See, for instance, Rey (2015) and Obstfeld (2015).

Figure 3.1
Synchronicity of Global Output and Interest Rate Cycles Across Countries
(Correlation with global component)



Sources: IMF, International Financial Statistics database, and IMF staff calculations.
Note: LAC includes Bolivia, Brazil, Chile, Colombia, Costa Rica, El Salvador, Honduras, Mexico, Paraguay, and Peru. Asia includes Bangladesh, China, Hong Kong SAR, India, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan Province of China, Thailand, and Vietnam. EECA includes Albania, Bulgaria, Croatia, Czech Republic, Hungary, Kazakhstan, Latvia, Poland, Romania, Russia, and Slovenia. MENA includes Egypt and Saudi Arabia. Africa includes Kenya and South Africa. Other advanced includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Malta, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and United States. For each variable, the global component is computed as the first principal component for all the countries in our sample over the period from January 2000 to December 2014.

particular, U.S. monetary policy? Is this correlation in financial conditions different from that of real business cycles? A principal component analysis of output growth, price inflation, and interest rates for a large set of countries sheds light on these questions.[2]

At least since the early 2000s, there has been substantial co-movement of interest rates across a large sample of advanced and emerging market economies. Indeed, short-term interest rates tend to exhibit a positive correlation with the global component in most countries (Figure 3.1). The co-movement over the past decade has been particularly strong among advanced economies, with an average correlation of about 0.9. Yet, a relatively high degree of co-movement with the global component is also observed for interest rates among the most financially integrated economies of Latin America (Brazil, Chile, Colombia, Mexico, and Peru; LA5 hereafter). The average correlation of LA5 short-term interest rates with the global factor is slightly above 0.7, comparable with that of financially integrated economies in Asia (for example, Hong Kong SAR, Singapore, South Korea, and Taiwan Province of China). Other Latin American countries, such as Costa Rica, Honduras, and Paraguay, show more limited co-movement with global short-term rates. The patterns are similar in the case of long-term interest rates.

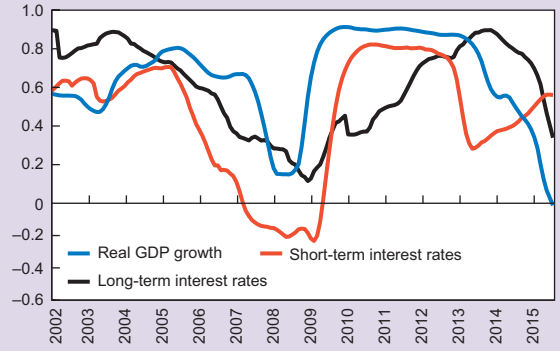
This synchronicity of interest rates may simply reflect a high degree of co-movement in business cycles across countries. Indeed, all countries in our sample exhibit a positive correlation of real GDP growth with the corresponding global component (Figure 3.1). On average, countries that exhibit a high degree of synchronicity with the global factor in terms of interest rates also tend to show a high degree of co-movement in terms of output growth and price inflation.

It is often argued that the degree of co-movement in asset prices is increasing over time, driven by deeper integration of financial markets.[3] Indeed, the degree of co-movement of interest rates with respect to the corresponding global factor varies over time. For instance, the degree of synchronicity of LA5 short-term interest rates with the global factor has reached particularly high levels in recent years (Figure 3.2). However, these fluctuations tend to mimic the variations in synchronization of business cycles across countries, which increased strongly around the global financial crisis. This underscores the need to account carefully for co-movement in business cycles when assessing linkages from global to domestic financial conditions. We turn to this in the following sections.

[2] See Annex 3.1 for a description of the principal component analysis.

[3] See, for instance, Obstfeld, Shambaugh, and Taylor (2010) and Rey (2015).

Figure 3.2
LA5: Evolution of Correlation with Global Component
(Average correlations across LA5 with corresponding global component; four-year moving average)



Sources: IMF, International Financial Statistics database, and IMF staff calculations.
Note: LA5 includes Brazil, Chile, Colombia, Mexico, and Peru. For each variable, the global component is computed as the first principal component for all the countries in our sample over the period from January 2000 to December 2014.

From Global Financial Conditions to Domestic Interest Rates: Quantifying the Linkages

How are changes in global or U.S. financial conditions transmitted to interest rates in different economies? We estimate a set of country-specific vector autoregression (VAR) models using monthly data since the early 2000s to quantify the reaction of domestic interest rates to changes in external financial variables.[4,5] Our analysis is largely focused on the effects of changes in U.S. interest rates, as these are a key driver of global financial conditions, but we also consider model specifications that include financial conditions in the euro area.[6]

The first model includes the federal funds rate as an exogenous variable and short-term market interest rates as the domestic variable.[7] Short-term rates react quite differently across countries to movements in the federal funds rate (circles in Figure 3.3, panel 1).[8] For instance, a 100-basis-point hike in the federal funds rate leads to an increase of 95 basis points and 80 basis points in Mexican and Peruvian short-term rates, respectively. The response to the same shock in Canada and Israel is about 60 basis points, and only 20 to 40 basis points in Argentina, Bolivia, Chile, Costa Rica, and Uruguay. Short-term rates in Colombia, in turn, exhibit responses close to zero, and the response is negative—though not significant—in the case of Brazil. The average response for a broad sample of emerging markets outside Latin America is less than 10 basis points, while the average response for advanced economies is about 30 basis points.

