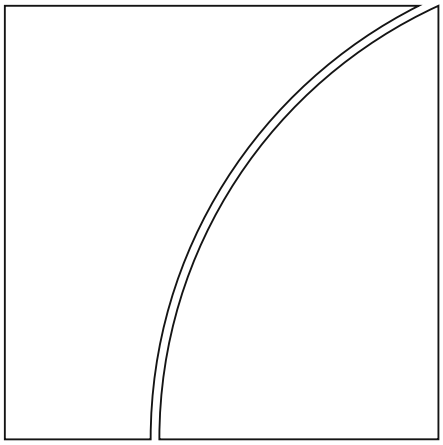

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Trilemmas and trade-offs: living with financial globalisation

by Maurice Obstfeld, comments by Otmar Issing and Takatoshi Ito

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Foreword

The 13th BIS Annual Conference took place in Lucerne, Switzerland on 27 June 2014. The event brought together a distinguished group of central bank governors, leading academics and former public officials to exchange views. The focus this year was on debt. The papers presented at the conference and the discussants' comments are released as BIS Working Papers 479 to 482.

BIS Papers No 80 contains the opening address by Jaime Caruana (General Manager, BIS) and a keynote address by Benjamin Friedman (Harvard University) and remarks by Stephen King (HSBC) and Masaaki Shirakawa (Aoyama Gakuin University).

Trilemmas and trade-offs: living with financial globalisation

Maurice Obstfeld[1]

Abstract

This paper evaluates the capacity of emerging market economies (EMEs) to moderate the domestic impact of global financial and monetary forces through their own monetary policies. Those EMEs that are able to exploit a flexible exchange rate are far better positioned than those that devote monetary policy to fixing the rate – a reflection of the classical monetary policy trilemma. However, exchange rate changes alone do not insulate economies from foreign financial and monetary shocks. While potentially a potent source of economic benefits, financial globalisation does have a downside for economic management. It worsens the trade-offs monetary policy faces in navigating among multiple domestic objectives. This drawback of globalisation raises the marginal value of additional tools of macroeconomic and financial policy. Unfortunately, the availability of such tools is constrained by a *financial* policy trilemma that is distinct from the monetary trilemma. This second trilemma posits the incompatibility of national responsibility for financial policy, international financial integration and financial stability.

Keywords: Policy trilemma, financial stability, financial globalisation, international policy transmission

JEL classification: F33, F36, F42, F65

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1. Introduction

This paper evaluates the capacity of emerging market economies (EMEs) to moderate the domestic impact of global financial and monetary forces through their own monetary policies. I present a case that those EMEs that are able to exploit a flexible exchange rate are far better positioned than those that devote monetary policy to fixing the rate – a reflection of the classical monetary policy trilemma. Indeed, this ability was critically important in EMEs' widely successful response to the global financial crisis (GFC) of 2007–09.

However, exchange rate changes alone do not insulate economies from foreign financial and monetary developments. While potentially a potent source of economic benefits, financial globalisation does have a downside for economic management. It worsens the trade-offs monetary policy faces in navigating among multiple domestic objectives. This drawback of globalisation raises the marginal value of additional tools of macroeconomic and financial policy.

Unfortunately, the availability of such tools is constrained by a *financial* policy trilemma that is distinct from the monetary trilemma. This second trilemma posits the incompatibility of national responsibility for financial policy, international financial integration and financial stability. Therefore, national prudential policies cannot be effective when capital markets are open to cross-border transactions.[2]

My argument that independent monetary policy is feasible for financially open EMEs, but limited in what it can achieve, takes a middle ground between more extreme positions in the debate about monetary independence in open economies. On one side, Woodford (2010, p 14) concludes: "I find it difficult to construct scenarios under which globalization would interfere in any substantial way with the ability of domestic monetary policy to maintain control over the dynamics of inflation." His pre-GFC analysis, however, leaves aside financial market imperfections and views inflation targeting as the only objective of monetary control. On the other side, Rey (2013) argues that the monetary trilemma is really a dilemma, because EMEs can exercise no monetary autonomy from US policy (or the global financial cycle) unless they impose capital controls.

The outline of this paper is as follows. First, I present an overview of the capital flow problem for EMEs. Then, I review mechanisms through which monetary policies and the financial cycle in advanced economies, especially in the United States, are transmitted to EMEs. One potent mechanism works through interest rate linkages, but financial conditions can also migrate through other channels. Thus, there is a global financial cycle that does not coincide with global monetary policy shifts (Borio (2012), Bruno and Shin (2013), Rey (2013)), and exchange rate changes alone do not fully offset its effects. The next section sets out empirical evidence on interest rate independence in EMEs, adding to the existing literature by analysing long-term interest rates. The results leave no doubt that countries that do not peg their exchange rates exercise considerable monetary autonomy at the short end of the term structure, but long-term interest rates are more highly correlated across countries irrespective of the exchange rate regime.

[2] See Schoenmaker (2013) for a broad survey.

In the penultimate section, I describe the relationship between policy trilemmas and trade-offs in open economies. I present my argument that the fundamental problem for open EMEs is not ineffective monetary policy per se. The problem is a more difficult trade-off among multiple objectives, the result of a shortage of reliable policy instruments for attaining those objectives simultaneously.[3] A brief final section outlines future research directions and also describes how some limited initiatives in international policy cooperation might soften the harsh trade-offs that EMEs now face.

2. Overview

Since the 19th century, emerging and frontier regions have been subject to the ebb and flow of lending from richer countries. Even during the past century, powerful lending cycles buffeted those regions, ie in the 1920s, in the 1970s to the early 1980s, in the early 1990s, in the mid-2000s, and after 2009.

With the development of emerging financial markets and the general expansion of global finance, however, recent decades have revealed some new patterns. First, many emerging market countries that Nurkse (1954) ruled out as portfolio investment destinations based on their colonial history now receive such flows. Perhaps history is not always destiny after all. Second, even emerging economies with persistent current account surpluses – including several Asian economies – may experience *gross* capital inflow surges, the result of rich-country portfolio shifts in favour of emerging assets. Where these portfolio demands are accommodated through the home central bank's intervention, the financial inflows finance foreign reserve increases. Where the central bank instead allows currency appreciation, net private claims of foreigners still rise, albeit gradually over time, as a result of a reduced current account balance.[4] The case of China shows how both mechanisms can operate at once. Whether the central bank intervenes or not, domestic financial conditions are affected immediately, although the expansionary effect is probably bigger when intervention occurs and causes an increase in the domestic money supply and domestic bank credit.[5]

Capital inflow surges can cause a variety of dislocations – not the least of which is to create a range of vulnerabilities to subsequent capital flow reversals. After the

[3] In a closely related spirit, Filardo et al (2014) propose a "three pillar" policy strategy for emerging economies – one that navigates among price stability, financial stability and exchange rate goals.

[4] In a pair of classic contributions, Calvo et al (1993, 1996) linked *net* emerging market capital inflow surges to monetary ease in the advanced countries. Their theme remains highly relevant, of course, and is the central focus of this paper. For documentation on *gross* capital flow surges and reversals, see Cowan et al (2008), Forbes and Warnock (2012) and Broner et al (2013). On long-term cycles in capital flows, see Bacha and Díaz-Alejandro (1982), Eichengreen (1991) and Obstfeld and Taylor (2004). Of course, the pattern of net capital flows remains puzzling, as discussed by Prasad et al (2007) and Gourinchas and Jeanne (2013). On the importance of financing conditions as reflected in gross capital flows, see Borio and Disyatat (2011).

