

CHALLENGES FOR EMERGING ECONOMIES IN THE FACE OF UNCONVENTIONAL MONETARY POLICIES IN ADVANCED ECONOMIES

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¹ All the opinions are the responsibility of the author, and do not necessarily reflect the views of Banco de México.

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It is a real pleasure and honor to have the opportunity to deliver the 15th Stavros Niarchos Foundation Lecture at the Peterson Institute for International Economics (PIIE). In particular, I wish to express my gratitude to Adam Posen for the invitation. I am sure that all of you present here tonight would agree with me that the PIIE has been since its creation a forum of excellence for the analysis and debate of issues related to international finance, trade, the international monetary system, and more, with a clear emphasis on exploring and identifying policy options. The contribution of the Institute has been particularly valuable since 2008, when the Global Financial Crisis (GFC) erupted in the United States, rapidly spread to most of the rest of advanced economies, and eventually affected the world as a whole.

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Even though the most critical aspects of the GFC have been overcome - in particular the possibility of extreme tail-risk events that would have been disastrous had they materialized -, the process of recovery has been extremely slow, and it still is vulnerable to setbacks. World economic growth continues to be sluggish, and a huge deficit in employment creation persists. Nevertheless, the quest for financial stability has shown more

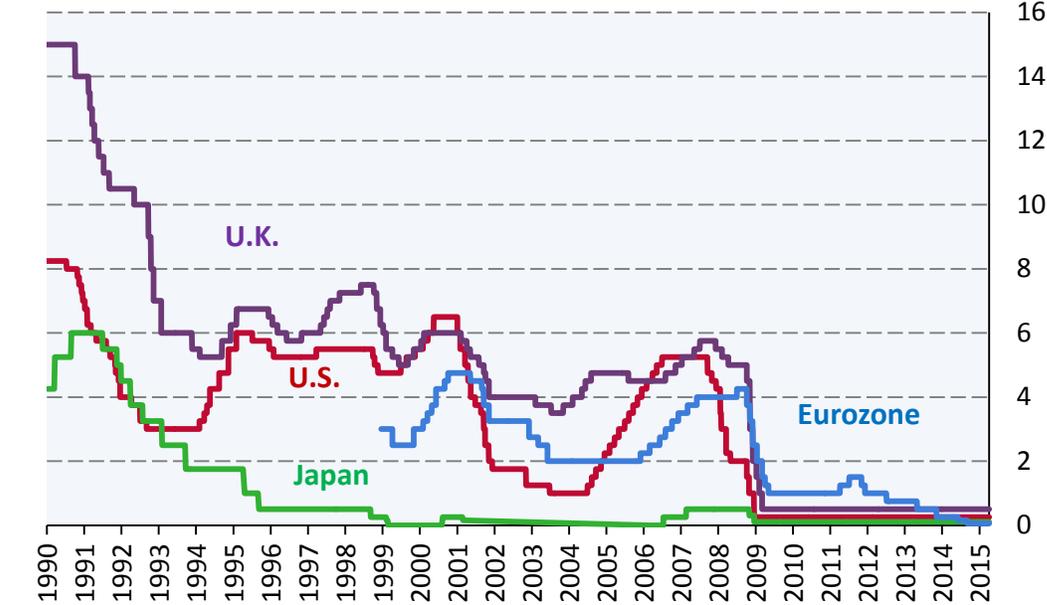
promising results, underpinned by a comprehensive Financial Sector Reform steered by the Financial Stability Board (FSB).

But the aspect that worries me the most about the process of recovery of the world economy is the fact that it still depends heavily on the monetary policy stances in main advanced economies (AEs) that are not sustainable over the medium and long term. Let me explain.

Relatively soon after the beginning of the crisis, it became clear that the feasibility in most AEs of stimulating growth through fiscal policy came to an end, as debt-to-GDP ratios grew very fast. Thus, the only stabilization policy instrument left was monetary policy, and therefore the main AEs central banks have adopted, at different times, speeds and with varied modalities, unprecedented expansionary monetary policies. The Federal Reserve System led the way, followed by the Bank of England, the Bank of Japan and the European Central Bank (ECB), the latter two motivated also by the growing risk of deflation. These policies have engineered sharp declines in interest rates across the yield curve. The zero lower bound in the policy reference rates became binding in all the above-

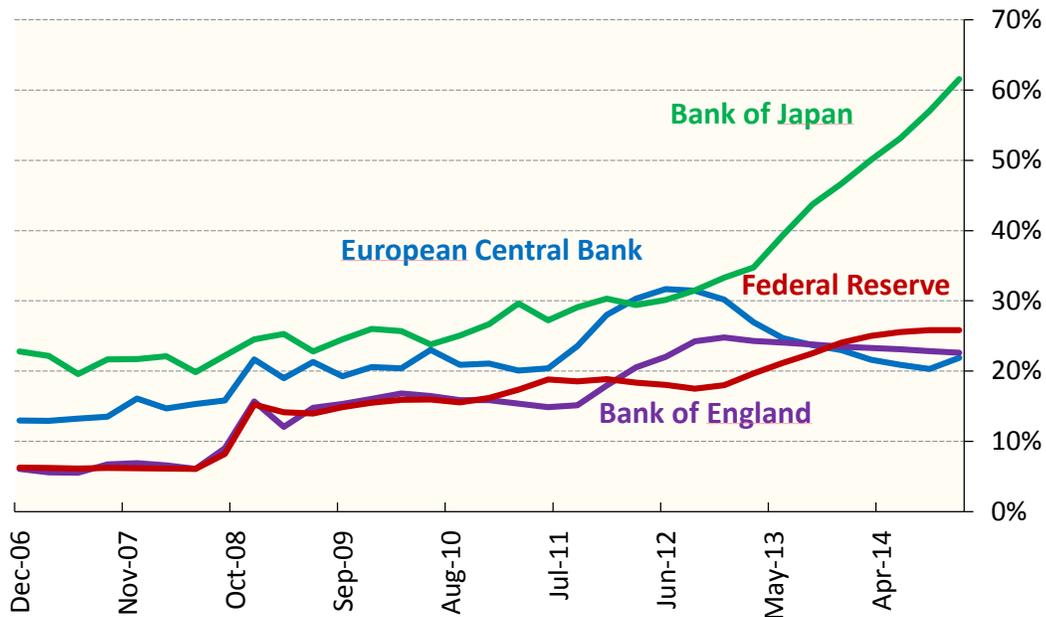
mentioned cases (Figure 1). In addition, forward guidance for the policy rates and quantitative easing (QE) have been adopted. As a result, the balance sheets of AEs central banks have increased sharply (Figure 2).

Figure 1
Advanced Economies: Central Bank Target Rate
%



Source: Bloomberg.

Figure 2
Advanced Economies: Assets in the Balance of Central Banks
 % of GDP



Source: Haver Analytics.

The overall objective of unconventional monetary policies (UMP) in these AEs has been to stimulate growth and employment, while inducing the convergence of inflation to each countries' objective. Inflation in most AEs has fallen below their objective, mostly as a result of widespread unemployment, large output gaps, reduction in commodities prices, in particular of oil, and more recently in the United States, due to a sharp effective appreciation of the US dollar.

I believe that given the magnitude of the GFC and the policy options available, the UMP have been essential and they

have worked well so far. Economic recovery in the United States and in the United Kingdom, and to a lesser extent in Japan, have taken hold, and recent figures in the Eurozone have been promising. Inflation expectations and core inflation have been moving towards the respective central banks' objectives.

