The exchange rate, real economy and financial markets

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Abstract

In this paper we analyse the relationship between increased exchange rate flexibility and economic growth and its volatility in emerging market economies. We also investigate the implications of exchange rate flexibility for financial market development. We do not find a robust correlation between exchange rate flexibility and long-run growth, although exchange rate flexibility has generally been beneficial in smoothing EMEs' output volatility in the previous decade. There are also indications that increased exchange rate flexibility is associated with a reduction in vulnerabilities such as currency mismatches, though its impact on financial market development is less clear.

Keywords: exchange rates, economic growth, volatility, financial market development

JEL classification: E23, F31, O16, O40

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Introduction

As exchange rates are key prices in the economy, their level and flexibility have implications for resource allocation and growth. Countries may attempt to influence the level of exchange rates and restrict their flexibility depending on, among other factors, the choice of monetary regime and the development of the financial system. Indeed, over the past decade, many emerging economies have done this. Such choices imply real trade-offs, with both short- and long-run implications.

The real economy is affected by the degree of exchange rate flexibility. Flexible exchange rates play a countercyclical role by smoothing output volatility. They are important in lessening incentives for foreign currency borrowing, thus reducing currency mismatches and deepening domestic financial markets. But financial development and exchange rate flexibility is a two-way street, since the degree of exchange rate flexibility is also likely to depend on the financial system's stage of development. This paper explores some of these issues in the context of emerging market economies.

The two main research questions we address are as follows. First, what is the relationship between increased exchange rate flexibility (implying less intervention), and economic growth and its volatility in our sample of EMEs? Second, what are the implications of exchange rate flexibility for financial market development, in particular that of local currency government bond markets and derivatives markets?

The following conclusions emerge.

- First, we do not find a robust correlation between exchange rate flexibility and long-run growth.
- Second, exchange rate flexibility has generally been beneficial in smoothing EMEs' output volatility in the previous decade.
- Third, there are also indications that increased exchange rate flexibility is associated with a reduction in vulnerabilities such as currency mismatches. However, its impact on financial market development is less clear.

This paper is structured as follows. Section 1 discusses the links between exchange rate flexibility and the real economy. Section 2 deals with the implications of exchange rate flexibility for vulnerabilities and financial market development. The final section concludes.

1. Exchange rate flexibility and the real economy

The extent of exchange rate flexibility, operating through a number of channels, has implications for both the real economy's long-run growth prospects and its volatility. This section outlines the trends in exchange rate flexibility in our sample of emerging economies in the past decade, discusses the relevant channels through which they influence real activity and documents their importance.

1.1 Developments in exchange rate flexibility

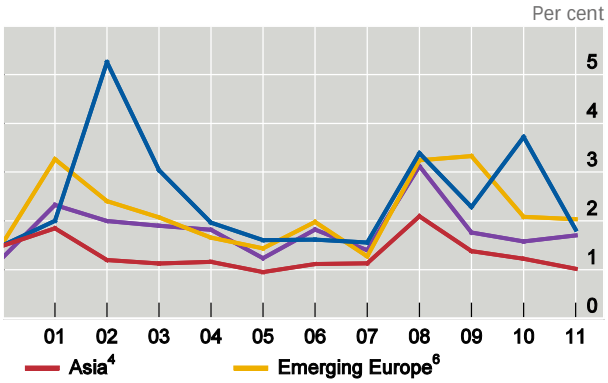
The degree of exchange rate flexibility has not changed substantially during the past decade in the EME regions (Graph 1). Based on the standard deviation of

changes in monthly[2] exchange rates, it appears that nominal[3] effective exchange rate (NEER) flexibility has been lower over time in Asia than in Latin America or central and eastern Europe, without any obvious trends in any of the regions (left-hand panel). Flexibility increased during the financial crisis in most regions, but has fallen since. Bilateral exchange rates against a base currency (either dollar or euro) have become somewhat more flexible over time in Asia, and in emerging Europe (right-hand panel).