[5] For some evidence suggesting that this is the case, and that net private capital inflows are likely to create more financial fragility in economies with less flexible exchange rate regimes, see Magud et al (2014). The theoretical perspective I sketch later in this paper suggests, however, that a more nuanced understanding would come from studying the impacts of *gross* inflows, as analysed by some of the references listed in the previous footnote.

GFC, industrial countries, their recoveries slowed by the effects of private and public debt overhang, relied on continuing monetary stimulus in the forms of ultra-low policy interest rates (sometimes coupled with forward guidance) and unconventional quantitative measures. In general, however, the EMEs – at least those that avoided big debt run-ups[6] – had suffered less in the crisis. With economies growing more briskly than those of advanced countries, these EMEs did not require abnormally accommodative monetary policy settings. Currencies, bonds, equities and real estate appreciated because of the resulting global portfolio shift into EME assets. Appreciation contributed to financial stability (as well as competitiveness) concerns, and countries that resisted exchange rate change through intervention saw greater pressure on domestic asset prices, on domestic credit growth and on general product price levels. Those pressures have now left EMEs more vulnerable to a reversal of global financial flows.

Clearly, then, EMEs have an interest in tempering the effects of global portfolio shifts, especially when the sequence is capital feast followed by capital famine. How can EMEs use their macroeconomic tools to do so? Astute observers have long known that in principle monetary policy is vital, but cannot furnish the sole response to capital inflow surges. Shortly after the Tequila crisis of two decades ago, for example, Calvo et al (1996, p 137) wrote:

> [T]he countries that have been the most successful in managing capital flows […] have implemented a comprehensive policy package and not relied on a single instrument. At the outset of the surge in inflows, these countries reacted by treating inflows as temporary and resisted a nominal exchange rate appreciation; the foreign exchange intervention was mostly sterilized. As the inflows persisted, sterilization efforts were scaled back and the domestic currency was allowed to appreciate. To moderate the extent of the real appreciation and prevent the economy from overheating, fiscal policy was tightened. To moderate the volume of the inflows and lengthen their maturities, exchange rate flexibility was increased and measures to curb inflows were implemented.

A less productive policy mix has consisted of persistent sterilisation (which keeps short-term interest rates comparatively high), heavy intervention in the foreign exchange market (which results in little short-run exchange rate uncertainty) and no controls on short-term capital movements. All of these policies have tended to provide especially strong incentives for short-term capital inflows.

Subsequent research and experience suggested, however, that for some countries the preceding approach was difficult to implement in practice during the 1990s. Perhaps most importantly, currency mismatch and the need for an easily verifiable nominal anchor sometimes imparted a strong policy bias towards exchange rate stability in EMEs, thereby constraining monetary policy (Hausmann et al (2001), Calvo and Reinhart (2002)). In the presence of fixed or highly managed exchange rates, a number of policy failures set the stage for the EME crises of the late 1990s.

More recently, the position of EMEs has evolved considerably. As noted above, international financial flows have increased in scale, particularly in gross terms,

[6] See Gourinchas and Obstfeld (2012).

driven in significant part by international banking flows. At the same time, domestic financial systems have expanded and deepened. While for EMEs these changes are not as extreme as for the advanced countries, they are still highly significant and leave EMEs more exposed to shifts in global financial market sentiment. For example, a big sell-off of domestic assets by foreign investors is likely to induce a significant exchange rate change before enough buyers come forward to restore market equilibrium. EME corporates and banks increasingly issue bonds offshore, and these foreign currency liabilities, which are not captured in standard, residence-based net international investment position data, are a potential source of currency mismatch, as well as direct exposure to foreign financing conditions (Turner (2014), Shin (2013)).

One manifestation of global financial linkages is the importance of cross-border credit, in both local and foreign currency (Borio et al (2011)). Figure 1 shows the ratio of cross-border to domestic bank credit for five regions, as measured by the BIS's global liquidity indicators. Three regularities stand out. First, apart from the Asia-Pacific grouping (which mixes advanced and emerging economies), cross-border credit is very significant compared with domestic bank credit – currently in the 10–20% range for the other four regions. Second, in all regions, the ratio of cross-border to domestic credit covaries positively with the global credit boom of the mid-2000s and the subsequent collapse – a reflection of the gross financial flows that helped fuel the GFC. Finally, the cross-border bank credit ratio falls secularly in Latin America and emerging Europe, from a very high level at the start of the millennium to a level roughly on the same order as for the United States and the euro area. In part, declining reliance on cross-border bank lending reflects domestic financial deepening; in part, it reflects retrenchment in banks' global activities and growth in bond finance after the GFC. While perhaps reduced compared with its level in 2000, considerable exposure to global banking fluctuations remains for many EMEs, and evidence indicates that net cross-border debt flows fuel domestic credit growth.[7] Moreover, increasing EME recourse to non-bank funding sources has created new exposures, some not even visible in residence-based data on gross external liabilities, such as the Lane and Milesi-Ferretti (2007) data for selected countries shown in Figure 2.[8]

Counteracting the increased vulnerabilities are some policy and institutional enhancements.[9] Over time, EMEs have shifted their gross liability positions away from debt in the direction of equity instruments (portfolio equity and foreign direct investment (FDI)). In this respect, international financial integration promotes international risk-sharing and can therefore be a stabilising factor. Figures 3 and 4 illustrate the recent dramatic shift of external liabilities towards equity (see also Lane and Shambaugh (2010) and Prasad (2012)).[10] Currency depreciation automatically

[7] Locational banking data such as these (based on the residence principle) may well understate banking exposure, as the head offices of domestic affiliates are likely to divert funding in a crisis. See Cetorelli and Goldberg (2011). Lane and McQuade (2014) document a link between net cross-border debt flows and domestic credit growth.

[8] For this figure, I exclude tax havens as well as all countries with GDP below $2 billion in 2012.

[9] See Obstfeld (2014) for a more detailed survey and discussion.

[10] In general, the picture in emerging Europe (where some countries are in the euro area) is more mixed and not as favourable to foreign equity finance. The data in the figures of course reflect stock market price fluctuations, but the trends are still clear. Broadly speaking, if one starts in 1970,

devalues this portion of external liabilities; but even the remaining external and domestic debt is increasingly denominated in domestic currency (Lane and Shambaugh (2010), Miyajima et al (2012), Turner (2012)). The growth of domestic bond markets – most advanced among the EMEs in Asia, where corporates are significant players alongside governments – has been an important supporting factor. Moving from a nominal exchange rate anchor to some alternative (often a managed float within the context of an inflation target) has paid dividends for many EMEs, both in providing generally moderate inflation and in relieving governments of the need to defend a definite line in the sand with monetary policy or reserves. The second dividend has generally reduced the incidence of foreign exchange crises, in part by freeing up foreign exchange reserves for purposes other than defence of an exchange rate target.[11] Of course, more reliably moderate inflation itself has helped to promote domestic currency denomination of domestic and foreign liabilities.