Nonetheless, my perception is that it is too early to declare victory. To begin with, we still have to see if the unwinding of those policies can proceed in an orderly fashion, once their immediate objectives are met. Once we reach that state of affairs, the unwinding of UMP will be unavoidable, given that otherwise they would feed into inflation, and induce higher than warranted interest rates and financial instability. This is the reason why I consider that UMP are not sustainable over the medium and long term. To assess the risks associated with the unwinding of those policies, we have to identify the unintended consequences that they have caused.

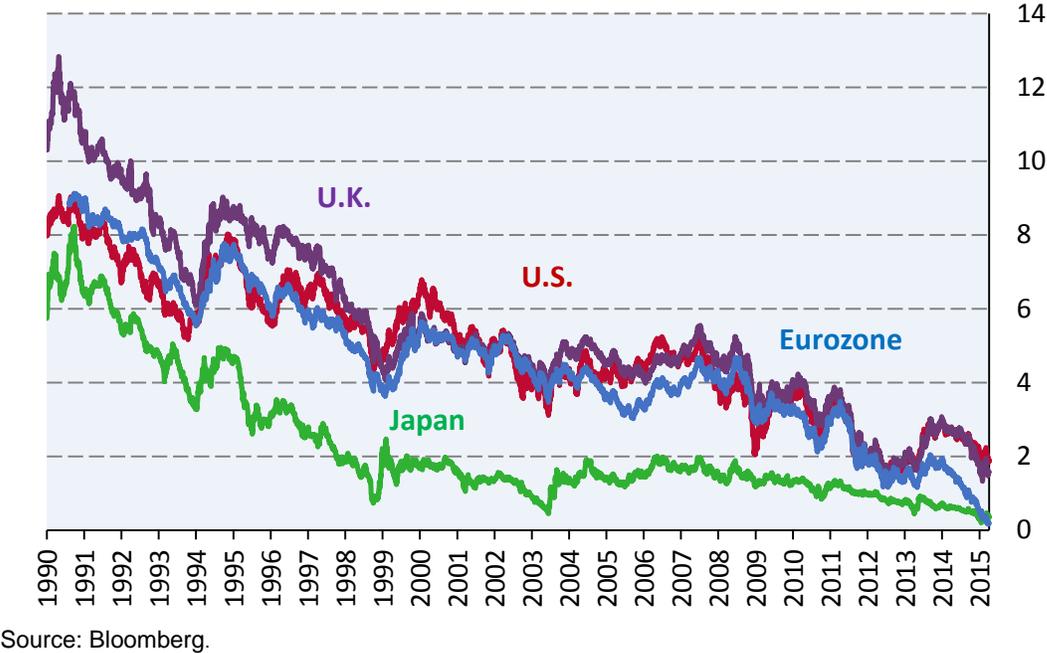
The transmission of extraordinary monetary stimulus to higher economic growth was meant to work primarily by enticing more risk taking by economic agents. In the case of consumers, and in particular as a response to quantitative easing (asset purchase programs by central banks), lower

interest rates and wealth effects would stimulate their expenditure. Another important channel that would operate was that lower interest rates, term spreads and credit spreads that would result from QE would stimulate real risk taking by firms, that is, QE would induce higher corporate investment. But investment has only partially recovered from the sharp fall in the recession of 2009 – the median decline from a group of AEs and emerging markets economies (EMEs) has been around 2 ½ percentage points of GDP. Meanwhile, there has been massive investments in financial instruments of all sorts, both in local and external markets, in what has been called “the search for yield”, which has created considerable spillover effects of UMP. The crux of the matter is that it seems that “financial risk-taking” has been by far more responsive to UMP than “real risk-taking”.

Several consequences have resulted from the above. Initially resources were directed to bonds and stock markets in AEs, but as the search for yield led to stretched valuations (Figure 3), investments in high-yield corporate, and EMEs sovereign and corporate debt exploded. These responses led in turn to wider credit and term spreads compressions, record

high-yield debt issuance and deteriorating underwriting standards.

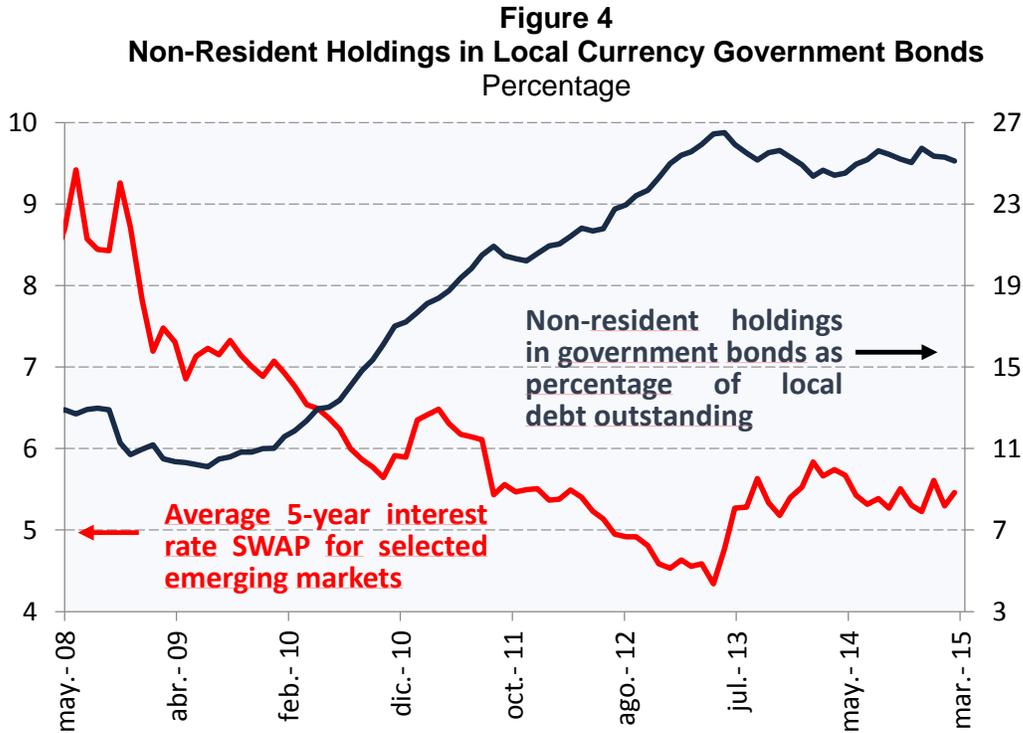
Figure 3
Advanced Economies: 10-Year Interest Rates
%



Most of these investments have been intermediated by non-bank financial institutions, such as asset management companies, hedge funds and pension and insurance companies.

A novel feature of this episode of capital inflows to EMEs has been the fact that a large portion of them have taken place as purchases of government bonds denominated in the domestic currency by non-resident investors (Figure 4). This is

an important feature, since it eliminates the “Original Sin Syndrome”³ that haunted EMEs for several decades.