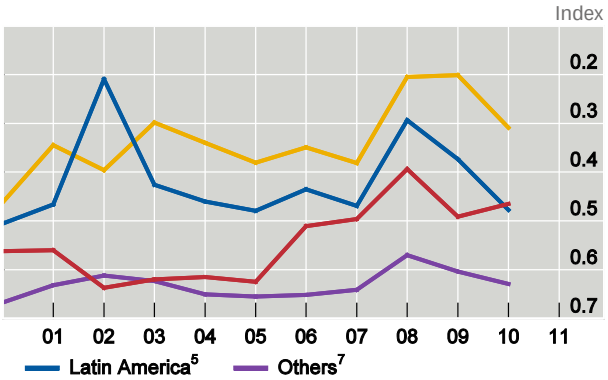
Exchange rate flexibility[1]

Graph 1

Flexibility of nominal effective exchange rate[2]



Bilateral exchange rate flexibility[3]



[1] Simple averages across the economies listed. [2] Standard deviation of the first difference in monthly log NEER. [3] Based on the normalised annual standard deviation of the monthly exchange rate between home and base country, as defined by Aizenman et al (2010). The index obtains values from 0 to 1, with higher values indicating a more stable movement against a base currency. [4] China, Hong Kong SAR, India, Indonesia, Korea, Malaysia, the Philippines, Singapore and Thailand. [5] Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela. [6] Czech Republic, Hungary, Poland, Russia and Turkey. [7] Israel, Saudi Arabia, South Africa and the United Arab Emirates.

Sources: BIS; Aizenman et al (2010); authors' calculations.

The increase in exchange rate flexibility in Asia and emerging Europe is also reflected in the *de facto* exchange rate regimes, based on the classification by the IMF (Table 1).[4] In both regions, there was a clear increase in the share of floating regimes during the previous decade, while pegged exchange rates and managed regimes became less prevalent. In Latin America, floating exchange rate regimes were already in place in most economies in 2002.

[2] These are low frequency indicators. Schnabl (2006) discusses the benefits of low versus high frequency exchange rate stabilisation.

[3] The analysis presented further below mostly uses real exchange rates, as these are arguably most relevant for real economic outcomes. Due to price stickiness, the measures of exchange rate flexibility presented in the left-hand panel in nominal terms are almost identical to those obtained with real effective exchange rates (REER).

[4] Another possibility is to examine *de jure* regimes. However, empirical analyses that link these regimes to economic outcomes can be problematic, as *de jure* regimes sometimes differ from actual behaviour (Rogoff et al (2003)).

Exchange rate regimes[1] Table 1

	2002				2011			
	Asia	Latin America	EM Europe	Other	Asia	Latin America	EM Europe	Other
Peg	33%	0%	20%	50%	11%	14%	0%	50%
Crawling peg	0%	0%	0%	25%	11%	14%	0%	0%
Managed	44%	14%	40%	0%	22%	0%	20%	0%
Floating	22%	86%	40%	25%	56%	71%	80%	50%

[1] De facto classification, exchange rate regimes at the end of the year. Shares of economies in each region. "Peg" includes currency board arrangements, other conventional fixed peg arrangements, pegged exchange rates within horizontal bands and conventional pegs. "Crawling peg" includes exchange rates within crawling bands, crawling pegs and crawl-like arrangements. "Managed" comprises managed floating with no pre-announced/predetermined path for the exchange rate and other managed arrangements. "Floating" includes both independently/free-floating and floating exchange rates.

Source: IMF, Annual Report on Exchange Arrangements and Exchange Restrictions 2003, 2012.

1.2 Exchange rate flexibility and long-term growth

Exchange rate flexibility could affect long-run economic growth if it has an impact on productivity growth. Both the level and volatility of the exchange rate are at play here. With respect to the level, the early literature argues in favour of an undervalued exchange rate for the promotion of domestic industries. Many emerging economies continue to have growth models heavily reliant on exports (BIS (2012)). Rodrik (2008) shows in a theoretical model how exchange rate undervaluation can stimulate growth if the tradable goods sector is affected disproportionately by market failures or institutional weaknesses. In addition, trend appreciations and depreciations can have negative implications for foreign direct investment through the location of industries. These considerations suggest that limiting exchange rate flexibility could matter, especially for the tradable goods sector.

Large and frequent changes in the exchange rate can create a volatile economic structure, particularly if financial markets are underdeveloped and agents have few hedging possibilities. Such a volatile economy could adversely affect prospects for investment and growth. It could also reduce international trade, especially in economies dependent on intra-regional trade because large exchange rate changes have compounding effects on the costs of intermediate inputs (see eg Thorbecke (2008)).

But greater exchange rate flexibility could also lead to a more efficient allocation of resources and higher growth. It could encourage innovation and productivity growth, as domestic firms cannot rely on undervalued exchange rates and FX intervention to maintain external competitiveness. When exchange rates are flexible and financial markets are well developed, investment and production decisions can be disconnected from movements in the exchange rate.