Movements in short-term rates are only part of the story, since many economic decisions depend on longer-term rates. Moreover, the Federal Reserve has conducted monetary policy by influencing the longer end of the yield curve through quantitative easing and forward guidance since the policy rate hit the zero lower bound during the global financial crisis.

Long-term rates typically do not react much to changes in the federal funds rate. A notable

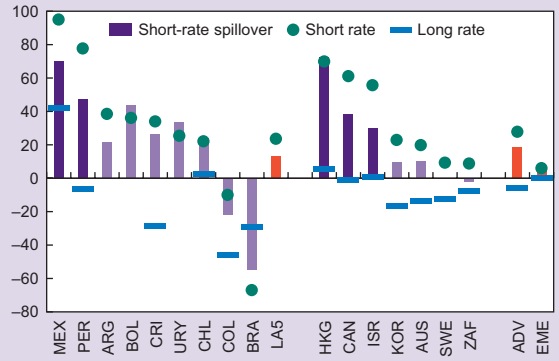
[4] See Box 3.1 for a brief discussion of potential effects on capital flows.
[5] All model specifications share the assumption that domestic variables do not affect global variables. Following the results in Chen, Mancini-Griffoli, and Sahay (2014), we also include the VIX in the exogenous block to account for changes in global risk sentiment. See Annex 3.1 for details.
[6] For instance, Ricci and Shi (forthcoming) report that movements in U.S. interest rates can explain 70 percent of the variation in the policy rates of the 30 largest economies.
[7] We use interest rates on short-term government bonds (with maturity of about three months; see Annex 3.1). Even though this interest rate is not the monetary policy instrument, it should be closely linked to changes in the monetary policy stance. In fact, if changes in the policy instrument did not heavily influence this short-term interest rate in local currency, it would be hard to argue that the central bank can affect domestic monetary conditions at all.
[8] Throughout the chapter we focus on cumulative impulse response functions of models after 12 months to allow transmission to be fully realized.

Figure 3.3

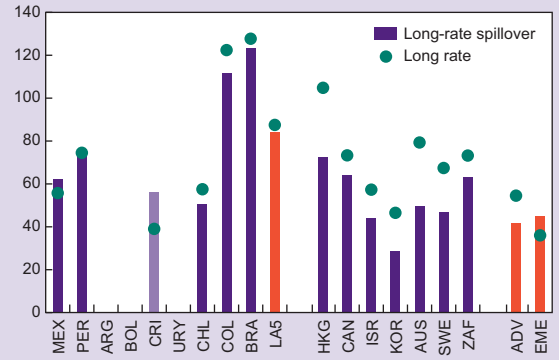
Assessing the Impact of Movements in U.S. Interest Rates

(Cumulative response of domestic interest rates to a 100-basis-point permanent increase in U.S. rates; in basis points)

1. Response to an Increase in the Federal Funds Rate



2. Response to an Increase in the 10-Year U.S. Treasury Bond Yield



Source: IMF staff calculations.
Note: The charts show the cumulative response after 12 months to a shock that increases the federal funds rate (panel 1) or the 10-year U.S. Treasury bond yield (panel 2) by 100 basis points after 12 months.
"Short rate spillover" and "Long rate spillover" denote the responses of domestic interest rates that have been purged from the effect of the domestic business cycle (see Annex 3.1). Solid bars denote that the response is statistically significant at the 5 percent confidence level.
ADV and EME denote averages for the set of countries listed under Advanced and Non-LA Emerging Markets, respectively, in Annex Table 3.1.

exception in the region is Mexico, where long-term rates are estimated to rise by about 40 basis points. Movements in 10-year U.S. bond yields, however, typically have a greater impact on corresponding domestic rates—and in a more similar fashion across countries—than changes in the federal funds rate (circles in Figure 3.3, panel 2). After a 100-basis-point increase in U.S. Treasury yields, long-term rates in emerging market and advanced economies increase by an average of 35 and 55 basis points, respectively. The average response of long-term rates in LA5 economies is even larger, at about 90 basis points. Brazil stands out with a response of about 130 basis points, followed by Colombia (120 basis points). The response in the other LA5 countries lies between 55 and 75 basis points.

Synchronization or "Spillovers"?

As discussed above, there is nothing surprising or inherently undesirable about domestic financial conditions being synchronized with conditions of international financial markets. For instance, countries with strong trade and financial linkages to the United States—such as Canada and Mexico—will tend to have an economic cycle that is highly synchronized with the U.S. cycle. In such cases, changes in domestic financial conditions may be broadly aligned with U.S. financial conditions, without posing challenges to achieving price and output stabilization objectives. A tension could emerge, however, in a case where domestic financial conditions are driven by foreign conditions that are out of sync with the domestic business cycle. To distinguish between these cases, we use a multi-stage VAR procedure (see Annex 3.1).