A more effective approach to financial oversight, typically including a macroprudential component, has supplemented these macroeconomic regime changes. Many EMEs, especially in Asia, have accumulated large stocks of foreign exchange reserves that allow the domestic monetary authority to play a lender of last resort role for financial institutions with short-term foreign currency liabilities. Market perceptions that authorities are willing and able to play that role, as many did quite effectively during the GFC, are a stabilising factor for capital flows. Moreover, large precautionary reserve holdings are complemented by a higher level of capital account restrictions than in advanced economies; Bussière et al (2014) present evidence on the stabilising effects of reserve stocks and the use of capital account measures. Figure 5, which is borrowed from their paper, shows that while advanced and advancing countries alike have liberalised cross-border financial flows over the past three decades, the developing/emerging country group has on average liberalised less and accumulated more international reserves in the process.[12]

To what degree have the preceding structural changes insulated EMEs from monetary shifts and financial cycles in advanced countries? Both during the accommodative phase of advanced country monetary policies following the GFC, and more lately as markets have come to anticipate the tapering of accommodation in the United States, EMEs showed their habitual reluctance to let exchange rates bear the full adjustment burden. Indeed, some of the very structural changes cited as enhancements for EME stability could have downsides. Domestic bond markets, if dominated by foreign asset managers and lacking big domestic players such as

the data describe a J shape. Prior to gaining access to private lending markets in the 1970s, developing countries relied primarily on FDI for private foreign financing. Access to debt finance allowed a fall in the FDI share. Only much later did portfolio equity inflows become important. The United States is shown in Figure 3 for the purpose of comparison. A caveat to Figures 3 and 4 is that the Lane and Milesi-Ferretti data, which are residence-based, do not capture offshore bond issuance by domestic nationals.

[11] Ghosh et al (2014) discuss evidence on the susceptibility of hard and adjustable pegs to crisis. If foreign exchange reserves are not dedicated to defending the exchange rate, more of them can be used in lender of last resort operations in support of domestic entities with short-term foreign currency liabilities. On the relation between reserve use during the GFC and economic performance, see Dominguez et al (2012).

[12] Figure 5 uses the Chinn and Ito (2006) measure of capital account openness.

pension funds and insurance companies, could be quite volatile, with long-term bond returns tightly linked to those in advanced country markets (Shin (2013)).[13] Moreover, if foreign holders of EME currency bonds hedge the currency risk with counterparts in the issuing country, this potentially creates a currency mismatch: the domestic counterparts have incurred a foreign currency liability that (leaving aside the associated forward claim to a domestic currency payment from the bondholders) is equivalent to foreign currency bond issuance (He and McCauley (2013)).

To diagnose and assess the threat from ongoing potential vulnerabilities, it is important to consider carefully which transmission mechanisms are at work between advanced and EME financial markets, and whether there are effective tools that EMEs can use to cope with financial shocks from abroad.

3. Transmission mechanisms

In the early 1970s, inflation surged worldwide. One obvious mechanism driving synchronised global inflation was the system of fixed exchange rates central to the Bretton Woods system, under which all countries pegged to the US dollar (thereby surrendering monetary autonomy) while the United States retained monetary discretion (thereby dominating global monetary conditions). Relatively loose monetary policy in the United States, together with a huge speculative portfolio shift away from the US dollar in anticipation of its debasement, led to big increases in foreign exchange reserves and money supplies outside the United States.

A major motivation for the subsequent move to generally floating exchange rates (at least among industrial economies) was therefore to regain control over domestic inflation. Yet industrial country inflation rates did not diverge. They rose in concert in the 1970s, continuing even after the abandonment of fixed exchange rates, and largely fell starting in the following decade. Ciccarelli and Mojon (2010) document a powerful common component in 22 OECD countries' inflation rates over the 1960–2008 period. EME inflation rates remained higher in some countries throughout the 1980s, notably in Latin America, but those rates also converged downwards starting in the 1990s. While trend inflation rates still differ across countries, the cross-country range of variation has become relatively small. The proposition that countries can control their inflation rates over the long term is widely accepted, and observed inflation convergence is regarded as a country- or currency union-specific phenomenon reflecting synchronised improvements in economic literacy and economic governance.[14]

[13] Managers of highly diversified funds might have little incentive to focus on particular countries' economic fundamentals, as argued by Calvo and Mendoza (2000).

[14] McKinnon (1982) hypothesised that, even with floating exchange rates, a high degree of substitutability among the major industrial country currencies made national inflation depend on world money supply growth. If this view were right, even long-term inflation would be out of the hands of any single central bank. There is little theoretical or empirical support for McKinnon's "global monetarist" hypothesis, although some authors have recently used global monetary aggregates as proxy variables for global liquidity conditions. An example of the empirical critiques is Wallace (1984).

The degree of national control over short- to medium-term macro developments (including but not restricted to price level dynamics) is more controversial. When countries' financial markets are linked, even imperfectly, macroeconomic models incorporating realistic goods or asset market frictions imply that policy and other shocks will be transmitted to trading partners, possibly causing unwanted spillovers even when currency exchange rates float freely. Two related questions have been especially prominent in the recent debate about the scope for independent and effective monetary policy by EMEs. First, can EMEs offset shifts in advanced country monetary policies – most importantly US monetary policy – through their own monetary instruments? Second, in the face of a global financial cycle that is in principle distinct from monetary policy cycles – but which also causes portfolio shifts with respect to EME assets – what scope do EMEs have for an effective policy response? Some recent analysis has been pessimistic. Perhaps most provocatively, Rey (2013) argues that EMEs have essentially *no* room for monetary policy that diverges from US conditions: the monetary trilemma is really a dilemma, with independent monetary policy possible if, and only if, capital markets are segmented from the outside world. In this view, global rather than national liquidity is central.[15]

To assess such arguments, it is useful to review some of the main mechanisms of transmission of foreign monetary and financial shocks to EME financial markets.[16]

3.1 Direct interest rate linkages

Perhaps most fundamental in a world of integrated financial markets are direct interest rate linkages between countries, which reflect forces of cross-border arbitrage on rates of return. Conventional monetary policy manipulates a short interest rate directly but has effects at all maturities, and these effects induce portfolio shifts into foreign assets. In turn, those portfolio shifts generally affect exchange rates, asset prices, capital accounts and macroeconomic policies abroad.

If an emerging country fixes its exchange rate against the currency of a central country (for example, the United States), then it has no choice but to match the latter's choice of policy interest rate. Moreover, provided the exchange rate peg is credibly permanent, risk-free nominal interest rates *at all maturities* must match those of the United States. Thus, US monetary policy is passively imported, in accord with the monetary trilemma.

More generally, exchange rate flexibility of various types and degrees will alter the international transmission of interest rates. If e is the domestic price of the US dollar, i the short-term policy rate of interest, and ρ a foreign currency risk premium, then domestic and US short rates will be linked by an interest-parity relationship of the form:

$$i_t = i_t^{US} + E_t e_{t+1} - e_t + \rho_{t.} \quad (1)$$

[15] For recent assessments of the concept of global liquidity, see Borio et al (2011), Committee on the Global Financial System (2011), Gourinchas (2012) and Landau (2014).

[16] For complementary discussions, see Caruana (2012), He and McCauley (2013) and McCauley et al (2014).

Above, the risk premium ρ might reflect the covariance between the depreciation rate of the domestic currency and a stochastic discount factor for domestic currency payments. Now, changes in the US interest rate need not feed one for one into i_t, depending on the behaviour of the exchange rate and the risk premium. For example, if the EME central bank holds its interest rate absolutely constant when the United States cuts its interest rate, and the risk premium does not change, then foreign currency will appreciate sharply (a fall in the price of dollars, e_t), overshooting its expected future value so as to maintain interest parity. The EME central bank can still set the policy interest rate it prefers, but a sharp exchange rate change may well have effects on its economy that strongly influence the monetary policy response.