Capturing the long-run impact of the exchange rate on growth is difficult because of the lack of information on total factor productivity in many EMEs. In general, econometric analysis gives inconclusive evidence about the relationship between exchange rate volatility and long-run growth. We regressed labour

productivity growth during 2000–11 on real exchange rate volatility during the same period, and on the level of initial income observed in 1999.[5] For a pooled sample comprising 52 advanced and emerging economies, the cross-sectional estimation yields a statistically insignificant and negative coefficient on exchange rate volatility, while the initial level of income appears as an important determinant of productivity growth, with a negative and statistically significant coefficient. This is in line with convergence effects in standard growth regressions. Chow breakpoint tests that we subsequently carried out were not able to establish a threshold level of initial income above or below which exchange rate volatility would become a statistically significant determinant of growth.[6]

These results suggest that other factors – such as financial development or exchange rate misalignments – may be at play in the relationship between exchange rate volatility and growth. This is in line with the extant literature. For instance, Aghion et al (2009) report that at low levels of financial development – measured by the ratio of credit to GDP – exchange rate volatility generally reduces growth. The authors show that this outcome is consistent with a model where real exchange rate uncertainty hinders investment when agents are credit constrained. It is plausible that firms in higher-income economies are more likely to internalise exchange rate movements and hedge against exchange rate risk – exchange rate movements then lead to smaller changes in real quantities than in lower-income economies. This is especially the case if income levels proxy for financial market development.[7] Finally, it is not clear to what extent possible exchange rate misalignments[8] account for the empirically observed relationships between productivity growth and exchange rate volatility. Rodrik (2008) provides empirical evidence that the growth impact of exchange rate undervaluation depends on the level of development, with stronger effects found in lower-income economies.

1.3 Exchange rate flexibility and output volatility

Moving from the *level* of growth to its *volatility*, a more flexible exchange rate could protect the economy against the adverse impacts of external shocks through its countercyclical role in reducing output volatility (eg Obstfeld and Rogoff (1995)).[9] Graph 2 suggests that there is a U-shaped relationship between real exchange rate volatility and output volatility in emerging economies (left-hand panel), when output volatility is measured by the standard deviation of quarterly real GDP growth. Up to a point, increased flexibility of the real exchange rate acts as a shock

[5] Real exchange rate volatility is defined as the standard deviation of the first difference in monthly log REER during 2000–11. Labour productivity is measured as real GDP per total employment. The level of initial income is specified as GDP *per capita* in USD.

[6] The Chow test endogenously conducts a search for a breakpoint that is unknown *a priori*.

[7] As part of our regression analysis we also carried out Chow breakpoint tests based on various threshold values of the ratio of domestic credit to GDP. The results are substantively similar to those using initial income as the threshold variable.

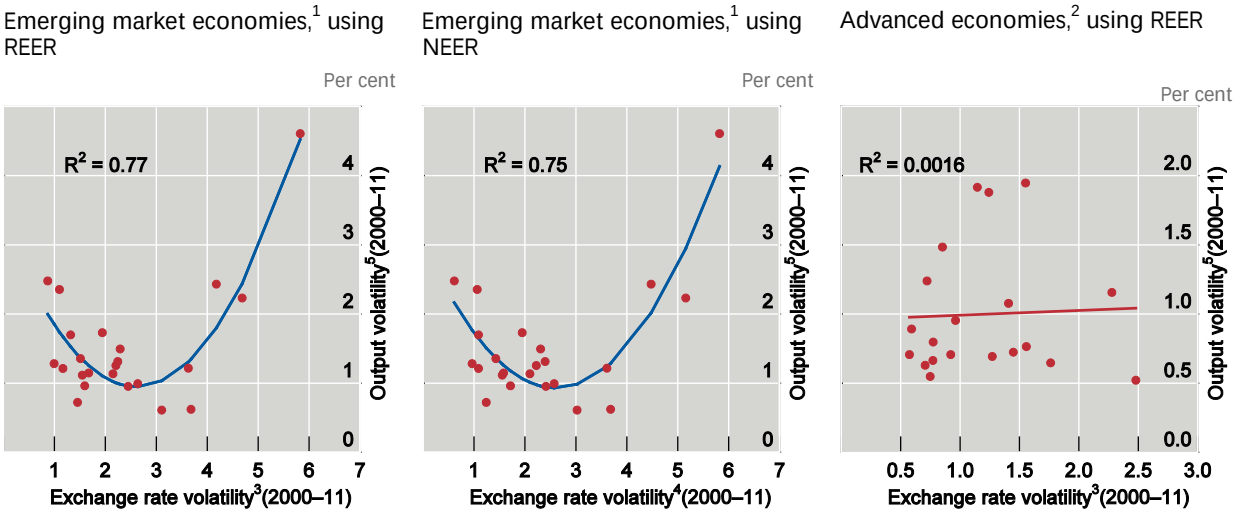
[8] Estimates of exchange rate misalignment are highly sensitive to the chosen method when computing equilibrium exchange rates, and there is no general agreement on a preferred measure.