In the first stage, we estimate a Taylor-type rule for the dynamic relationship between domestic interest rates and 12-months-ahead forecasts of inflation and output growth, as reported by Consensus Economics. These market forecasts are meant to capture changes in the economic outlook due to both idiosyncratic and global factors. The residuals or unexplained components from these estimations can be interpreted as deviations from the historical policy reaction function that characterizes the central bank's efforts to stabilize the domestic cycle. These unexplained interest rate movements could reflect other central bank objectives beyond preserving price stability, including financial stability concerns, and thus

could well be welfare-enhancing.[9] Nonetheless, they entail changes in domestic monetary conditions beyond what can be attributed to the central bank's usual response to inflation and output developments.

In the second stage, we seek to quantify to what extent these residual movements in domestic interest rates can be explained by movements in global financial conditions. To do so, we substitute the domestic interest rates in the country-specific VAR models with the corresponding residuals from our first-stage estimation. We label the second-stage estimated responses to global financial shocks as *spillovers*, and expect these to be low where monetary autonomy is high.

In general, the *spillover* response of domestic short-term rates after a 100-basis-point increase in the federal funds rate (depicted with bars in Figure 3.3) is smaller than the overall response reported earlier (20 basis points lower on average). That is to say, an important portion of the co-movement in interest rates is simply a reflection of synchronized business cycles, and thus cannot be construed as inconsistent with monetary autonomy.

Nonetheless, estimated *spillovers* to domestic short-term rates are statistically significant in 8 out of 46 advanced and emerging market economies, where they average a nontrivial 40 basis points, but differ substantially across countries.[10] Interestingly, these economies include countries with fully flexible exchange rates and well-established central bank credibility, such as Canada and Israel.

In Latin America, the *spillover* response to short-term rates is significant and large in the cases of Mexico (about 70 basis points) and Peru (about 50 basis points), but smaller and not statistically significant in the other countries. This is not surprising given the tight financial links with the United States in the former and the high degree of dollarization in the latter. In the current juncture, where the U.S. and Latin American business cycles seem out of sync, our results suggest that a co-movement with U.S. rates would be more likely in Mexico and Peru than elsewhere.[11]

Turning to the longer-end of the yield curve, the *spillover* response (bars in Figure 3.3, panel 2) is essentially the same as the overall response (circles).

Our approach is subject to common empirical limitations. While we should employ the central bank's internal forecasts used to inform the policy decision, these are only publicly available for a handful of countries and with a significant delay. The market forecasts that we use instead are subject to two limitations. First, there is a timing problem because they are not collected on the day of monetary policy decisions.[12] While this could potentially bias our *spillover* estimates, we find that using alternative timings does not significantly alter our results.[13] Second, even if timing were not an issue, market forecasts may incorporate

[9] Consider the case of a central bank that decides to increase interest rates in the face of a shock that would otherwise lead to exchange rate depreciation. Our procedure identifies the part of the rate increase that can be explained by its concern for the second-round effects on inflation, as captured by its historical behavior. The remainder is considered unexplained, even though it could correspond to an explicit intent to contain vulnerabilities from balance sheet mismatches in order to preserve financial stability.

[10] The eight economies that show significant *spillover* responses are Canada, Hong Kong SAR, Israel, Mexico, Peru, Saudi Arabia, Singapore, and Taiwan Province of China.

[11] Note that our estimates reflect historical average effects, and thus do not fully capture improvements in policy frameworks that have been implemented since 2000.

[12] We use lagged market forecasts to ensure that they are predetermined with respect to policy decisions, but this reduces their information content.

[13] An event that occurs between the forecast date and the policy decision and which affects rates in both countries could be (wrongly) considered a *spillover* response. However, using forecasts from the same month as the decision or the following month does not significantly affect results. For instance, the estimated *spillover* to Mexico remains significant and in the range of 59 to 66 basis points.

expected policy responses.[14] In practice, however, monetary policy only affects economic conditions with a significant delay. Accordingly, movements in 12-months-ahead market forecasts should be highly correlated with movements in the central bank's internal forecasts.

In sum, we find that a large portion of the response of short-term interest rates to movements in U.S. rates can be attributed to the synchronicity of business cycles across countries. However, we also find that, for several countries, including a few in Latin America, movements in U.S. rates generate significant *spillovers* to domestic short-term rates above and beyond what can be explained by standard business-cycle co-movement.

Exploring the Determinants of Monetary Autonomy

What determines a country's exposure to unexplained monetary tightening (or loosening) due to external financial shocks? The traditional trilemma framework points to the degree of exchange rate flexibility and capital account openness as the main determinants of monetary policy autonomy. More recently, Rey (2015) has questioned the dimensions of the trade-off, arguing that autonomy can only be achieved by restricting the capital account. Our results lay somewhere in between. Even countries with flexible exchange rates display significant *spillovers* from global financial conditions. However, their magnitudes vary a great deal, suggesting that other factors may also affect the tradeoffs underlying monetary autonomy.

In this section, we use a panel VAR estimation approach to exploit the differences in *spillovers* across countries and explore how these are affected by policy choices and characteristics of the domestic financial system.[15]

We find that, indeed, maintaining a fully flexible exchange rate regime sharply reduces the degree of *spillovers* to domestic short-term rates. Specifically, for a country with a relatively open capital account, the *spillover* effect declines from about 30 basis points under a fixed exchange rate to about 10 basis points under a floating exchange rate and to only 3 basis points under a fully flexible regime (Figure 3.4, panel 1).[16,17] In turn, opening the capital account increases the degree of *spillover* for a country with a flexible exchange rate regime.