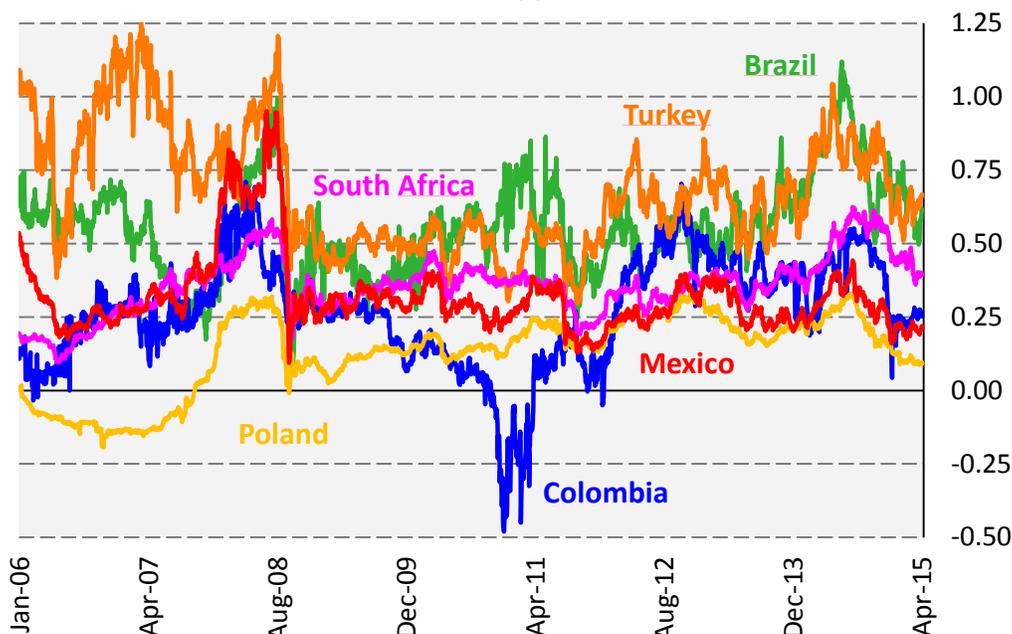
Source: Ministries of finance, central banks and other national authorities.
 Note: Non-resident holdings of the following countries: Mexico, Peru, Colombia, Brazil, Indonesia, Malaysia, Thailand, Poland, Turkey, Israel, Russia, Hungary, South Africa and South Korea (since December 2009).

Massive capital inflows into EMEs persisted for a while, fueled primarily by carry trades explained by ex ante uncovered interest rates arbitrage opportunities (Figure 5). The flows promoted by the excess global liquidity created a sense of exuberance, which in turn generated mispricing in some assets in many EMEs, meaningful real exchange rate appreciations

³ This term was coined by Barry Eichengreen and Ricardo Hausmann (1999), and refers to the propensity of Latin American countries to borrow in foreign currency given that foreign interest rates were lower than domestic ones, but disregarding the potential additional cost that could be generated by local currency depreciation, which happened often in the eighties and nineties in the region.

and opened the door for potential sudden capital flow reversals. These factors caused concerns among many countries, in particular about the potential of capital flows to: a) induce a sharp decline in exports, given the resulting real exchange rate appreciation; b) produce asset price bubbles created by rapid credit expansion, which in turn could result in financial instability; and c) eventually observing capital outflows, which also could be a source of financial instability. Most EMEs resorted to at least one of the following defensive policy measures: (i) the accumulation of international reserves; and/or (ii) the adoption of macroprudential policies.

Figure 5
Carry to Risk
 Index



Note: Carry to Risk is calculated based on the implied spread between local rate and foreign rate in FX forwards with three-month maturity. This spread is adjusted using the implied volatility in FX options with three-month maturity.

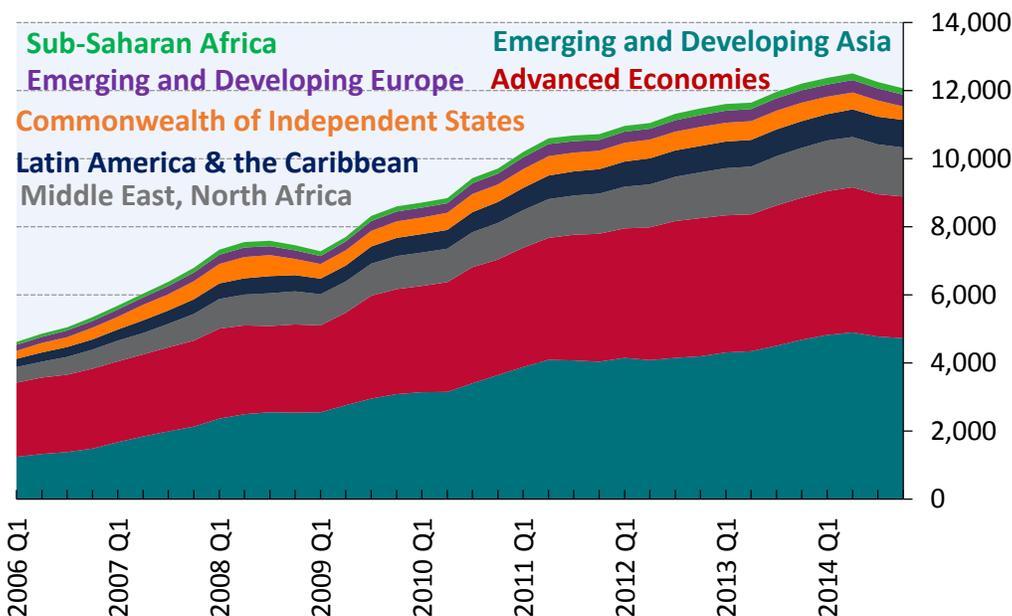
Source: Central Bank of Mexico using information from Bloomberg.

The accumulation of international reserves by EMEs is a phenomenon interesting to analyze in detail. Almost two years ago, as he delivered the 12th Stavros Niarchos Foundation Lecture, Fred Bergsten⁴ said that “the transmission of all monetary policy occurs to some extent through the exchange markets”. He is absolutely right. Given the sheer size of quantitative easing in the United States, coupled with the one implemented so far in Japan, it is not surprising that EMEs

⁴ See Bergsten, Fred. (2013). “Currency Wars, the Economy of the United States and Reforms of the International Monetary System”. 12th Stavros Niarchos Foundation Lecture. Peterson Institute for International Economics.

domestic currencies suffered sharp appreciations in response. This is the main reason that some analysts and policymakers have labeled QE as “competitive easing”. In a way, the aggressive accumulation of international reserves by EMEs all the way to late 2013 (Figure 6) is at least partially the other side of the coin to “competitive easing”. As a matter of fact we might as well call it “competitive reserve accumulation”. In most of the cases, I would agree with this practice, given the blunt distorting effects that QE had on EMEs. The size of capital flows to this subset of countries was much larger per unit of time than the capacity of such countries to absorb them without suffering substantial distortions.

Figure 6
International Reserves
 Billions of dollars



Source: Elaborated by Banco de Mexico using information from International Financial Statistics Database. International Monetary Fund (IMF).

*Advanced Economies.- Canada, Germany, France, Italy, Spain, Japan, United States & United Kingdom.

Commonwealth of Independent States.- Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Uzbekistan & Ukraine.

Emerging and Developing Asia.- Bangladesh, Bhutan, Brunei Darussalam, Cambodia, China, Fiji, India, Indonesia, Kiribati, Lao P.D.R., Malaysia, Maldives, Marshall Islands, Micronesia, Mongolia, Myanmar, Nepal, Palau, Papua New Guinea, Philippines, Samoa, Solomon Islands, Sri Lanka, Thailand, Timor-Leste, Tonga, Tuvalu, Vanuatu, and Vietnam.

Emerging and Developing Europe.- Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Hungary, Kosovo, Lithuania, FYR Macedonia, Montenegro, Poland, Romania, Serbia, and Turkey.