[9] When an economy is hit by an external real shock in a regime of fixed exchange rates, the adjustment must come through changes in domestic prices and wages. As nominal rigidities typically hinder rapid adjustments in these variables, there are costs in terms of employment and output.

absorber and helps to insulate the economy against shocks. But extreme exchange rate flexibility can itself become a source of real volatility. This can arise if exchange rates display overshooting behaviour[10] and thereby become sources of shocks themselves; if a large exchange rate movement reflects a sudden stop of capital flows and a balance of payments crisis; or if large exchange rate movements exacerbate the impact of structural vulnerabilities in the economy, such as currency mismatches.[11] Due to price rigidities, it is not surprising that the U-shaped relationship is robust to using *nominal* effective exchange rates instead (centre panel) – these are arguably more relevant for policymakers from an operational viewpoint.

Exchange rate and output volatility

Graph 2



[1] Coverage of EMEs as in Graph 1, excluding Saudi Arabia and the United Arab Emirates. [2] The advanced economies are the 20 largest industrial countries based on the IMF WEO classification and nominal GDP data for 2011, omitting the economies classified as EMEs in this paper. [3] Standard deviation of first difference of monthly log REER during the specified period. [4] Standard deviation of first difference of monthly log NEER during the specified period. [5] Standard deviation of quarterly real GDP growth during the specified period.

Sources: IMF, *World Economic Outlook*; Datastream; national data; BIS calculations.

The database on financial crises by Laeven and Valencia (2012) classifies three EMEs in our sample as having experienced currency crises during the previous decade – Argentina, Turkey and Venezuela. These are the three economies located on the upward sloping part of the left-hand and centre graph, suggesting that the nature and size of shocks are indeed important. Omitting the economies that experienced currency crises, exchange rate flexibility appears beneficial in smoothing output volatility. For our sample of advanced economies (right-hand panel), we find no correlation between exchange rate and output volatility during the last decade.

An alternative perspective is provided by comparing output volatility with the exchange rate regimes in emerging economies. We use the IMF classification of *de*

[10] For a discussion of how foreign exchange intervention can break the destabilizing feedback loop of momentum effects, see Ehlers and Takáts (2013).

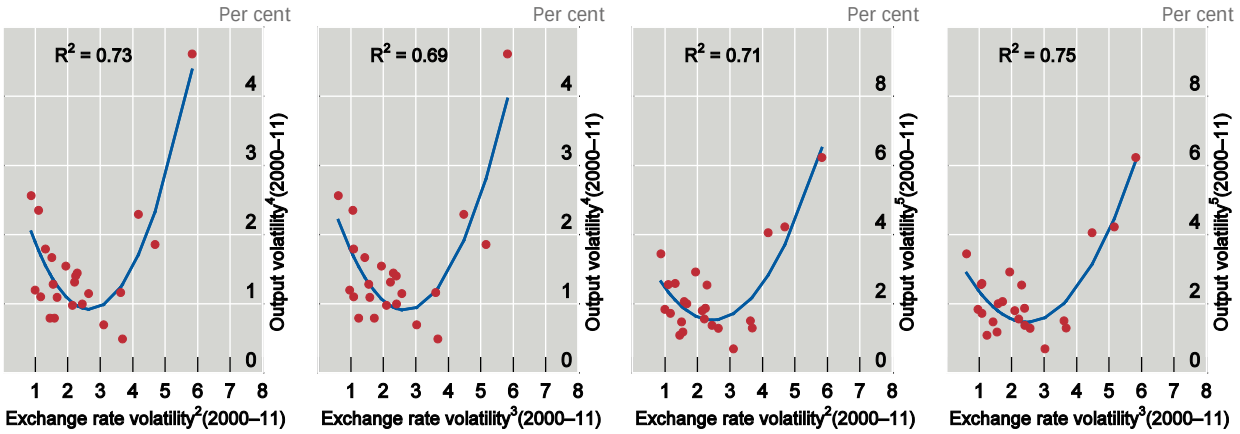
[11] The causality in Graph 2 could go either way. If an economy is hit by large external shocks such as those to the terms of trade, large movements in exchange rates are needed to bring about the required adjustment in the equilibrium exchange rate.