But other factors also matter. Figure 3.4 (panel 2) shows that under a floating exchange rate and a relatively open capital account, increased financial dollarization, the presence of global banks in the domestic financial system and perceived fiscal vulnerability all reduce the degree of monetary autonomy. Foreign ownership of sovereign debt does not seem to affect the degree of *spillovers*. Conversely, an active use of reserve requirements and greater central bank credibility reduce the intensity of *spillovers*.

The size of these effects is also economically meaningful. Take the example of financial dollarization, which reduces the ability of balance sheets to absorb large exchange rate movements driven by external shocks. Our estimates suggest that reducing financial dollarization, proxied by the share of bank deposits denominated in foreign currency, from 60 percent—the level observed in Peru over our estimation sample—to the median level in our sample (about 6 percent), decreases

[14] Under this argument and if the central bank is fully credible, market forecasts might not move at all in response to a shock that would otherwise affect output growth and inflation because agents anticipate that the central bank will do whatever is necessary to neutralize the shock.

[15] The model setup follows Towbin and Weber (2013). See Annex 3.1 for more details.

[16] The exchange rate regime classification follows Ilzetzki, Reinhart, and Rogoff (2009).

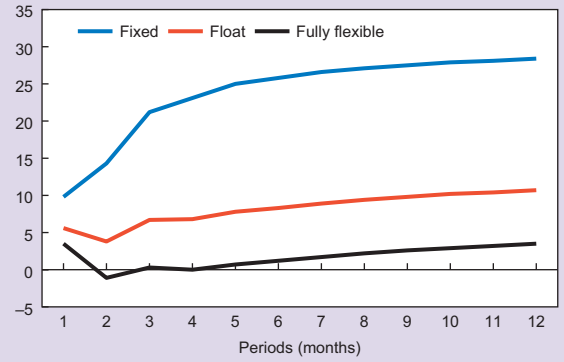
[17] This finding is in line with Obstfeld's (2015) panel analysis for a similar broad sample of countries, and the narrative approach in Claro and Opazo (2014) and De Gregorio (2014) for the case of Chile.

Figure 3.4

Determinants of Spillovers

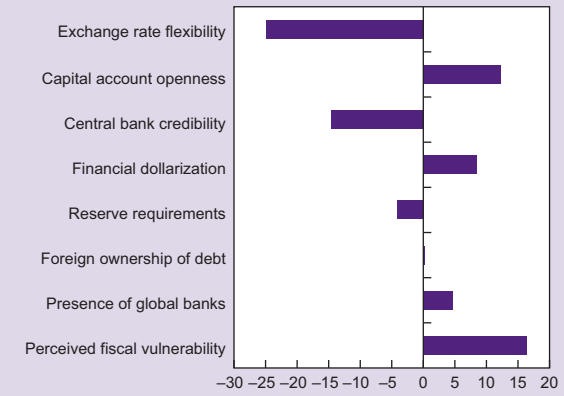
1. Cumulative *spillover* response of domestic short-term rates to a 100-basis-point increase in the U.S. federal funds rate under alternative exchange rate regimes for countries with high capital account openness

(Basis points)



2. Difference in *spillover* responses of short-term rates to a 100-basis-point shock to the U.S. federal funds rate for alternative values of fundamentals

(Basis points)



Source: IMF staff calculations.

Note: The impulse responses are estimated with an Interacted-Panel VAR (see Annex 3.1). Each bar denotes the difference in the responses when that fundamental moves from the lower (3rd decile) to the higher (7th decile) end of its empirical distribution holding other fundamentals at their median values, except for the exchange rate that is set as floating. "Exchange rate flexibility" is an updated version of Ilzetzki, Reinhart, and Rogoff (2009). "Capital account openness" is from Aizenman, Chinn, and Ito (2010). "Central bank credibility" index is based on inflation forecast disagreement as described in Annex 3.1. "Financial dollarization" is an updated version of Levy-Yeyati (2006). The index on the active use of "Reserve requirements" is from Cordella and others (2014). "Foreign ownership of (sovereign) debt" is from Ebeke and Kyobe (2015). "Presence of global banks" follows Cetorelli and Goldberg (2012). The "Perceived fiscal vulnerability" is proxied by credit default swap spreads. See the list of countries included in Annex Table 3.1.

the extent of *spillovers* by about 25 basis points in response to a U.S. monetary tightening. Of course, many of these variables are slow-moving fundamentals, and changing them would require persistent policy action, along with a broader assessment of their welfare implications.

What Can Latin America Expect from U.S. Monetary Policy Normalization?

The analysis presented so far reflects average responses to movements in U.S. interest rates. But the actual effect on Latin American interest rates from the upcoming U.S. monetary policy normalization will depend on the combination of underlying developments that drive the U.S. rates. Is it an anticipated response to a better economic outlook as reflected in current futures-implied market expectations? Will it be attenuated by accommodative monetary policy in other major advanced economies? Will the term premium remain compressed? In this section, we attempt to quantify the expected impact on domestic rates under different scenarios surrounding these questions.

Do the Nature and Source of Global Financial Shocks Matter?