Latin America & Caribbean.- Antigua and Barbuda, Argentina, The Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Trinidad and Tobago, Uruguay, and Venezuela.

Middle East & North Africa.- Afghanistan, Algeria, Bahrain, Djibouti, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Pakistan, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, United Arab Emirates, and Yemen.

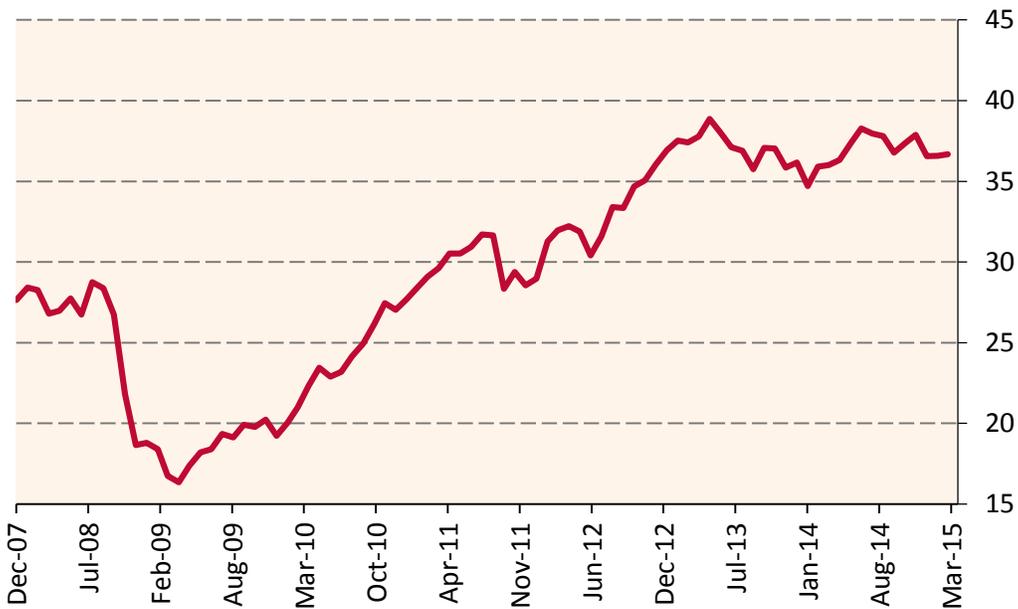
Sub-Saharan Africa.- Countries in the continent that lie south of the Sahara Desert (such as South Africa).

Therefore, for most EMEs it has been appropriate to throw some “gravel under the wheels” via international reserve accumulation to mitigate some of the negative externalities that could take place as a result of the sharp real exchange rate appreciation. Even the contained appreciation has had real effects, starting with a deterioration of the trade balance, and going all the way to substantially handicapping some sectors in

a variety of countries, such as manufacturing in Brazil. We have several other recent examples in this regard.

Another important reason to accumulate reserves in the face of QE is that it might avoid financial instability in the future. As QE will be temporary, countries should prepare themselves for the reversals of capital, and one way to do so is by accumulating reserves and by building other backstops (Figure 7). In addition, rapid capital inflows could be used in the recipient economy in such a way that asset price bubbles or rich valuations could result; this is of particular concern if such flows are intermediated by the banking system of the recipient country and they lead to a real estate bubble, which, as we well know, usually are the source of major crisis. The avoidance of this scenario through reserve accumulation has been an effective prudential instrument.

Figure 7
Net Non-resident Holdings of Emerging Markets' Government Bonds
 Percentage of International Reserves



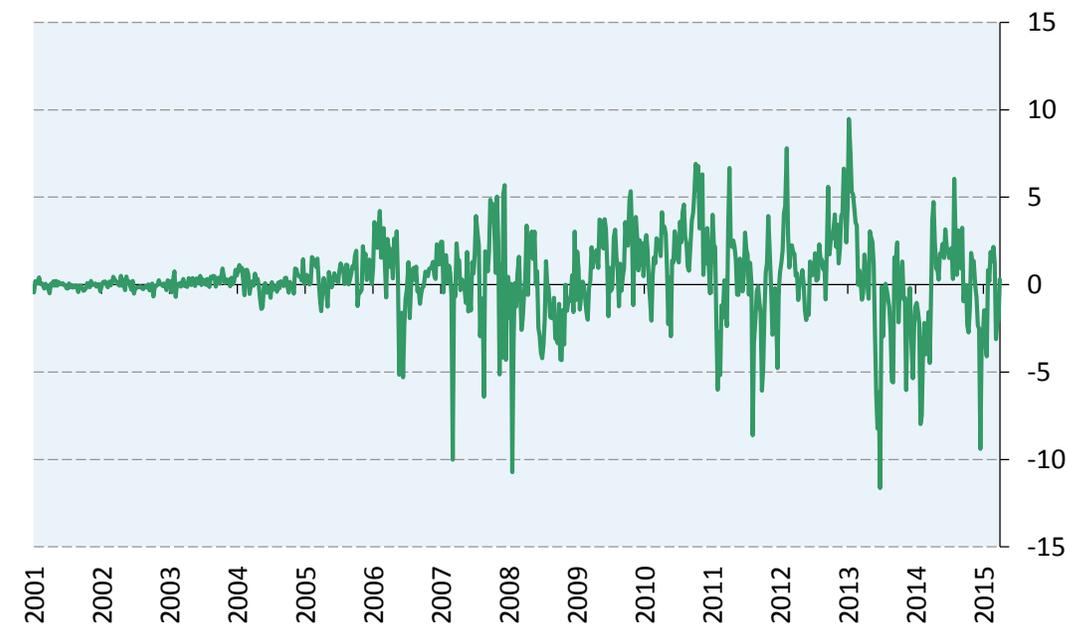
Source: Ministries of finance, central banks and other national authorities.

Note: Average percentage of foreign holdings on local bonds for the following countries: Mexico, Brazil, Indonesia, Malaysia, Thailand, Poland, Turkey, Israel, Hungary and South Korea (since December 2009).

Of course, in some cases macroprudential measures applied through the banking system (like loan to value or income to debt limits, and the imposition of higher reserve requirements), could deliver the same results, and several EMEs have followed this path. Nevertheless, macroprudential policies are far less effective when capital flows are not channeled through the banking system, as has been the case with recent cross-border flows to many EMEs, where market-based financing has been the norm.

As time passed, a gradual deterioration in some EMEs macrofundamentals, in combination with some major events in AEs that periodically switched the risk-on to off, and vice versa, (such as the problems with Greece and other countries in the periphery of the Eurozone, the possibility of a fiscal cliff in the United States, the “whatever it takes” statement by Mario Draghi⁵) have made capital flows to EMEs increasingly volatile (Figure 8).

Figure 8
Emerging Economies: Capital Flows (Debt and Equity)
Weekly Billion USD



Source: Emerging Portfolio Fund Research.

In April/May 2013 the first serious reality check for EMEs arrived. At that time, the global financial cycle was more clearly

⁵ See Draghi, Mario. 2012. Remarks at the Global Investment Conference. London. UK.

transmitted to EMEs, triggered mostly by the start of the discussion of monetary policy normalization in the United States, that is the “taper talk”. This, together with the correction in commodity prices that has followed the economic slowdown in China and in most AEs, invited a reevaluation of EMEs’ prospects.