facto regimes, as in Table 1.[12] This analysis reinforces the result that exchange rate flexibility has a stabilising effect: output volatility during 2000-11 is lowest on average under floating exchange rates and highest in regimes of pegged exchange rates (2.5% vs 4.8%, respectively).[13] Managed regimes appear to feature slightly higher output volatility (2.9%) than floating ones.[14]

Theoretically, the stabilising role of flexible exchange rates could also come about through the impact of exchange rate regimes on fiscal discipline. Tornell and Velasco (2000) argue that flexible exchange rates would immediately reflect unsound fiscal policies; in contrast, fiscal indiscipline eventually leads to a collapse of the fixed exchange rate with costly real consequences.

Exchange rate and output volatility[1]

Alternative measures — Graph 3



[1] Coverage of EMEs as in Graph 1, excluding Saudi Arabia and the United Arab Emirates. [2] Standard deviation of first difference of monthly log REER during the specified period. [3] Standard deviation of first difference of monthly log NEER during the specified period. [4] Standard deviation of residuals from an AR(1) process of quarterly real GDP growth. [5] Standard deviation of quarterly output gap, as defined in Footnote 15.

Sources: IMF, *World Economic Outlook*; Datastream; national data; BIS calculations.

The finding of a U-shaped relationship between exchange rate and output volatility in emerging economies in the previous decade appears robust to two alternative measures of output volatility. In Graph 3, first and second panels, output volatility is defined as the standard deviation of the residuals of an AR(1) process of

[12] The *de facto* exchange rate regimes can of course change over time. We take the exchange rate regime reported for at least two out of the following three years: 2002, 2007 and 2011, as the relevant *de facto* exchange rate regime for this analysis. If an economy has a different regime during each of the three years, it is omitted.

[13] Output volatility is measured here as standard deviation of first difference of annual log real GDP. Results for the category "crawling peg" are not considered, since only one economy is included in this category.

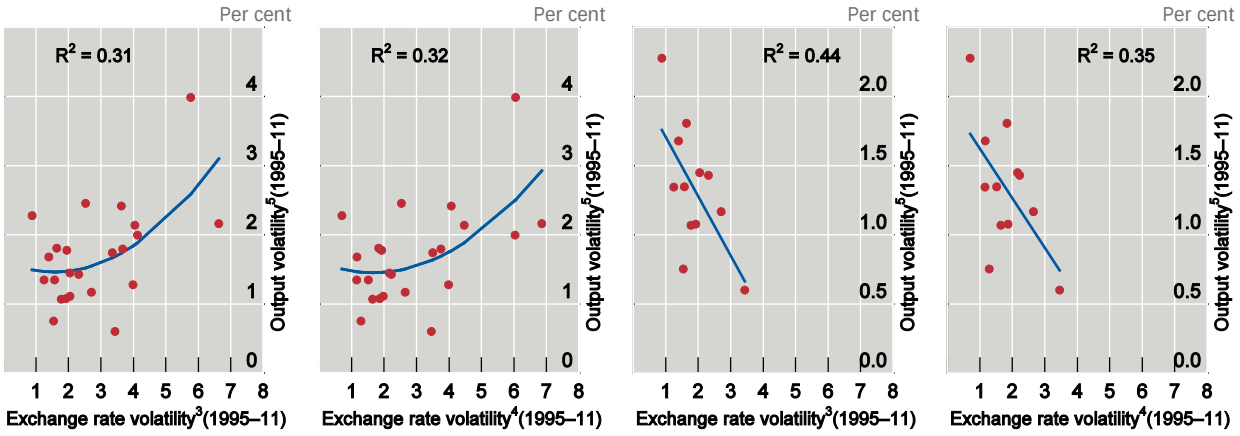
[14] Filardo and Grenville (2012) suggest that, while an intermediate approach between fixed and flexible rates has emerged as a feasible choice in Asian EMEs in the past decade, it has not been without costs. These costs arise, *inter alia*, from the expansion in central bank balance sheets through an increase in carrying costs and re-valuation risks when exchange and interest rates fluctuate.

quarterly real GDP growth; in the third and fourth panels, the standard deviation of an estimated output gap is used.[15] The similarities between these measures of output volatility are in line with evidence for the United States in Blanchard and Simon (2001).