A powerful inhibition to allowing full exchange rate adjustment in such circumstances is the negative effect on domestic export competitiveness. The EME central bank may intervene to dampen appreciation, thereby (typically) acquiring international reserves and allowing a jump in the net private capital inflow into its economy. In turn, an increased money supply will likely cause a rise in domestic bank lending. Sterilisation of the monetary effects (if somewhat effective) could raise longer-term rates at home and (if carried out on a large enough scale) lower them in the United States, eliciting further pressure through the capital account. The carry trade dynamics may be reinforced by the perception that the central bank is merely slowing an inevitable appreciation of its currency. The probable effect, in this case, therefore remains transmission of US monetary ease.

Since sterilised foreign exchange intervention is often limited in its effectiveness, stronger efforts to limit currency appreciation are likely to enhance the correlation between the domestic and US policy interest rates. Even when there is no intervention, consequential two-way private gross capital flows could occur, such as increased US bank loans to the EME country, the proceeds of which are deposited in banks abroad. This increase in cross-border credit could well have an impact on domestic financial conditions (as suggested in partial-equilibrium models such as in Bruno and Shin (2013)); I return to this issue below. Even a fully floating exchange rate cannot provide full insulation from the expansion of gross foreign assets and liabilities.

Further international linkages occur through the longer-term interest rates set in bond markets. These rates affect activity in key economic sectors and drive real wealth through asset valuation effects. As in the case of short-term interest rates, direct arbitrage between national markets links long-term rates and exchange rates; however, long-term rates reflect not only short-term rates, but expected future short rates as well as risk factors. To the extent that monetary policy works through its effect on longer-term interest rates, such as mortgage rates or corporate borrowing rates, stronger international linkages between long-term rates could hamper monetary autonomy, in the sense of requiring sharper changes in short-term rates (and perhaps in forward guidance on those rates) to achieve a desired result.

To make the discussion more precise, consider the simplest two-period example. Then an approximate term structure model would represent the domestic nominal risk-free yield $i_t^{(2)}$ on a two-period discount bond as depending on an average of current and future expected short rates:

$$i_t^{(2)} = \tfrac{1}{2} i_t + \tfrac{1}{2} E_t i_{t+1} + \tau_t. \qquad (2)$$

Here, τ_t is a term premium that might reflect the covariance between future interest rates and a stochastic discount factor for domestic currency payments. Because of the interest parity relationship, τ_t is obviously closely related to the currency risk premium ρ_t in general equilibrium. Subtracting from this the parallel relationship for the United States shows that international long-term rates obey an interest parity relationship of the form:

$$i_t^{(2)} = i_t^{US\ (2)} + \tfrac{1}{2}(E_t e_{t+1} - e_t) + \tfrac{1}{2}(E_t e_{t+2} - E_t e_{t+1}) + \tfrac{1}{2}\rho_t + \tfrac{1}{2}E_t\rho_{t+1} + \tau_t - \tau_t^{US}. \quad (3)$$

Exchange rate variability matters for short- as well as for long-term risk-free interest rate correlations across countries, but to the extent that expected exchange rate movements tend to slow or reverse over time, long rates could be more highly correlated than short rates – perhaps the EME central bank allows short-run movements, but its long-run inflation target is similar to that of the United States, and expected real exchange rate changes are small. High international correlation among term premia could also induce long-rate correlation across countries. For example, He and McCauley (2013) and Turner (2014) argue that US quantitative easing policies that reduce term premia spill over into a reduction of term premia abroad.[17] In this way, US unconventional easing may be spread abroad.

Empirically, long-term interest rates tend to be more highly correlated across countries than short-term rates, which is consistent with results in the next section. Goodhart and Turner (2014) summarise a widely held view of the evidence:

> Long-term interest rates are more correlated across countries than short-term rates. A central bank operating under a flexible exchange rate regime can set its policy rate independently of the Fed funds rate.
>
> But it has much less power over the long-term rate in its own currency because yields in all bond markets integrated into the financial system tend to rise whenever US yields jump. Bond yields in countries with weaker macroeconomic or financial fundamentals often rise even more.[18]

Why is this so? One reason, documented in the next section, is that there is mean reversion in short-term policy rate differentials. In addition, countries' term premia appear to be increasingly correlated over time and closely linked to US bond premia; see, for example, Hellerstein (2011) and Dahlquist and Hasseltoft (2012). Our understanding of these premia in terms of reliable structural models is limited, but they are clearly related to investor risk aversion. In any case, to the extent that long-term rates are strongly subject to global forces, the power of short-term rates to steer the economy could diminish. While recent attention has focused on the effects on EME long-term rates of monetary policy shifts in the United States, even US long-term rates appear to be subject to global influences, as evidenced by several empirical studies. Also related is the anecdotal evidence of the "Greenspan conundrum": the relative constancy of long-term rates in the face of rising policy rates in the mid-2000s.[19]

[17] Neely (2013) carries out an econometric study.

[18] See also Bernanke (2013) and Sheets and Sockin (2013).

[19] Another possibly relevant factor is that uncovered interest parity seems to hold more closely for long-term nominal interest rates than for short-term rates; see Chinn and Quayyum (2012).

The apparently high cross-country correlation in term premia could reflect factors that drive global financial cycles – for example, changes in risk appetite – so I turn the discussion to the impact of international financial developments.[20]

3.2 The financial cycle

Like monetary policy, the financial cycle has effects that are transmitted abroad. The level of interest rates certainly can play a catalytic role, among other causes.[21] Changes in credit volumes, including banking flows, can have strong effects across borders. The mid-2000s saw a powerful credit cycle that originated primarily in the United States and Europe, but was also related to the pattern of global current account imbalances. Until the cycle collapsed in September 2008, most EMEs – including those in Asia – navigated it fairly successfully, although some countries experienced problems with capital inflows and appreciation.

A first transmission channel comes from the compression of risk premia. Consider first the case just under discussion: long-term government bonds. A general decline in risk aversion originating in the United States might compress term premia both at home and abroad. But the latter can be a powerful source of policy spillovers. Looking at the preceding long-term interest parity relation, we can see that the immediate exchange rate response might have to be quite big if EME long-term rates and the long-term nominal exchange rate do not adjust. For example, a 10 basis point fall in the term premium on a US two-year bond would require a 20 basis point currency appreciation. Just as small movements in exchange rates can be consistent with big discrepancies between short-term interest rates, small discrepancies between long-term rates will require substantial exchange rate movements unless offset by risk premium changes.

Financial conditions can migrate across borders by relaxing the quantitative borrowing constraints that agents may face. A financial boom in the United States will spill over into increased credit supply abroad, causing foreign currencies to appreciate and raising foreign asset values. In turn, those developments will raise collateral values in the recipient countries, with a procyclical effect on their borrowing and asset markets. A number of models suggest different mechanisms through which the process could, to some degree, be self-reinforcing. Examples are Gertler and Karadi (2011), who focus on the franchise value of intermediaries as a limit to lending, and Bruno and Shin (2013), who emphasise the role of currency appreciation in strengthening unhedged borrowers' balance sheets.

If the current account is slow to adjust in the short run, then a financial inflow will necessarily be matched by an equal outflow. Absent central bank intervention, a higher private inflow is matched by a higher private outflow. Partial-equilibrium models of banking inflows such as in Bruno and Shin (2013) do not capture this consequence.[22] However, the resulting expansion of gross liabilities and assets is quite likely to worsen the balance of financial stability risks, increasing the challenge

[20] Consistent with the financial cycle view is the evidence of Gonzáles-Rozada and Levy Yeyati (2008) that emerging market bond spreads (on foreign currency debt) respond strongly to proxies for US risk appetite and liquidity.