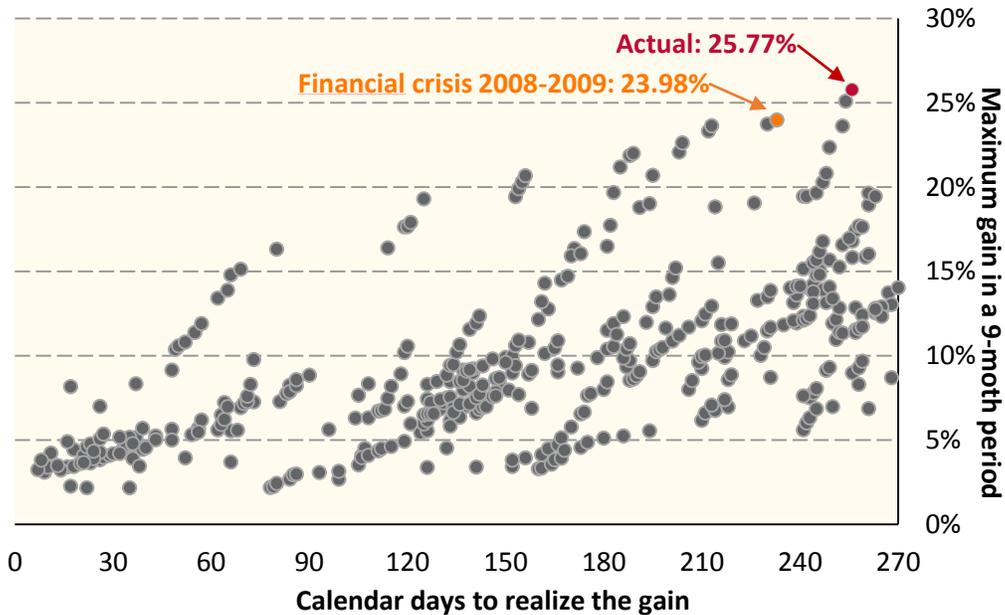
The turbulence in EMEs’ financial markets that followed was not homogeneous. The most severe turbulence occurred in countries with the weakest fundamentals, mostly judged by the size of their current account and fiscal deficits. In these cases, sharp depreciations in local currencies took place, together with disproportionate increases in interest rates, and plummeting stock markets. National authorities reacted by intervening in the foreign exchange markets, facilitating the reduction of duration in investors’ portfolios, and more importantly, by tightening fiscal and monetary policies. In contrast, many other EMEs managed to sail through this episode by reinforcing their policy stance, and allowing the exchange and interest rates to make the adjustments, without any market interventions. We could say that many EMEs came out strengthened from this period of volatility.

Financial markets were surprisingly calm in late 2013 and the first half of 2014. The tapering of securities purchases by the Federal Reserve started in January 2014 and proceeded without unforeseen consequences. At the same time, the Federal Open Market Committee (FOMC) enhanced the clarity of its forward guidance, creating the expectations of policy rate adjustments until 2015. In the euro area, major concerns became evident about sluggish economic growth and massive unemployment, together with inflation rates substantially below the ECB target. This generated the expectation of significant additional monetary policy easing by the ECB. Owing to these events, together with the reactivation of the search for yield, credit spreads compressed and their dispersion fell to unusually low levels, volatility in all asset classes was suppressed and capital flows seemed to recover.

But market conditions started to change considerably for the worse at the beginning of the second half of 2014. Again, events in the United States and the Eurozone were important triggers. As the QE tapering was coming to an end in the United States, widespread speculation about potential dates and modalities of the policy rate lift-off from the zero lower bound became destabilizing, leading to higher US rates. At the same

time, both the Bank of Japan and the ECB took sequential steps towards additional monetary easing. Worth noting was the fact that in January of 2015 the ECB initiated a fully-fledged QE program. The combination of the expectation of the normalization of US monetary policy, with additional easing in the Eurozone and Japan, have established conditions for euro and yen carry trades, as the US offers higher yields and an appreciating currency, while low rates make the euro and the yen attractive funding currencies. This process feeds into itself, as the flows that it triggers have reinforced the appreciation of the US dollar. Thus it is not surprising that the US dollar effective appreciation in the 9-month span from July, 2014 to today has been the largest since 1973 (Figure 9).

Figure 9
USD Appreciation over a 9-month Period^{1/} and
Days it Took to Reach the Highest Level
 Percentage, days



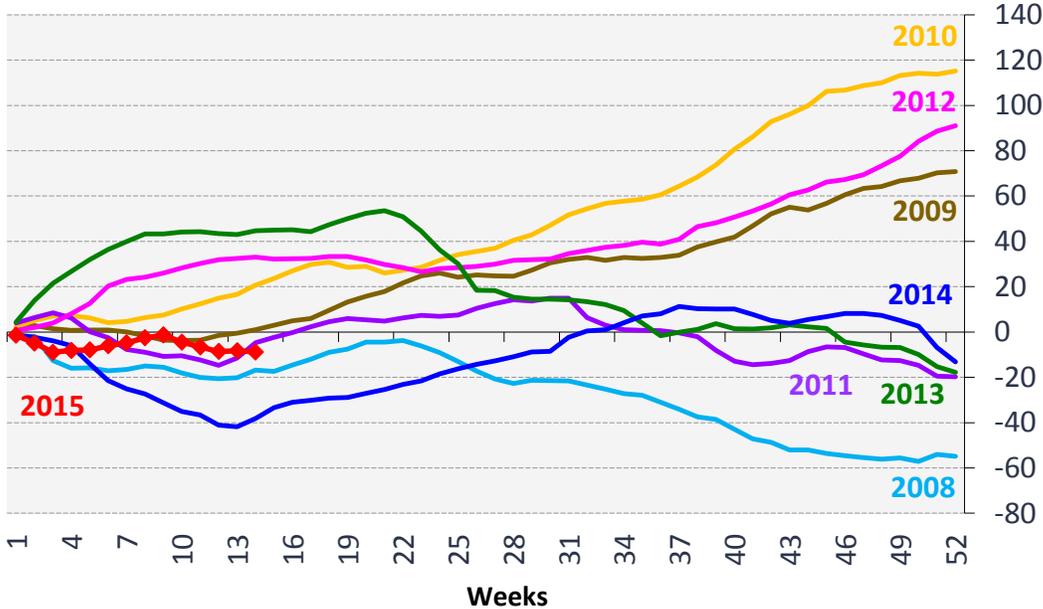
1/ The USD appreciation was computed using the DXY Index.
 Source: Banco de Mexico's own calculations using data from Bloomberg.

When the United States implemented QE, cross border flows increased to many EMEs. But now, with the Eurozone and Japanese QE combined with the expectation of an imminent Fed tightening, together with stronger economic growth in the US even with respect to many EMEs, flows are going towards the United States, implying tighter external financial conditions for EMEs.