Finally, the U-shaped relationship is dependent on the time period and the incidence of crises. If the years 1995–99 with multiple EME crises are included in the sample (Graph 4, first and second panels), the downward-sloping part of the curve disappears. This likely reflects the different nature of shocks, such as sudden stops in capital flows that lead to large exchange rate movements. Indeed, if the emerging economies that experienced currency crises are omitted from the sample, the graph becomes downward-sloping (third and fourth panels), again in line with the stabilising properties of flexible exchange rates. Finally, as shown in Graphs 2–4, the relationships are robust irrespective of whether nominal or real effective exchange rates are used.

Exchange rate and output volatility

Alternative samples — Graph 4



[1] Coverage of EMEs as in Graph 1, excluding Saudi Arabia and the United Arab Emirates. For the Czech Republic, Q2 1996–2011, for Hungary, Poland and Russia, Q2 1995–2011. [2] Chile, China, Colombia, the Czech Republic, Hong Kong SAR, Hungary, India, Israel, Peru, Poland, Singapore and South Africa. For the Czech Republic, Q2 1996–2011, for Hungary and Poland, Q2 1995–2011. [3] Standard deviation of first difference of monthly log REER during the specified period. [4] Standard deviation of first difference of monthly log NEER during the specified period. [5] Standard deviation of quarterly real GDP growth during the specified period.

Sources: IMF, *World Economic Outlook*; Datastream; national data; BIS calculations.

2. Exchange rate flexibility and financial markets

The extent of exchange rate flexibility may affect the perception of economic agents regarding risks related to vulnerabilities such as currency mismatches. There may

[15] The output gap is defined as the difference between actual and potential output, where potential output is based on a Hodrick-Prescott filtered trend of quarterly real GDP (in logarithms) and a standard smoothing parameter of 1,600.

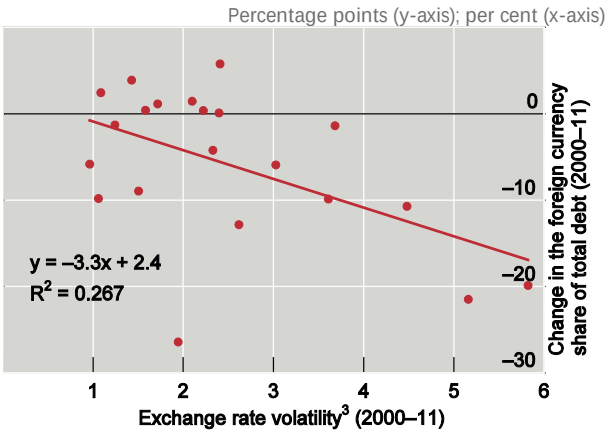
also be an impact on financial market development, in particular markets for local currency debt instruments and those for hedging against exchange rate risk. The hedging markets, in turn, arguably affect the desired extent of exchange rate flexibility for a given economy. These issues are examined in this section.

There is a two-way relationship between exchange rate flexibility and the structure of balance sheets, in particular the prevalence of currency mismatches. A more flexible exchange rate may encourage a reduction in currency mismatches and unhedged borrowing, by raising awareness about financial risks. The extent to which currency mismatches are reduced depends on whether firms and governments can hedge currency risks, affording an important role for the development of derivatives markets. On the other hand, the degree of exchange rate flexibility also depends on initial mismatches, as argued in the "fear of floating" literature (eg Calvo and Reinhart (2002)). In the presence of large currency mismatches, in particular under liability dollarisation, policymakers may be reluctant to allow much exchange rate flexibility. Lastly, large net foreign assets in the form of foreign exchange reserves could be used by the authorities to reduce exchange rate volatility.

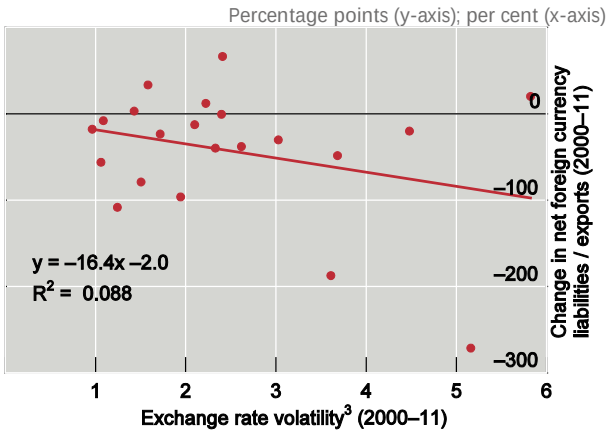
Change in currency mismatches and exchange rate volatility[1]

Graph 5

Relationship with foreign currency share of total debt[2]



Relationship with net foreign liabilities (foreign currency liabilities less foreign currency assets) as share of exports[2]



[1] Coverage of EMEs as in Graph 1, excluding Hong Kong SAR, Saudi Arabia, Singapore and the United Arab Emirates. For Colombia, Mexico and the Philippines, 2001–11. [2] Based on the measure developed by Goldstein and Turner (2004); includes debt between residents. [3] Standard deviation of first difference of monthly log NEER.