[21] For some evidence on the role of interest rates in US bank behaviour, see Dell'Ariccia et al (2013).

[22] The development of general-equilibrium models should therefore be a research priority.

for macroprudential policy. Challenges for macroeconomic policy could also be accentuated. Goldberg (2013) presents some evidence that a substantial foreign banking presence can reduce monetary independence, as measured by interest rate independence.

A major spillover channel for easier foreign financial conditions is the compression of corporate spreads, which occurs as domestic financial conditions also ease. Figure 6 shows the behaviour of Korean domestic corporate spreads (with the Federal Reserve's target policy rate superimposed).[23] Spreads are highly variable, rising with the wave of bankruptcies following the dotcom crash, rising in the Korean credit card crisis, and falling sharply afterwards only to spike upwards with the Lehman collapse in September 2008. Due to the influence of common factors, the relationship to US monetary policy is not mechanical. Starting in mid-2004, for example, the federal funds rate rises and Korean spreads decline, both in response to the ongoing global boom in credit and liquidity that ended in the GFC.

3.3 Foreign currency credit

While dollar, euro and yen credit is extended to non-residents, the dollar is dominant, with credit transactions often between two non-US residents (Borio et al (2011)). Figure 7 displays some trends. Since 2000, dollar bank credit to non-banks outside the United States has risen from an amount equal to 23% of total US domestic bank credit to about 35% – while US domestic bank credit itself has risen to a level about equal to annual US GDP. Thus, more than a third of global dollar lending by banks to non-banks now takes place outside US borders. Alongside offshore dollar bank credit, there is also significant offshore issuance of dollar debt securities by non-financial borrowers. While such issuance stood at about half of offshore dollar borrowing from banks by non-banks in 2000, the ratio fell sharply up to the GFC as international banking expanded in an environment of low interest rates. The GFC then caused a contraction in bank lending everywhere. More recently, however, offshore dollar bank lending and debt issuance have begun to expand in tandem, with debt issuance rising especially rapidly after the crisis as a result of low long-term dollar interest rates following the Fed's unconventional operations (McCauley et al (2014)).

Foreign currency credit presents another transmission channel, most importantly for shocks originating in US financial markets. The effective cost of borrowing in dollars, if those are swapped into domestic currency, is still the domestic interest rate if covered interest parity applies, and a shortage of funding for covered interest arbitrage (as in Ivashina et al (2012)) will only raise the cost of covered dollar borrowing.[24] However, there are channels through which the interest rate on dollar loans and the loans' availability can directly affect credit flows in economies outside the United States.

[23] Spreads are for local currency yields computed relative to a Korean government bond of the same tenor.

[24] Munro and Wooldridge (2012) argue, however, that domestic borrowers may overcome some financial frictions by borrowing in foreign currency and swapping the proceeds into domestic currency.

Domestic residents who hedge foreign currency borrowing will still effectively face the domestic interest rate if covered interest parity holds. However, some may engage in unhedged carry trades, either because they are financially unsophisticated or believe (perhaps wrongly) that domestic currency depreciation is very unlikely. Under this scenario, a fall in the cost of unhedged foreign borrowing will be expansionary in the short run, though possibly highly contractionary later in the event that significant currency depreciation does occur.

More generally, the heavy participation of global non-US banks in intermediating US dollars creates a potent channel for US monetary and financial developments to influence their balance sheets and lending activities, including domestic and foreign lending denominated in non-dollar currencies. In other words, shocks to the non-dollar component of an international bank's balance sheet are bound to spill over to the rest of the balance sheet. For example, a decline in dollar funding rates is likely to raise banking profits, spurring asset expansion across all currencies. The GFC provided vivid examples of negative effects of dollar funding disruptions on non-US banks. Not only non-US banks but also non-US non-bank dollar borrowers, whether they borrow from banks or in capital markets, may feel effects of changes in dollar interest rates or dollar funding conditions.

3.4 Implications of transmission

A country that pegs its exchange rate to the dollar and has open capital markets will import US monetary policy. While a flexible exchange rate allows the country to control inflation independently, as in Woodford's (2010) exposition, monetary policy has additional objectives, and globalisation might worsen the trade-off between these and inflation. Some of these are related to the exchange rate, where big changes could have adverse effects on financial stability or internal resource allocation. Even with exchange rate flexibility, the influence of monetary policy over long-term interest rates could be reduced compared with a closed economy. Spillovers may be easy to absorb when countries throughout the world face common shocks, but less so when their positions are asymmetric, as was the case in the years immediately following the GFC.

Policy rates of interest are central to financial conditions, and induce portfolio shifts towards EMEs, but other aspects of advanced economy financial conditions can spill across borders to EMEs in the form of incipient or actual net capital flows and gross flows. These factors may have substantial impacts on exchange rates, asset prices and credit volumes, and thus on economic activity, inflation and financial stability. Given the international prevalence of dollar credit, movements in US interest rates and financial conditions are likely to be especially important.

4. Evidence on interest rate independence

Because some interest rate independence is a necessary condition for an effective monetary policy aimed at domestic goals, a central empirical issue is the correlation between domestic and foreign interest rates, and its relation to the exchange rate

regime. This section presents some evidence, adding to the findings of previous studies by analysing long-term nominal rates of interest.[25]

A first test, which is based on approaches in Shambaugh (2004), Obstfeld et al (2005) and Klein and Shambaugh (2013), investigates the average coherence between a short-term nominal interest rate and a base-country rate in panels of countries. More specifically, consider the regression equation linking country *j*'s nominal interest rate to the interest rate of base country *b*:

$$\Delta i_{jt} = \alpha + \beta \Delta i_{bt} + \boldsymbol{\gamma}' \boldsymbol{X}_{jt} + u_{jt}. \quad (4)$$

Above, β = 1 and $\boldsymbol{\gamma}$ = 0 under a fully credible currency peg. With some exchange rate flexibility, however, there would generally be less than full pass-through of the base rate to the domestic rate, β < 1, and the interest rate might also respond to domestic variables included in the vector $\boldsymbol{X}_{jt}$ (for example, through a Taylor rule mechanism). Thus, information about the magnitude of β and the statistical significance of the coefficient vector $\boldsymbol{\gamma}$ is informative about the degree of monetary independence. In specification (4), differences of interest rates are preferred to levels so as to avoid spurious regression problems.

In general, there are at least two concerns in interpreting regression (4). First, if a peg is non-credible, it is possible that elements of $\boldsymbol{X}_{jt}$ could affect the domestic interest rate by creating realignment expectations. But in that case, we would also expect to see an amplified response of the home interest rate to changes in the base rate, β > 1 (and we would not view this as evidence of monetary independence).

A second concern is with unobserved global shocks that are not captured fully by the included vector $\boldsymbol{X}_{jt}$. For example, shifts in global risk tolerance or global liquidity might simultaneously move the base and domestic rates in the same direction. Such an omitted variable would induce a positive correlation between Δi_{bt} and u_{jt}, raising the ordinary least squares (OLS) estimate of β even under substantial monetary independence. (In this case, the upwardly biased estimate could be indicating positive transmission of the financial cycle, not of monetary policy.) Alternatively, the global shock might be a generalised shift in portfolio preference between base-country bonds and foreign bonds in general (for example, safe haven inflows to the base country). In this case, u_t would tend to have a negative correlation with Δi_{bt}, which would induce a downward bias in the OLS estimate of β. One way to address the issue is to recognise that different countries have different "natural" base rates – the US dollar for Mexico, the euro for Poland and the South African rand for Botswana, for example. Accounting for this heterogeneity allows one to control for common time effects in the panel version of (4), and thereby attempt to capture unobserved global shocks.