In addition, also since mid-2014 we have witness a sharp decrease in commodity prices, specially in oil, which reflects

protracted low growth in the world economy, the appreciation of the US dollar and particular circumstances in specific markets. So what we have seen recently in EMEs are capital outflows (Figure 10) and continued exchange rate depreciation (Figure 11), caused to a large extent by the strengthening of the dollar and the sharp collapse in commodity prices (Figure 12).⁶

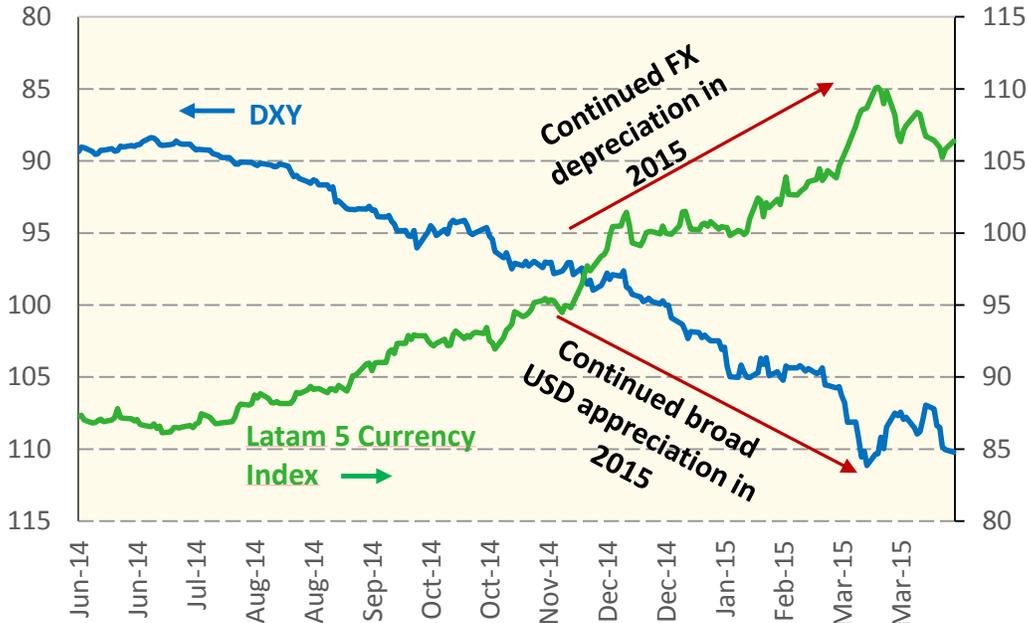
Figure 10
Emerging Economies: Accumulated Capital Flows to Emerging Markets
(Debt and Equity)^{1/}
 Billion USD



1/ The sample includes funds used to sell or buy equity and bonds from emerging markets registered in advanced economies. Flows exclude changes in market value of portfolios and changes in foreign exchange rates.
 Source: Emerging Portfolio Fund Research.

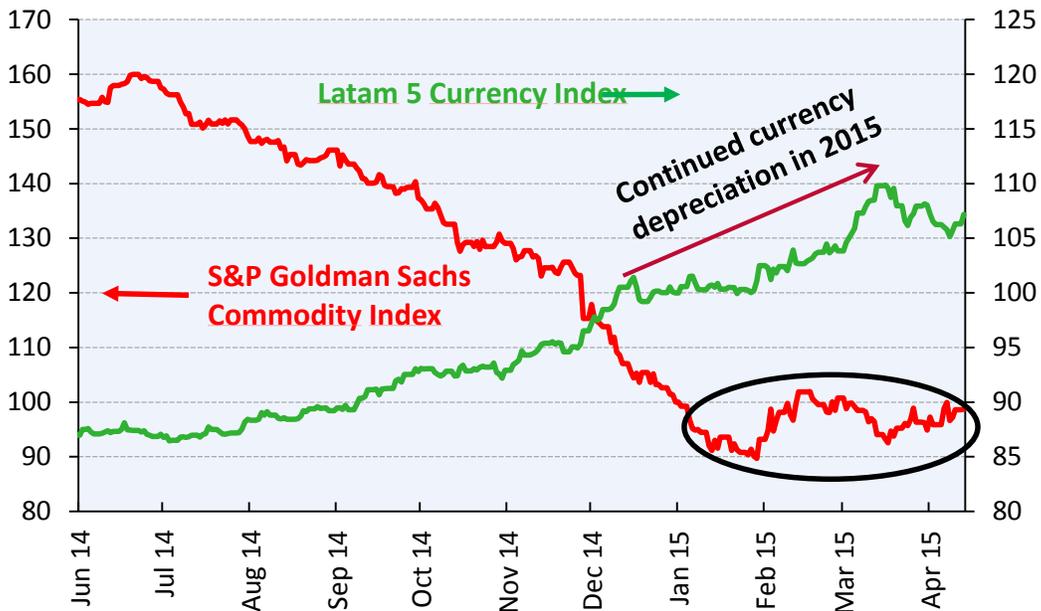
⁶ See Reichsfeld, David. (2015). "Identifying the Forces Behind Recent Large LatAm FX Depreciation". EM Macro Daily. Goldman Sachs Global Macro Research.

Figure 11
Latam FX Depreciation and Broad USD Appreciation
 Index 31-Dec-14 = 100



Source: Goldman Sachs Analysis replicated with Bloomberg data.
 Note: Latam 5 FX Index is computed using an equally weighted average of the returns in the Mexican Peso, the Brazilian Real, the Chilean Peso, the Colombian Peso and the Peruvian Sol.

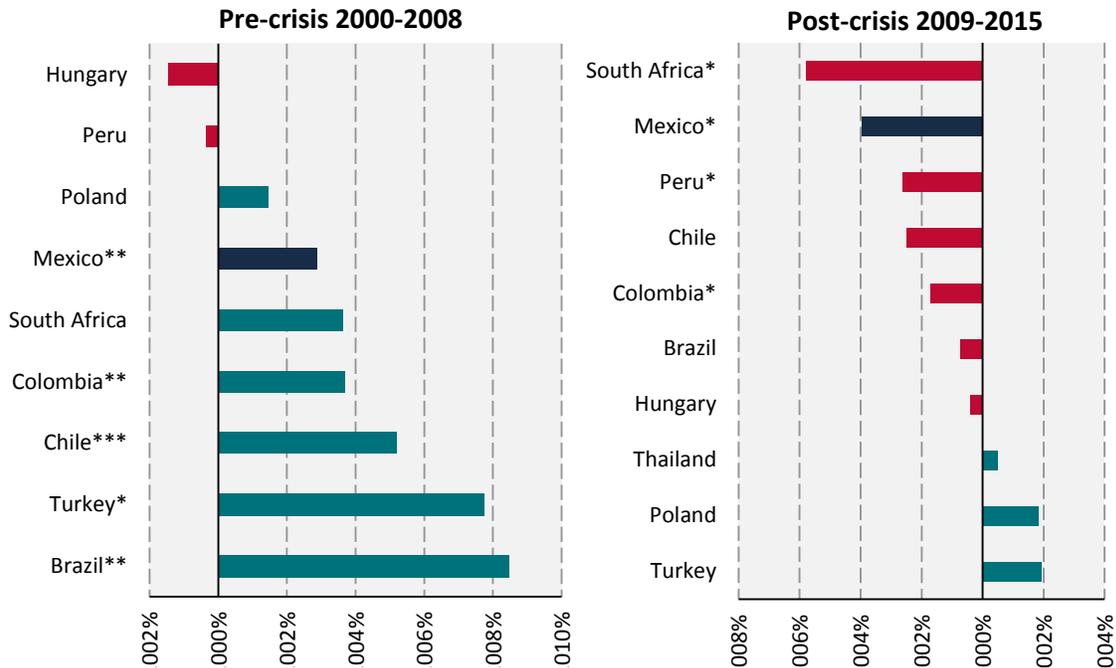
Figure 12
Latam Currency Depreciation Amid Flatter Commodity Prices in 2015
 Index 31-Dec-2014 = 100



Source: Goldman Sachs Analysis replicated with Bloomberg data.
 Note: Latam 5 FX Index is computed using an equally weighted average of the returns in the Mexican Peso, the Brazilian Real, the Chilean Peso, the Colombian Peso and the Peruvian Sol.