Sources: IMF; CEIC; Datastream; national data; BIS.

Graph 5 shows that increased exchange rate flexibility has indeed been associated with a reduction in currency mismatches during the last decade. This holds if mismatches are expressed both as foreign currency shares of total debt (left-hand panel) and net foreign liabilities as share of exports (right-hand panel). This is consistent with the two-way relationship between currency mismatches and exchange rate flexibility.[16] The smaller currency mismatches, in turn, have allowed monetary authorities to conduct countercyclical interest rate policy, with fewer

[16] Such correlations cannot capture the importance of other, exogenous, factors. As an example, the Asian crisis led to greater focus on reducing currency mismatches, while at the same time international observers encouraged the adoption of more flexible exchange rate regimes.

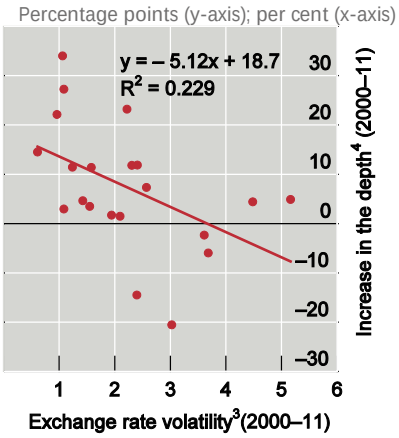
concerns about the adverse balance sheet effects of exchange rate depreciation (Mehrotra, Miyajima and Villar (2012)). This helps further smooth output volatility.

Greater exchange rate flexibility may affect the development of local currency bond markets. Central banks can benefit from the development of deep local currency securities markets for sterilisation operations. This is particularly relevant to those that actively intervene in the FX markets and sterilise the resulting increase in monetary liabilities. Another important consideration is how foreign investment in local currency bond markets is affected; foreign investors, who face exchange rate risk, are often seen to be the main contributors to liquidity in these markets (Turner (2012)). A fixed exchange rate regime reduces short-term currency risks, encouraging foreign investment in local currency debt. Indeed, Miyajima, Mohanty and Chan (2012) show that the high volatility of emerging market currencies can undo the potential diversification benefits for foreign investors, especially in the case where these investors are not hedged against exchange rate movements.

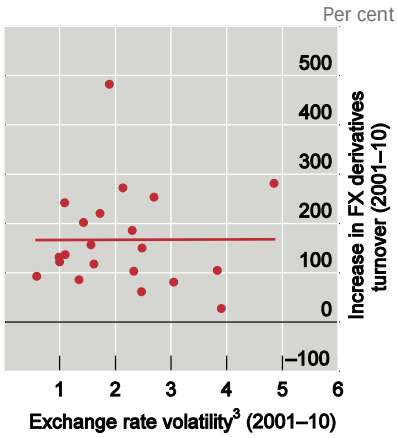
Financial market development and exchange rate volatility

Graph 6

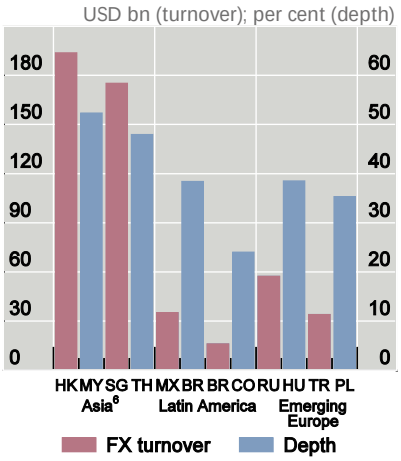
Exchange rates and increase in local currency government bond market depth[1]



Exchange rates and increase in FX derivatives turnover[2]



FX derivatives turnover and depth of local currency government bond markets[4, 5]



BR = Brazil; CO = Colombia; HK = Hong Kong SAR; HU = Hungary; MX = Mexico; MY = Malaysia; PL = Poland; RU = Russia; SG = Singapore; TH = Thailand; TR = Turkey.