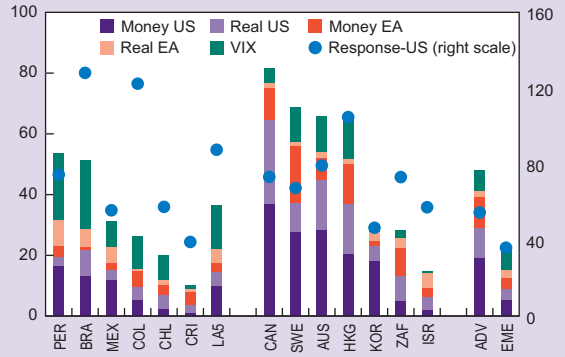
The impact of a Federal Reserve policy decision will likely differ if it responds to a better economic outlook or reflects tighter monetary conditions alone. One reason is that decisions responding to an improved economic outlook are easier to anticipate, and may already be priced in by financial markets before they occur. An unanticipated rate hike, in turn, is likely to generate sharper adjustments of asset prices than one that has been fully anticipated. Another channel is that the better U.S. outlook will itself have implications for many global variables, including demand for exports and commodity prices, which will affect countries differently.

To analyze these issues, we decompose movements in U.S. and euro area 10-year bond yields according to whether they respond to movements in global risk aversion, unexpected monetary tightening, or an improved economic outlook in each of the

Figure 3.5

What Drives Long-Term Interest Rates? Expected and Unexpected Shocks to 10-Year Bond Yields in the United States and the Euro Area

(Share of variance explained by each component; percentage points, left scale. Cumulative response after 12 months; basis points, right scale)



Source: IMF staff calculations.
Note: The bars denote the variance decomposition (in percent, left scale) of domestic long-term interest rates attributable to expected ("Real US") and unexpected ("Money US") changes in 10-year U.S. bond yields; expected ("Real EA") and unexpected ("Money EA") changes in euro area 10-year bond yields; and global risk sentiment, as proxied by the VIX index. The shock decomposition and identification are based on Osorio Buitron and Vesperoni (forthcoming); see Annex 3.1.The markers denote the cumulative response after 12 months (in basis points, right scale) of domestic long-term interest rates to a permanent increase of 100 basis points in the 10-year U.S. Treasury bond yields ("Response-US," which is the same as in Figure 3.3, panel 2). "ADV" and "EME" denote averages for the set of countries listed under Advanced and Non-LA Emerging Markets, respectively, in Annex Table 3.1.

two economies.[18] We then include these identified drivers of global long-term rates among the exogenous variables of our model, while long-term government bond yields are included in the domestic block. Figure 3.5 (bars) shows the share of variation in domestic long-term rates that can be attributed to each of these drivers. It also shows (circles) the cumulative response of domestic rates to a 100-basis-point increase in 10-year U.S. bond yields previously reported.

The first result that stands out is that monetary surprises significantly affect bond yields around the world, and Latin America is no exception. Indeed, movements in global long-term rates that are driven by an unexpected monetary tightening explain a larger fraction of the variability in domestic rates than those driven by an improved economic outlook. The contribution from monetary surprises among the external factors excluding the VIX is about 70 percent in advanced economies and 60 percent in emerging economies. Among LA5, the share is about 60 percent, with individual shares ranging from about 45 percent in Chile to about 70 percent in Colombia.

Another important feature at the current juncture is that the United States is set to start normalizing its monetary policy while other major economies, such as the euro area and Japan, are maintaining a highly accommodative stance. An interesting question in this context is how much of an attenuating effect this asynchronicity of advanced economy monetary policies could provide for Latin America.

The results suggest that the relief Latin America may receive will be limited, where movements in U.S. rates are the main source of global financial shocks. Indeed, the share of total variation in domestic bond yields in LA5 economies attributable to U.S. shocks is twice the share corresponding to euro area shocks.

Finally, it is worth noting that idiosyncratic factors still explain a large fraction of interest rate movements in Latin America. For instance, an increase in U.S. yields has a much larger effect on interest rates in Brazil and Colombia than in the average advanced economy. However, the share of the overall interest rate variability attributable to U.S. yields is comparable across these groups of countries.

Assessing the Effects of Shocks to the Term Premium

Another potential source of risk surrounding the normalization of U.S. monetary policy is a sudden

[18] The method was first proposed by Matheson and Stavrev (2014) and has been further extended by Osorio Buitron and Vesperoni (forthcoming) to incorporate global risk aversion and euro area yields. Note that while the identification strategy cannot distinguish between monetary policy shocks and inflationary surprises, our interest is in distinguishing expected interest rate movements associated with changes in the economic outlook. See Annex 3.1.

decompression of the term premium—that is, the difference between the 10-year yield and the average of expected future short-term rates over the same horizon—which is currently at historically low levels.[19]

To assess the potential impact from a rise in the term premium, we include the decomposition of the 10-year U.S. Treasury bond yield into the expected path of short-term interest rates and the term premium as exogenous variables in the country-specific VAR models.[20]

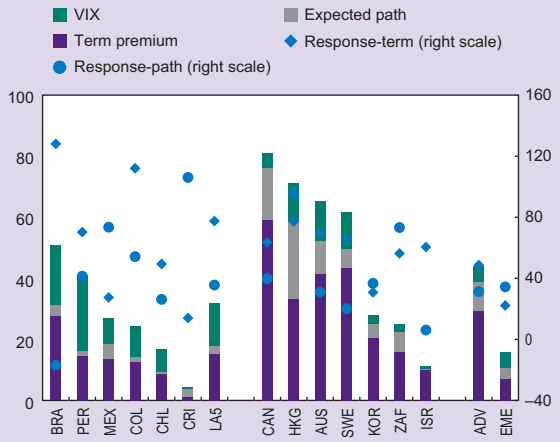
Our results confirm that movements in the term premium are a major source of spillovers of long-term interest rate shocks across countries, and in particular for Latin America (bars in Figure 3.6). On average, for a sample of 42 advanced and emerging market economies, we find that shocks to the U.S. term premium account for about three-fourths of the variance in domestic long-term rates attributable to shocks to U.S. rates. This share is as large as 85 percent on average for LA5 economies.