From the above, I hope that I have made the case that the initiation of the unwinding of the UMP in the United States, certainly without being the sole contributor, has induced a noticeable increase in volatility in financial markets, in particular in EMEs. In a way this could be surprising, since the fact that the Fed is in a position to contemplate the full normalization of its monetary policy stance signals that the economic recovery has almost been consolidated in the context of price stability. This constitutes really good news for the United States, EMEs and the world as a whole. But my fear is that during this transition period the overextension of “financial risk-taking” is overwhelming the usual market responses. Let me illustrate this with a simple example. In the pre-crisis period, good figures in the US nonfarm payroll data generated an appreciation in EMEs currencies, given that a strong US economy meant a positive impulse for their exports. In the post-crisis period, and more markedly in recent times, a positive surprise in US payroll data generates depreciations of EMEs currencies, given that such surprises makes market participants anticipate an earlier lift-off in the US police reference rate (Figure 13) !

Figure 13
Percentage Change in the Foreign Exchange Rates per unit of Difference Between the Expected Nonfarm Payrolls Data and the Observed Percentage



Note:*** p<0.05, ** p<0.15, *p<0.3. The percentage was calculated using a regression where the dependent variable is the percentage change on the exchange rate for each developing country currency and the independent variable is the difference between the expected Nonfarm Payrolls data and the observed.

In light of the complex external environment described above, central banks in EMEs are currently facing significant challenges with respect to the conduction of monetary policy. On the one hand, regarding domestic conditions, economic activity has lost momentum and growth prospects have been revised downward. Furthermore, low energy prices have put also downward pressure on inflation. On the other hand, with respect to external factors, the imminent normalization of monetary conditions in the US have already triggered periods of financial turbulence and, accordingly, EMEs have

experienced exchange rate depreciations, resulting oftentimes in higher inflation expectations.

In this scenario, central banks in EMEs have to weigh both internal and external determinants of inflation, since they can point towards opposite policy actions. Thus, the assessment of the appropriate monetary policy stance has become a more difficult task.

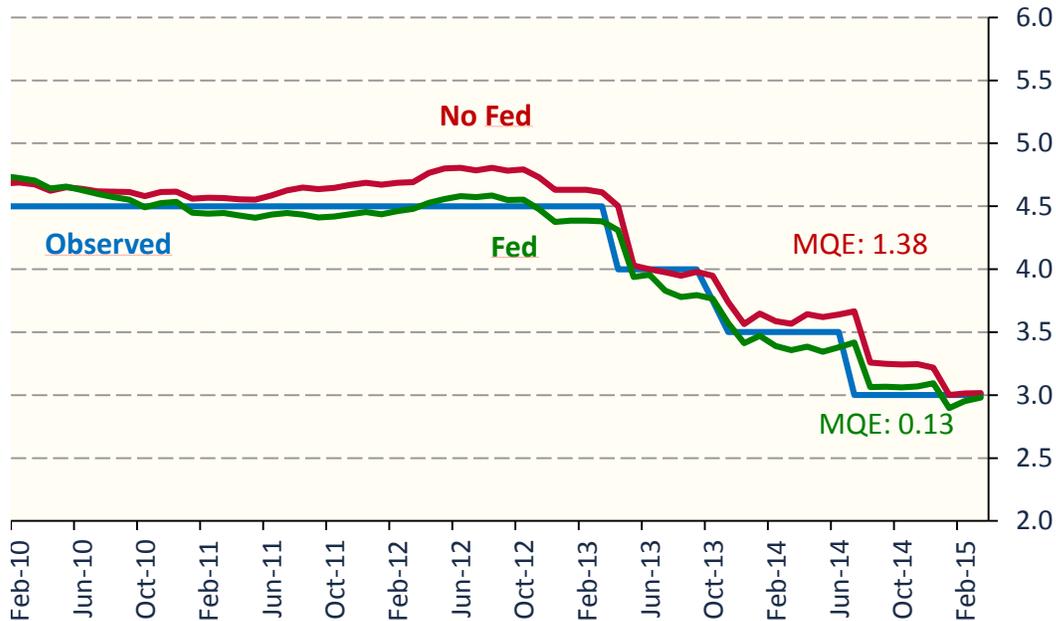
In order to determine to what extent central banks in small and open economies react to changes in the monetary policy stance in the US, I estimated two specifications for the Taylor Rule for a number of economies. The first one corresponds to a traditional (*or conventional*) Taylor Rule where central banks take into account the output and the inflation gaps when setting the policy rate. Then, I augment the Taylor Rule with the US policy rate and also with the so-called shadow policy rate from 2008 onwards. The shadow rate accounts for the effects of QE once the policy rate reached the zero lower bound, and is taken from the work of Wu and Xia (2014). In sum, the shadow rate is an indicator of the degree of monetary policy easing.

The estimations show that in most cases, including Mexico, monetary conditions in the US have a statistically significant effect on EMEs policy rates (see Appendix).

That is, in response to a more accommodative monetary policy stance in the US, central banks in EMEs have reduced their policy rate. This means that the inflation and output gaps do not capture all the impact of external events on the domestic economy and, accordingly, central banks react to the US monetary conditions (Figure 14 for the case of México). As Rey (2013) has suggested, the U.S. monetary policy is a key determinant of the so-called global financial cycle. In turn, monetary authorities in EMEs care about the impact of such cycle on their domestic economies and, accordingly, take into account the evolution of monetary conditions in the US when assessing their appropriate monetary policy stance. This situation seems to have intensified after the GFC.

Figure 14
Taylor Rule for Mexico (augmented) ^{1/}:

$$i_t = (r^* + \pi^* + \beta_1(\pi_t^{core} - \pi^*) + \beta_2 gap_t^{GDP} + \beta_3 i_t^{USA})(1 - \rho) + \rho i_{t-1}$$



1/ Estimations include data from 2000m1 to 2015m2. For the Fed Funds Rate after 2008 a shadow rate estimated by Wu and Xia (2014) is used. MQE: Mean Quadratic Error.

Source: Own calculations with data from Bank of Mexico, Haver Analytics and Wu and Xia (2014).

Looking ahead, given the imminent normalization of monetary conditions in the US, it could be expected that central banks in EMEs will increase their policy rates as the Federal Reserve adjust upwards the federal funds rate. This might happen even if the domestic economic conditions do not justify a policy rate increase. Although the baseline scenario is one of a gradual and orderly normalization of US monetary conditions, episodes of financial turbulence cannot be discarded. Under these circumstances, authorities might not only need to increase their policy rate, but also might be forced to intervene in key financial markets, namely the forex and money markets,

in the later case to facilitate the adjustment of duration in portfolios of domestic sovereign securities. These unorthodox market intervention by central banks would be pertinent if, as it is likely, market liquidity dries up during stress episodes. Precisely for this reason, I have mentioned the need for EMEs to have additional backstops, for example the IMF's Flexible Credit Line (FCL).

The fact that EMEs would have to adjust their monetary policy rate due to external conditions (i.e. Federal Reserve policy adjustments), overwhelming domestic ones (inflation and growth gaps), makes it obvious that they cannot depend solely on monetary policy to achieve the ultimate policy goal, which is to reach faster and sustainable growth and simultaneously consolidate financial stability. In this sense macro-relevant structural reforms, together with strong fundamentals, becomes of the essence. This is the path that Mexico has followed.

* * *

Let me conclude with a brief commentary on the International Monetary System (IMS). It is fair to say that the IMS is in

transition and much remains to be done to make it more stable and adapt it to the challenges of the twenty-first century.