[25] This section builds on earlier work by Frankel et al (2004), Shambaugh (2004), Obstfeld et al (2005) and Klein and Shambaugh (2013). The general conclusion of these studies (which the evidence in this section supports) is that there is some scope for short-run interest rate independence when exchange rates are flexible. Alternative methodologies attempt to identify exogenous monetary shocks but reach conclusions broadly similar to those of the previous studies; see Miniane and Rogers (2007) and Bluedorn and Bowdler (2010). In a related vein, Sheets and Sockin (2013) argue that US policy rates strongly influence the policy rates of the other major industrial countries, but do so primarily by shifting the arguments in those countries' Taylor rules rather than forcing deviations from Taylor rules.

Several researchers have argued that the Chicago Board Options Exchange's equity option volatility index (VIX) is a useful summary statistic for the state of the financial cycle, lower values being associated with a greater tolerance for risk-taking (including increases in leverage); see Bruno and Shin (2013) and Rey (2013), among many others. If countries in the sample are matched to their heterogeneous bases, one can enter the percentage change in the VIX as an independent variable in the regressions, rather than time fixed effects. This yields an alternative way to control for shocks to the global cycle that potentially move national and base interest rates simultaneously. If the change in the VIX is a stand-in for global shocks that cause global interest rates to move up or down in concert, then adding the VIX should reduce the estimated coefficient $\hat{\beta}$ in (4). On the other hand, VIX movements could be more highly correlated with portfolio shifts between advanced and emerging markets – the waves of capital flow into or out of the developing world as discussed by Calvo et al – and in that case we should expect $\hat{\beta}$ to fall when the VIX change is added as a regressor.

To gauge the additional autonomy loss due to pegging, I will use the interactive specification

$$\beta = \beta_0 + \beta_1 \times PEG, \tag{5}$$

where *PEG* is an indicator variable.

A second type of test, following Frankel et al (2004) and Obstfeld et al (2005), considers dynamic adjustment to a long-run levels relationship between home and base-country interest rates. To this end, I will estimate country *j*-specific equations of the form:

$$\Delta i_{jt} = \sum_{p=1}^{P} \rho_p \Delta i_{jt-p} + \sum_{q=0}^{Q} \beta_q \Delta i_{bt-q} + \sum_{q=0}^{Q} \boldsymbol{\gamma}_q' \Delta \boldsymbol{X}_{jt-q} + \theta\left(i_{jt-1} - \xi i_{bt-1} - \boldsymbol{\omega}' \boldsymbol{X}_{jt-1}\right) + u_{jt}. \tag{6}$$

In estimating (6), I do not pool over *j* because of the likelihood of heterogeneous dynamics across economies. In specification (6), the coefficient ξ is the long-run levels relationship between the home and base interest rate, and $-\theta$ is the adjustment speed toward that relationship. We would expect ξ to be in the neighbourhood of 1, with $-\theta$ an inverse measure of the scope for departure from the long-run relation.

Table 1 reports the result of estimating specification (3) as a pooled or panel regression using my full sample of countries (22 advanced other than the US and 34 emerging/developing, dictated by data availability).[26] None of the specifications will include country fixed effects, on the grounds that a steady positive or negative country-specific nominal interest rate trend is implausible in my data, but some will include time effects, motivated by the possibility of unobserved global shocks that induce higher interest rates everywhere. The results in Table 1 provide a very crude first pass that accounts for neither exchange rate regime nor level of development. Nonetheless, the findings display several regularities that prove robust to more nuanced cuts at the data.

[26] Data coverage is detailed in an appendix. Even where longer data series are available, I generally estimate over the period starting around 1990 so as to capture the regularities that apply during the recent period of high and growing financial globalisation. See Klein and Shambaugh (2013) for an analysis of longer time series.

Columns 1–4 report regressions of short-term nominal interest rate changes (SR) on the short rate change in a base country, whereas columns 5–8 do the same for long-term nominal interest rates (LR). Also included (in the $\boldsymbol{X}$ variables that enter equation (4)) are current values and lags of the change in real GDP and the change in CPI inflation, where I use the Bayesian information criterion to determine the number of lags to include, up to a maximum of six.[27] Thus, the observations are at a quarterly frequency. The short-term interest rate is the quarterly average of end-of-month rates on 90- or 91-day government securities; the long-term rate is the quarterly average of end-of-month rates on 10-year government bonds.

Column 1 assumes that the US dollar is the base currency for all other countries, and the estimated coefficient on its interest rate turns out to be tiny and statistically insignificant. Once countries are matched to more appropriate base currencies, however – the currencies they are most likely to shadow – the estimated coefficient better than triples (to 0.201) but it remains rather small, and insignificant. In column 3, adding time effects to the column 2 specification reduces the coefficient, as one would expect when the time effect captures global shocks that induce positive covariation in policy rates of interest. Adding the change in the VIX in column 4 raises $\hat{\beta}$ compared with column 2, but not significantly so. However, the change in the VIX itself is significant at the 10% level, with a rise in the VIX raising the domestic interest rate. The results are consistent with the view that reductions in global-risk aversion are associated with portfolio shifts toward EMEs.

In all of the column 1–4 regressions, there is overwhelming evidence for a role of lagged changes in domestic output and inflation – effects that would be absent were domestic interest rates determined entirely by nominal arbitrage without exchange rate variability. These results, together with the low $\hat{\beta}$ estimates, are compatible with substantial interest rate independence at the short end.

Columns 5–8, which analyse long-term rates, present a starkly different picture. In column 5, which takes the US dollar as the universal base, the coefficient on the US bond rate change is significantly different from zero at the 1% level, though significantly below 0.5. Once countries are matched to their most natural base currencies, however, the coefficient rises above 0.5, remaining highly significant. Time effects lower the coefficient (to 0.433), but the change is not significant, and the new slope estimate remains significant at the 1% level. Finally, adding the VIX change raises $\hat{\beta}$ substantially, and the VIX variable is itself highly significant, suggesting that the global financial cycle is communicated to long-term interest rates. The effect of a change in the VIX is small but precisely estimated for long-term rates. Interestingly, the auxiliary domestic macro variables usually do not enter this regression with very high significance, and the adjusted R^2 in columns 5–8 are uniformly higher than those in columns 1–4. The LR picture is one of much less interest rate independence than in the SR case.

Table 2 breaks out the role of exchange rate pegs by adding specification (5) to specification (4), thereby interacting the interest rate response with the peg indicator.[28] For the SR case in the first four columns, positive correlations with the

[27] To save space, I do not report coefficients on these auxiliary variables.

[28] I adapt to quarterly data (see the appendix) the de facto currency regime coding method from Klein and Shambaugh (2013), who themselves look at a finer gradation of regimes than just peg or non-

base currency interest rate change are almost entirely due to being pegged. Adding time effects lowers the estimated SR peg effect somewhat, but leaves it potentially large. Adding the VIX change has little impact compared with column 2. Perhaps surprisingly, the peg interactions are not themselves statistically significant, even at the 10% level. It may be that the limited commitment under a de facto peg allows substantial room for interest rate deviations from the base, at least for some of currencies.