In terms of the magnitude of the responses to a shock in the term premium, our results suggest that the average response of domestic long-term rates across countries is somewhat larger if the shock is entirely driven by a movement in the term premium rather than to a change in the expected path of short-term rates in the United States (markers in Figure 3.6).[21] The median difference in our sample is about 15 basis points. For LA5 economies, the average difference is larger—about 45 basis points—but with some heterogeneity across countries. In the case of Mexico, for instance, a term premium shock is associated with a smaller impact than a shock to the expected path of short rates.

Figure 3.6

What Drives Long-Term Interest Rates: U.S. Term Premium, Expected Path of U.S. Monetary Policy, or Global Risk Sentiment?

(Share of variance explained by each component; percentage points, left scale. Cumulative response after 12 months; basis points, right scale)



Source: IMF staff calculations.

Note: The bars denote the variance decomposition (in percent, left scale) of domestic long-term interest rates attributable to changes in the expected path of U.S. short-term interest rates ("Expected Path"), term premium, and global risk sentiment, as proxied by the VIX index. The markers denote the cumulative response after 12 months (in basis points, right scale) of domestic long-term interest rates to a permanent increase of 100 basis points in the term premium or the expected path of U.S. short-term interest rates, respectively. "ADV" and "EME" denote averages for the set of countries listed under Advanced and Non-LA Emerging Markets, respectively, in Annex Table 3.1.

Risk Scenario Analysis

Using country-specific estimates, we assess the likely impact of U.S. monetary normalization on short-term and long-term domestic rates under alternative scenarios. Throughout this exercise, we maintain our focus on medium-term accumulated impacts rather than on shorter-horizon market reactions.

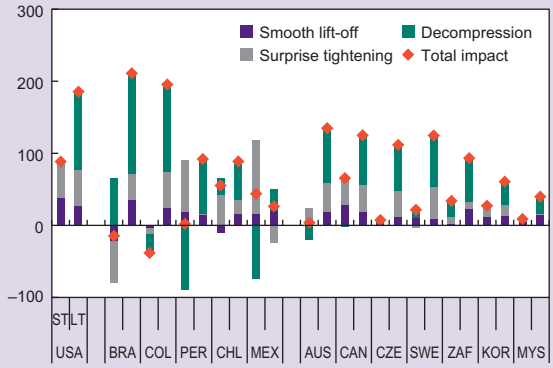
The baseline scenario assumes that the federal funds rate and 10-year U.S. Treasury yields evolve according to current futures-implied market

[19] The term premium can be thought of as the extra return investors require to hold a longer-dated bond instead of investing in a series of short-term securities, and likely reflects their uncertainty about the future path of interest rates as well as their degree of risk aversion. As such, movements in the term premium tend to be closely correlated with risk premiums on other assets in global financial markets.

[20] We employ the estimate produced by Adrian, Crump, and Moench (2013) and maintained by the Federal Reserve Bank of New York.

[21] While we focus on the results after 12 months throughout the chapter, we also inspect the full response functions and find that shock transmission is relatively quick and does not suggest significant overshooting.

Figure 3.7
Impact of U.S. Lift-off on Domestic Interest Rates: Alternative Scenarios
(Basis points)



Source: IMF staff calculations.
Note: This chart shows the change in domestic short-term (ST) and long-term (LT) government bonds due to the realization of each scenario. The counterfactual is a situation in which there is no change in interest rates, and this is in line with a weaker evolution of the U.S. economy and market expectations. The change in U.S. rates under the smooth lift-off scenario is based on interest rate futures reported by Bloomberg on September 23, 2015.

expectations, which anticipate an accumulated increase of 39 basis points and 27 basis points over the next 12 months, respectively. The impact on LA5 economies is estimated to be quite limited, consistent with these expectations already being priced in by the market (Figure 3.7).[22]

Deviations from market expectations for U.S. rates would provoke more noticeable impacts on LA5 financial conditions. In a first risk scenario, we assume that the federal funds rate and 10-year U.S. bond yields each rise by 50 basis points more than currently expected by markets, and that this additional tightening is not accompanied by an improved economic outlook. In this case, the impact on LA5 interest rates is somewhat more pronounced, particularly at the longer end of the curve.

We then consider a riskier scenario under which, in addition, the U.S. term premium decompresses back to its precrisis average (January 2000 to August 2008). This implies an increase in the term premium of about 109 basis points, arguably a very large movement. This scenario would generate much larger movements in certain Latin American countries, with estimated increases of over 200 basis points in Brazil and Colombia's long-term rates.