The global economy is becoming more multi-polar and interconnected, underpinned by rapid structural growth in large EMEs. Dynamic EMEs generally exhibit lower levels of financial development and global integration than their more advanced peers, suggesting scope for catch-up. This transition raises challenges and provides opportunities, and how it will take place has important implications for financial stability and growth, and for the architecture of the IMS and its efficacy.

Despite some reforms after the GFC, question marks remain about the resilience of the IMS. Incremental steps have been taken to strengthen policy collaboration, monitor and manage capital flows, and broaden the financial safety net. However, more fundamental IMS reforms to address sources of instability, have remained on a backburner. A key concern, developed in my presentation, has been that monetary policy decisions by AEs can create large spillovers, especially for EMEs, so some form of coordination is urgently needed.

The international community has an opportunity to facilitate and shape a virtuous further integration of major EMEs into the global economy, while in the process addressing some long-standing weaknesses of the IMS. These can be achieved by:

- First: Providing incentives and support for EMEs to join existing governance structures, including by adapting those structures to their needs and ensuring fair representation, which would help prevent fragmentation and duplication, and promote deeper, more substantive global policy dialogue.
- Second: Orderly, well-sequenced financial deepening and opening in key EMEs could deliver substantial welfare gains for these countries, along with positive global spillovers and stability gains for the IMS, as deeper domestic financial markets would promote domestic demand, facilitate greater reliance on exchange rates to achieve external adjustment and thereby help reduce global imbalances, and improve the ability to cope with capital flow volatility. Increased opportunities for asset diversification, both domestically and at the global level, would provide additional welfare gains.

- Third: Finally, further broad efforts are needed to strengthen and close gaps in the global financial safety net, and avoid the need for costly and distortionary reserves accumulation. Certainly, this implies reaching the point of full implementation of the 2010 Governance Reforms at the IMF, which would increase its lending capacity based on quotas, and enhance the voice and representation of EMEs. This would enrich the IMF's credibility, efficiency and legitimacy, placing the institution in a stronger position to improve the functioning of the IMS.

Thank you very much.

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Technical Appendix

An econometric exercise is conducted in order to analyze the main determinants of policy rates in small and open economies. In particular, the purpose is to assess to what extent central banks in these economies react to changes in the U.S. monetary policy stance. In order to address this issue, two specifications for the Taylor rule are estimated for 11 economies.⁷ Given the availability of data, the sample period for this analysis is from January 2000 to February 2015.⁸

First, a traditional Taylor rule is estimated for these economies. In this specification the central bank reacts to deviations of the output from its potential level (output gap) and inflation from its target level (inflation gap) when setting the policy rate:

$$i_t = (r^* + \pi^* + \beta_1(\pi_t^{core} - \pi^*) + \beta_2 gap_t^{GDP})(1 - \rho) + \rho i_{t-1}$$

⁷ The countries considered for this analysis are: Canada, Czech Republic, euro zone, Israel, Korea, Mexico, New Zealand, Norway, Poland, South Africa and Thailand.

⁸ For the countries that hit the zero lower bound in this period –Euro Zone, Czech Republic and Israel–, the sample period ends when the ZLB is reached. The data for inflation and policy rate was retrieved from Haver Analytics. The output gap was estimated using the Hodrick-Prescott filter with tail correction. The inflation target is the official for each countries' central bank. The Fed Funds Shadow Rate was taken from an updated database of Wu and Xia's (2014) work from the Federal Reserve Bank of Atlanta webpage.

Where i_t represents the policy rate, r^* the neutral real interest rate (an interest rate consistent with the inflation rate being at its target and an output gap equal to zero), π_t the inflation rate, π^* the inflation target and gap_t^{GDP} the output gap. In addition, ρ is a parameter that represents the tendency of central banks to smooth adjustments in its interest rate.

Second, the above specification is augmented with an indicator of the U.S. monetary policy stance (*Non-conventional Taylor Rule*).

$$i_t = (r^* + \pi^* + \beta_1(\pi_t^{core} - \pi^*) + \beta_2 gap_t^{GDP} + \beta_3 i_t^{US})(1 - \rho) + \rho i_{t-1}$$

Where i_t^{US} denotes the U.S. policy rate and the shadow policy rate from 2008 onwards. The latter is taken from Wu and Xia (2014) and is an indicator of the monetary policy conditions that summarizes the level of monetary policy easing in the U.S. In this setting, such indicator takes into account the impact of the unconventional monetary policies implemented by the Fed once the federal fund rate reached the zero lower bound.

Table 1 shows the results of the first specification (*Conventional Taylor Rule*). The first and second columns correspond to the coefficients associated to the inflation gap and the output gap, respectively.

Table 1: Taylor rule w/o the Fed Rate

Country	No Fed			
	β_1 Inflation Gap	β_2 Output Gap	(1- ρ)	R2
Canada	0.53	1.28***	0.04***	0.99
Czech Republic	0.57**	0.28	0.05***	0.99
Euro Zone	-0.4	1.82**	0.02**	0.99
Israel	3.85	0.74	0.02	0.98
Korea	-0.42	2.16***	0.03***	0.98
Mexico	1.69**	0.62**	0.14***	0.89
New Zealand	0.39	3.48***	0.03**	0.99
Norway	-1.46	2.63	0.02	0.99
Poland	0.4***	0.91***	0.08***	0.99
South Africa	0.39	4.7	0.02*	0.98
Thailand	0.92***	-0.12	0.06***	0.97

* significant at 10%; ** significant at 5%; *** significant at 1%

In turn, Table 2 shows the results of the second specification (*Non-conventional Taylor Rule*). The first and second columns also correspond to the coefficients associated with the inflation gap and the output gap. The third column correspond to the coefficients associated with the indicator of monetary conditions in the U.S. Finally the fifth column shows the effect

of increasing in 1 percent the Federal Funds Rate today over the domestic interest rate.

Table 2: Taylor rule with the Fed Rate

Country	Fed					
	β_1 Inflation Gap	β_2 Output Gap	β_3 Fed Funds Rate	(1- ρ)	$\beta_3 * (1-\rho)$	R2
Canada	0.23***	0.37***	0.45***	0.16***	0.072	0.99
Czech Republic	0.57***	-0.16	0.5***	0.08***	0.04	0.99
Euro Zone	0.12	0.37***	0.45***	0.12***	0.054	0.99
Israel	1.87**	-0.09	0.82***	0.04***	0.0328	0.98
Korea	0.04	0.66***	0.32***	0.14***	0.0448	0.99
Mexico	0.96**	0.17	0.57***	0.25***	0.1425	0.90
New Zealand	0.06	1.15***	0.6***	0.08***	0.048	0.99
Norway	-0.54	0.67	0.85***	0.03***	0.0255	0.99
Poland	0.46***	0.64**	0.27***	0.1***	0.027	0.99
South Africa	0.62***	1.4	0.7***	0.05***	0.035	0.98
Thailand	0.83***	-0.1	0.1	0.06***	0.006	0.97

* significant at 10%; ** significant at 5%; *** significant at 1%. The numbers in blue indicate that in those countries the U.S. monetary policy has a significant effect in the domestic policy rate.

Summing up, the results show that in many cases, U.S. monetary conditions have a statistically significant effect on EMEs policy rates. In other words, in response to a more accommodative monetary policy stance in the U.S., central banks in the set of countries considered in the analysis tend to reduce their policy rates.