[1] Coverage of EMEs as in Graph 1, excluding Israel, Saudi Arabia, the United Arab Emirates and Venezuela. [2] Coverage of EMEs as in Graph 1, excluding Argentina, China, the United Arab Emirates and Venezuela. [3] Standard deviation of first difference of monthly log NEER. [4] Depth defined as the share of local currency government bond securities outstanding to nominal GDP. [5] For each region, the graph shows the two economies with the highest turnover in 2010 and the highest depth of local currency government bond markets in 2011. [6] FX derivatives turnover for Hong Kong SAR and Singapore plotted on the left axis.

Source: BIS.

A prerequisite for fixed exchange rates to encourage foreign investment is credibility of the regime, effectively reducing unanticipated movements in exchange rates. In contrast, a flexible exchange rate regime may also encourage foreign investors to add more EME debt securities into their portfolio holdings, if they do not perceive the currency to be artificially moved by FX intervention away from the market equilibrium rate. Graph 6, left-hand panel, shows that greater exchange rate flexibility was negatively associated with the depth of local currency bond markets in our sample of emerging economies. This suggests that considerations of exchange rate risk may have been important.

When exchange rates are more volatile, firms may increase their hedging activities against expected fluctuations, contributing to higher turnover in FX derivatives markets. But exchange rate flexibility is only one of the many relevant factors influencing the development of derivatives markets. Capital account openness and market infrastructure arguably play important roles. Mihaljek and Packer (2010) show that growth in derivatives turnover in emerging markets is positively correlated with the volume of external trade, per capita income and financial activity. Geczy et al (1997) and Allayannis and Offek (2001) find that exposure factors (ie foreign sales and foreign trade) prompt firms to engage in hedging.[17]

Indeed, the centre panel of Graph 6 shows no obvious relationship between exchange rate volatility and the increase in FX derivatives turnover in the past decade. Some EMEs with less flexible exchange rates have large derivatives markets, in particular Hong Kong SAR (right-hand panel). Similar results are obtained when considering interest rate derivatives instead of FX derivatives. This lack of correlation may reflect either the multiple factors relevant for the development of derivatives markets, or reverse causality, whereby market completeness through derivatives contracts may help to stabilise exchange rates over time.[18]

As the development of local currency bond and derivatives markets is intertwined, the risks for foreign investors may eventually be highest in managed exchange rate regimes with underdeveloped hedging markets. Insufficient hedging may lead to crises in future. All things considered, a flexible exchange rate may not necessarily lead to a deeper derivatives market (as shown in Graph 6). Rather, it is the extent of development of hedging markets that influences the desired degree of exchange rate flexibility. That makes the development of these markets the crucial policy challenge.

Conclusions

In this paper, we have analysed the links between exchange rate volatility, the real economy and financial markets. The analysis is motivated by the observation that many emerging economies have intervened in the foreign exchange markets in the previous decade to contain volatility and possibly to curb appreciation pressures in their currencies. To the extent that intervention restricts the overall extent of exchange rate flexibility, there may be implications in terms of real economic outcomes and financial market development.

The paper reports the following findings. In line with the literature, we find no strong link between exchange rate flexibility and long-run productivity growth. Further, we find that the relationship between exchange rate volatility and output volatility in our sample of emerging economies is U-shaped. Some exchange rate flexibility is beneficial, but too much of it can create instability in the real economy. This also likely reflects the nature of shocks facing the economies. Focusing only on

[17] Allayannis and Ofek (2001) further find that other factors associated with theories of optimal hedging (eg size and R&D expenditures) are important determinants of the level of derivatives use.

[18] We have estimated panel regressions to further investigate the link between exchange rate volatility and derivatives markets turnover, controlling for the determinants that were found significant in Mihaljek and Packer (2010). The statistical insignificance of exchange rate volatility in determining derivatives turnover remains unchanged in such regressions.

economies with no currency crises, increased exchange rate flexibility appears to be largely beneficial for output stability.

Finally, the relationship between exchange rate flexibility and the development of financial markets is less clear. A multitude of different factors influence financial market development, and the credibility of the chosen foreign exchange rate regime also plays a non-trivial role. Besides, the relationship between exchange rate flexibility and financial market development may be subject to reverse causality.

Overall, the paper suggests that the choices regarding exchange rate flexibility have real economic consequences. Yet, the relationships between exchange rates and the real economy are complex, and there are many contributing factors, such as levels of income, market imperfections and financial development.

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