The LR $\hat{\beta}$s in the last four columns follow the pattern familiar from Table 1. They are reasonably big and very significantly different from zero. While a peg is always estimated to raise the correlation, that result is never statistically significant. It should be noted, however, that because the different base long rates tend to be highly correlated among themselves, adding time effects in this case induces some multicollinearity. As earlier, adding the VIX change raises the estimated coefficient on the base interest rate both for countries that peg (coded as "pegs") and for those that do not ("non-pegs"), and the VIX change itself is highly significant. As in Table 1, the auxiliary output and inflation variables are usually not highly significant in the LR regressions of Table 2, regardless of the exchange rate regime. (These regressions allow the coefficients on the auxiliary variables to differ as between pegs and non-pegs.)

The summary of Table 2 is that there is considerable independence at the short end of the term structure apart from pegged exchange rates, whereas long rates remain significantly correlated with those of base currency countries even in the absence of a peg (although pegs appear to raise the correlation somewhat compared to non-pegs). As in Table 1, given the base long-term rate, the domestic long-term rate appears less responsive to standard domestic macro variables.

Tables 3 and 4 contrast the results for developing/emerging and advanced economies (with Newly Industrialised Asia placed in the emerging group). Short-term rates for the developing/EME non-pegs appear less tightly linked to base currency short rates than for the advanced group of non-pegs; and for the advanced countries, the marginal effect of pegging is greater for dollar pegs than for pegs in general, although there is little difference for developing/EME countries. The time effects regression in column 3 of Table 4 suggests that much of the synchronisation of advanced short-term rates with base rates is due to common responses to global shocks. Long-term rate coherence with base rates also seems much greater for advanced economies, with pegs quantitatively important only for advanced countries pegged to the US dollar. By and large, the results are not inconsistent with substantial monetary independence in terms of short policy rates, even though the advanced economies move in step to a considerable degree. While the coherence among movements in long-term interest rates is much more pronounced for advanced countries, advanced country data series on long rates are much longer, and reflect much thicker markets, so the results in Table 3, columns 5–8, should be interpreted cautiously. To the extent that long-term rate co-movement among advanced countries represents forces of arbitrage, it could capture a weakening of the potency of domestic monetary policies and a channel for monetary spillovers from abroad. A final finding in Tables 3 and 4 is the importance of the VIX change for

peg; see the discussion in the next section. I thank Michael Klein and Jay Shambaugh for providing the files underlying their paper.

movements in long-term interest rates, given base rate changes, for both country groups, but especially for non-advanced economies.

The apparently higher short-term rate independence for developing/emerging economies, compared with advanced economies, could follow from a greater prevalence of capital controls; recall Figure 5. As Klein and Shambaugh (2013) document, however, only thoroughgoing and long-standing controls seem effective in conferring greater monetary independence, other things equal.

Turn next to estimation of the dynamic relationship (6). The approach of Pesaran, Shin and Smith (2001) (hereafter PSS) allows for a levels relationship as in (6) between domestic and base rates of interest, even when interest rate levels are stationary. However, different critical regions for test statistics apply depending on whether interest rates are I(0) or I(1). PSS tabulate the appropriate critical values. Because the data are monthly, the vector $\boldsymbol{X}$ in (6) includes only the level of CPI inflation.

Tables 5 and 6 report results for short-term and long-term nominal interest rates, respectively, with all countries measured against the US dollar as the base currency. The columns labelled "PSS F stat" indicate whether the hypothesis $\theta = \xi = \boldsymbol{\omega} = 0$ (ie no levels relationship) is rejected at the 5% level (indicator = 1) or not (indicator = 0), under the alternative assumptions that the variables in specification (3) are, respectively, I(0) and I(1). Similarly, the columns labelled "PSS T stat" concern the hypothesis $\theta = 0$.

As expected, there is considerable heterogeneity across countries, even within broad country groupings. Looking at country group averages, however, the values of ξ have a central tendency in the neighbourhood of 1 for both groups, for both short- and long-term interest rates, although estimates are much more precise for the advanced countries. Thus, the levels relationship (when it exists) is consistent with long-run equality of nominal interest rates at short and long maturities (up to a constant). The average adjustment speed θ for long rates is nearly the same for both country groups, implying adjustment half-lives of about 14.6 to 17.5 months. For short-term rates, the adjustment speed appears to be quite a bit faster for developing/emerging economies (about a year as opposed to over two years), although once again the standard error of estimation is comparatively large. The data seem consistent with the existence of a long-term levels relationship in a good number of cases when the data are I(0), but generally less so when the data are I(1). It is particularly hard to detect a levels relationship for developing/emerging short-term rates. It is also very hard to reject the hypothesis $\theta = 0$ for those rates.

These averages, as noted, conceal considerable idiosyncrasies, even within Asia. For example, with respect to short-term interest rates, Hong Kong shows unitary long-run coherence with US rates and an extremely rapid adjustment speed (half-life below four months). Singapore's adjustment speed is even more rapid, but its estimated ξ is only 0.39. Malaysia shows both a ξ value of 0.58, and a slow adjustment speed that implies an estimated half-life of about a year and a half. The results for long-term rates are on the whole similar.

The overall impression is that nominal interest rates trend strongly with US rates in the long run, in both country groups, but there is usually considerable medium-run scope for interest rate independence. As before, however, the possibility of unobserved global shocks to interest rates bedevils the interpretation of these results.

5. Trilemmas and trade-offs

In line with previous research, the results of the preceding section indicate considerable scope for countries that do not peg their exchange rates to vary *short-term* nominal interest rates independently of foreign nominal interest rates. In addition, changes in short-term rates appear to reflect changes in domestic variables such as inflation and output. The independence of *long-term* rates seems lower, regardless of the exchange regime, and the relation of changes in long-term rates to key domestic macro variables is more tenuous.

Rey (2013) summarises earlier studies and new evidence of her own suggesting that foreign financial shocks besides interest rates spill across national borders, even when exchange rates are flexible. She concludes that:

> [M]onetary conditions are transmitted from the main financial centers to the rest of the world through gross credit flows and leverage, irrespective of the exchange rate regime. […] Fluctuating exchange rates cannot insulate economies from the global financial cycle, when capital is mobile. The "trilemma" morphs into a "dilemma" – independent monetary policies are possible if and only if the capital account is managed, directly or indirectly, regardless of the exchange-rate regime.

Because nominal interest rate independence is demonstrably less where currencies are pegged, one is led to ask: does this interest rate independence matter at all? Is there any advantage to having a flexible exchange rate? Rose (2014), for example, shows that it is hard to detect systematic differences between economic outcomes for hard currency pegs and inflation targeting regimes for small economies. As he acknowledges, however, currency regime choice is not exogenous (and, in particular, seems related to the degree of democracy). Di Giovanni and Shambaugh (2008) take a more direct approach to seek benefits from partial independence of interest rates. They demonstrate that comparative interest rate independence allows countries with flexible exchange rates to shield themselves from the contractionary output effects of higher interest rates abroad. In contrast, countries with pegs suffer more.[29]

Such evidence suggests that, provided an EME's policy interest rate feeds through to other domestic interest rates and demand, its central bank retains a capacity to steer the economy, and the capacity is greater the more the bank is willing to allow exchange rates to fluctuate and depart from the US interest rate. Klein and Shambaugh (2013) present striking confirmation that even countries that dampen exchange rate fluctuations still enjoy some short-term interest rate independence (though not as much as those that freely float). And, of course, countries that manage exchange rates flexibly (or let them float) do not provide a one-way bet for speculators – they seem to be less susceptible to various types of crisis, including growth collapses of the type seen recently in some euro area countries.[30]

[29] Aizenman et al (2010) report a similar finding, and also trace over time different country groups' approaches to navigating the monetary trilemma.