Conclusion and Policy Implications

Asset prices, and interest rates in particular, exhibit a large degree of co-movement across countries, including in the financially integrated economies of Latin America. This synchronicity in financial conditions goes hand in hand with a high degree of co-movement in business cycles.

However, we do find evidence of excessive financial correlation, or *spillovers*: even after controlling for domestic economic conditions, interest rates in many economies, including some in Latin America, respond to global financial shocks. We interpret this result as evidence that these economies do not enjoy full autonomy to set monetary conditions according to domestic price and output stability objectives, and are to a certain extent forced to follow external signals, although there is significant country variation.

The intensity of these financial *spillovers* depends, first of all, on the nature of the global shock. Particularly large *spillovers* are caused by movements in global interest rates that are not accompanied by changes in the economic outlook, or that are associated with fluctuations in the term premium. The source of the shock also matters. For Latin America, U.S.-originated shocks matter more than those originating in the euro area.

Importantly, the magnitude of the *spillovers* also appears to depend on the economic policy framework that is in place and other country-specific characteristics. Our results confirm

[22] To assess the impact from expected versus unexpected movements in the federal funds rate, we follow the identification strategy in Romer and Romer (2004).

that more exchange rate flexibility allows for greater monetary autonomy, even if the capital account is unrestricted. But they also suggest that, for a given policy choice along the capital account openness and exchange rate flexibility dimensions, improving the credibility of policy frameworks, reducing the extent of financial dollarization, and using macroprudential reserve requirements can help achieve a higher degree of monetary autonomy.

Box 3.1

Global Financial Conditions and Portfolio Flows to Latin America

The analysis in this chapter has focused on the response of asset prices—more precisely, interest rates on government bonds—to changes in global financial conditions. But what can we expect regarding quantity flows of these assets? In fact, a simple look at the data suggests that gross portfolio inflows to emerging markets since 2000 have been positively correlated with U.S. interest rates. For Latin America, flows are relatively more correlated with other external factors, such as global risk sentiment and commodity prices. Just as we find for interest rates, the reason underlying the movement in U.S. rates might matter: flows tend to soften somewhat following increases in the U.S. term premium, and to accelerate following an increase in the risk-neutral U.S. rate, which is associated with an improved economic outlook. This is broadly consistent with the behavior of flows during the two most recent episodes of U.S. rate increases, where the "taper tantrum" of 2013 had a greater impact than the "Greenspan conundrum" period of the mid-2000s, due to the decompression of the term premium during the former.

This simple exercise does not allow us to draw strong conclusions, but is consistent with the more comprehensive analysis in Adler, Djigbenou, and Sosa (2014) and Chapter 3 of the April 2014 *Regional Economic Outlook: Western Hemisphere*. They find that a surprise increase in U.S. interest rates leads to a significant drop in gross capital inflows to emerging market economies, whereas an increase that is driven by an improved economic outlook actually increases flows.

Table 3.1.1. Correlation between Global Financial Variables and Normalized Gross Portfolio Flows to Emerging Markets

	Federal Funds Rate	10-year U.S. Treasury Yields	U.S. Term Premium	U.S. Risk-neutral	VIX	Commodity Export Price Index
Median EM	*0.40	0.17	–0.22	*0.42	*–0.43	*0.46
LA5	0.13	0.09	–0.09	0.19	*–0.32	*0.36
Asia	*0.34	0.11	–0.19	*0.32	*–0.46	*0.41
EMEA	*0.44	0.15	*–0.26	*0.45	*–0.32	*0.35

Sources: IMF staff calculations using data from the IMF International Financial Statistics database; Federal Reserve Bank of New York; Chicago Board Options Exchange; and Gruss (2014).
Note: Correlations at quarterly frequency over the period of 2000:Q1–2014:Q4. Normalized flows are computed by subtracting the moving five-year average of inflows for the respective quarter. LA5 includes Brazil, Chile, Colombia, Mexico, and Peru. Asia includes China, India, Indonesia, Korea, Philippines, and Thailand. EMEA includes Hungary, Israel, Poland, Russia, South Africa, and Turkey. Median EM includes all countries listed above. * denotes a correlation that is statistically different from zero at the 0.05 confidence level.

Note: This box benefited from the contributions of Jaume Puig and Andre Meier.

Annex 3.1. Technical Details

Interest Rate Database

Short-term and long-term nominal interest rates correspond to three-month and 10-year (respectively) secondary market yields for government bonds denominated in local currency.[1] Gaps in interest rates at these maturities are interpolated using the variability in bond yields at close maturities (using maturities from one month to two years for short-term rates and five to 20 years for long-term rates). When Treasury bond yields are not available, bonds issued by the central bank for monetary policy operations are used. Data sources vary by instrument, country, and period but include the IMF's International Financial Statistics and Monetary Surveys, Bloomberg, L.P., Haver Analytics, Global Financial Data, and national authorities.

Measuring Global Factors

The global factor (or component) of short-term and long-term interest rates, real output growth, and consumer price index (CPI) inflation is the *principal component* of the time-series of each variable across countries, based on the principal component analysis (PCA). The first or principal component is the linear combination of those series that produces the maximum variance in the available data.

Computing Spillover Responses

To compute the *spillover* response of domestic interest rates to an increase in the federal funds rate, we follow a three-stage procedure. First, we estimate a VAR(2) model including domestic variables only: a domestic interest rate r_t, as well as a vector X_t including the 12-month-ahead forecasts of real GDP growth and CPI inflation from Consensus Economics (lagged one period to avoid potential endogeneity issues):

$$\begin{bmatrix} r \\ X \end{bmatrix}_t = A_0 + \sum_{j=1}^{2} A_j \begin{bmatrix} r \\ X \end{bmatrix}_{t-j} + \begin{bmatrix} e^r \\ e^X \end{bmatrix}_t . \quad \text{(A3.1.1)}$$

Second, we take the residual $\hat{e}_t^r$ from the first equation (which essentially purges the interest rate r_t from the effects of the *lags* of X_t) and regress it on the other two residuals (vector $\hat{e}^X$):

$$\hat{e}_t^r = a = \beta' \hat{e}_t^X + u_t^r . \quad \text{(A3.1.2)}$$

Finally, we include the residual $\hat{u}_t^r$ from the above regression (which is now also purged from the *contemporaneous* effects of X_t) in a VAR model that includes global variables:

$$\begin{bmatrix} \hat{u}^r \\ z^* \end{bmatrix}_t = B_0 + \sum_{j=1}^{2} B_j \begin{bmatrix} \hat{u}^r \\ z^* \end{bmatrix}_{t-j} + \begin{bmatrix} v \\ v^* \end{bmatrix}_t , \quad \text{(A3.1.3)}$$

where vector z_t^* includes the U.S. interest rate (r_t^*) and the VIX index, and the matrices B_j are restricted to ensure the (block) exogeneity of z_t^* (under which global variables are not affected by domestic variables). We denote the Cholesky-orthogonalized impulse response of $\hat{u}_t^r$ to a shock from r_t^* a *spillover*.

Interacted Panel VAR

An Interacted-Panel VAR (IPVAR) model is used to explore how the *spillover* response of domestic interest rates to U.S. interest rates depends on country-specific fundamentals or characteristics. The model includes the same variables as in equation (A3.1.3) but in a panel setting. A regular panel VAR would force all the matrices B_j in equation (A3.1.3) to be the same for all countries. In the IPVAR model, instead, matrices B_j are functions of country-specific fundamentals that can, in addition, vary over time. More precisely, for each country i characterized by a vector of fundamentals $F_{i,t}$ at time t, the coefficients inside the B_j are defined as: $b_{i,t} = c + \gamma' F_{i,t}$.

[1] Time series of policy rates are often impaired as the choice of policy instrument changes over time. Money market rates are widely available and are typically more homogeneous across countries, but are subject to volatility not necessarily related to monetary policy.

Annex Table 3.1. Sample of Countries for Model Estimates

Country Sample				
Advanced		LA	Non-LA Emerging	
AUS	NOR	ARG*	ARM+	PAK+
CAN	NZL	BOL*	BGR+	PHL
CHE	SGP	BRA	CHN+	POL
CZE	SVN+	CHL	EGY*+	ROM+
DNK	SWE	COL	HRV+	RUS+
GBR	TWN+	CRI	HUN+	SAU+
HKG+		MEX	IDN	THA
ISR		PER	IND	TUR
JPN		URY*+	KAZ*+	VNM*+
KOR			MYS	ZAF
LVA			NGA	

Source: IMF staff calculations.
Note: * denotes countries for which long-term interest rates are not available. + denotes countries not included in the Interacted-Panel VAR model due to data limitations. See page 89 for country acronyms.

Central Bank Credibility Index

Forecast disagreement has commonly been used as a proxy of inflation uncertainty, which reflects both the predictability and credibility of the central bank, as well as the variability of supply and demand shocks affecting the economy. Inflation forecast disagreement is moreover closely related to de jure measures of central bank independence in G7 economies (see, Dovern, Fritsche, and Slacalek 2012). In this chapter, we use the degree of anchoring of inflation expectations to construct an index of central bank credibility. More precisely, the central bank credibility index $CBC_{i,t}$ for country i at time t is constructed as an ordinal ranking of the inverse disagreement among forecasters (measured as the four-year moving average of the standard deviation of inflation forecasts reported by Consensus Economics, $MA4(\sigma_{i,t})$):

$$CBC_{i,t} = \frac{1}{N} Rank\left[\frac{1}{MA4(\sigma_{i,t})}\right]. \quad \text{(A3.1.4)}$$

Identified Global Financial Shocks

The identification of shocks driving movements in U.S. and euro area 10-year bond yields is based on the methodology proposed by Matheson and Stavrev (2014) for U.S. yields and further extended by Osorio Buitron and Vesperoni (forthcoming) to account for shifts in global risk aversion and to include euro area yields (constructed as PPP-GDP weighted-average of 10-year bonds issued by Germany, France, Italy, and Spain) as well. The approach uses sign restriction and data on the VIX, stock prices, and bond yields to identify "real" shocks and "money" shocks (which arguably include monetary policy shocks and inflationary surprises). It is based on the assumption that money shocks raise sovereign bond yields and depress stock prices, while positive real shocks lead to an increase in both yields and stock prices. It also distinguishes the money and real shocks coming from the United States and those of the euro area (to this end it also assumes that contemporaneous shocks from the United States can affect euro area variables, but not the other way around).