[30] See Ghosh et al (2014). Rose's (2014) discussion points to the recent durability of flexible exchange rate/inflation targeting regimes.

Thus, it strikes me as not really fruitful to ask whether the exchange rate regime materially influences the scope for monetary policy independence. Of course it does. It is unquestionably true, as Rey (2013) asserts, that "monetary conditions are transmitted from the main financial centers to the rest of the world through gross credit flows and leverage". However, the exchange rate regime is central to the channels of transmission and to the range of policy responses available. The monetary trilemma remains valid.

This is not to say that even monetary independence makes the available menu of options attractive when the capital account is fully open. We learned soon after the fall of the Bretton Woods system in 1973 that floating exchange rates can be helpful in the face of some economic shocks but almost never provide full insulation against disturbances from abroad. Rather, they provide an expanded choice menu for policymakers, but with no guarantee that the available choices will be pleasant. This has proven especially true in the face of recent financial cycles in the rich economies. The monetary trilemma remains, but the difficulty of the trade-offs that alternative policy choices entail can be worsened by financial globalisation.

To understand the trade-off problem, we need to ask: what exactly does monetary policy autonomy or independence *mean*? I would define it as the ability to pursue a range of domestic goals; and an exchange rate peg clearly precludes this pursuit when capital flows freely across the border. Woodford's (2010) analysis demonstrates that when there is one target only – an inflation rate – then monetary autonomy is possible if the exchange rate floats. Woodford shows within a variety of New Keynesian models that, under a float, the central bank can always shift the dynamic aggregate demand curve to achieve a desired inflation target.

Normally, however, the monetary authority has *multiple* goals, and this is where the trade-off problem arises.

Even in a hypothetical closed economy, monetary policy faces difficult trade-offs. The most basic is that between inflation and unemployment. Under certain favourable conditions – essentially, that price pressure (as modelled by a New Keynesian Phillips curve) depends only upon the gap between output and its first-best level – there is no trade-off, as monetary policy can hit both targets simultaneously. This is Blanchard and Galí's (2007) "divine coincidence". But in general – for example, when there are real wage rigidities – the coincidence fails, and the single instrument of monetary policy has somehow to navigate between the two targets, minimising a policy loss function subject to a less favourable inflation/unemployment trade-off.

Opening up the economy may raise further non-financial problems, because the impact of exchange rate changes on sectoral resource allocation and income distribution is generally far from neutral. Neither in theory nor in practice is there generally a "divine coincidence" for the exchange rate.

Speaking from the central banker's perspective, Fischer (2010) summarises eloquently:

> Not infrequently we hear central bankers say something like: "We have only one instrument – money growth (or the interest rate) – and so we can have only one target, inflation." This view may be based on the targets and instruments approach of Tinbergen, of over 50 years ago, the general result of which was that you need as many instruments as targets. That view is correct if you have to hit the target exactly.

But it is not correct if the problem is set up as is typical in microeconomics, where the goal is to maximize a utility function subject to constraints, in a situation where for whatever reason it is not possible to hit all the targets precisely and all the time. Among the reasons we may not be able to hit our targets precisely and all the time is that there may be more targets than instruments, for instance when the central bank's maximand is a function of output and growth. In that case we have to find marginal conditions for a maximum, and to talk about trade-offs in explaining the optimum.

Most relevant for the present discussion are the implications for financial stability. The GFC and euro crises underscore that the trade-off problem arises, even in a closed economy, when monetary policy is additionally burdened with a financial stability remit. In an economy with nominal rigidities, for example, excessive private borrowing may entail negative demand externalities which private agents do not internalise; see Eggertsson and Krugman (2012) and Farhi and Werning (2013), among others. High debt may then lead to recession and liquidity traps. If authorities do not have available the first-best tools to correct the externalities from debt issuance, then even in an economy characterised by a "divine coincidence" between output and inflation goals, monetary policy might need to deviate from price stability and full employment in order to restrain debt build-ups. In the absence of effective macroprudential tools, an optimal monetary policy could be drawn away from exclusive devotion to traditional macroeconomic goals (even if these would be attainable absent financial stability concerns).

In this hypothetical closed-economy setting, monetary policy does not become ineffective – "independence" of monetary policy certainly remains – but because authorities now face a trade-off between standard macro objectives and other targets, they will intentionally set monetary policy so as to miss all targets in a way that balances the marginal costs of the various discrepancies. Monetary policy simply carries a bigger burden than it would without financial market distortions.

No one would expect this problem to disappear in an open economy, especially when its capital account is full open. And it does not: by themselves, exchange rate changes would not shut out global financial developments even for policymakers willing to allow exchange rates to float free of intervention. Several theoretical models provide ample confirmation that, even in the unrealistically favourable case where national policymakers cooperate, financial frictions that cannot be addressed through other tools will lead to deviations from price stability.[31]

Indeed, the problem confronting monetary policy is likely to be even worse in the open economy, because openness to global financial markets will inevitably degrade the effectiveness of the macroprudential tools that are available. The trade-off between macro stabilisation and financial stability becomes even worse, in the sense that the optimal monetary policy will deviate even more from first-best macro stabilisation than in the closed economy. If the effects of monetary tools are weakened because of openness, trade-offs will become harsher still. Even so, independent monetary policy will still be possible, and more so the less tightly the exchange rate is managed. For example, if a bigger interest rate change is needed to bring about a given demand response in an open economy, this may worsen the

[31] For a recent contribution, see Kolasa and Lombardo (2014).

macroprudential problem by increasing the fragility of banks and encouraging gross financial inflows.

The proposition that the efficacy of financial stability policies is weakened in the open economy follows from the financial trilemma formulated by Schoenmaker (2013). According to this trilemma, only two of the following three can be enjoyed simultaneously:

1. National control over financial policies.
2. Financial integration with the global market.
3. Financial stability.

For example, it may do little good to place restrictions on lenders within one's jurisdiction if foreign lenders can enter the market and operate without restriction. As another example, direct limitation of residents' domestic foreign currency borrowing is less effective if the same entities can issue foreign currency debt in offshore markets.[32]

Moreover, the reliance of financial insurance and resolution policies on the national budget can segment global financial and capital markets along national lines (while also damaging stability), as in the euro area today. In a world of large-scale globalised finance, countries need to preserve precautionary fiscal space against financial crises. Thus, the financial trilemma can imply heavier constraints on fiscal policy as well as on monetary policy in its pursuit of domestic objectives.

Of course, the Basel Committee on Banking Supervision has been grappling with the financial trilemma since 1974, gradually but continually extending the scope and efficacy of international regulatory cooperation. The Basel III blueprint is part of the latest reform wave. Significantly (as observed by Borio et al (2011)), Basel III calls for jurisdictional reciprocity in the application of countercyclical capital buffers, so that foreign banks with loans to a country that has invoked the supplementary capital buffer are also subject to the buffer with respect to those loans.[33] By raising the effectiveness of domestic authorities' macroprudential tools, this provision reduces the burden on monetary policy.[34]

To summarise, even for small economies buffeted by a global financial cycle, the monetary trilemma is still valid: with open capital markets, monetary authorities have far more room for manoeuvre than if they pegged the exchange rate. That does not mean their lives will be easy, however. Because of the financial trilemma, the impact of monetary policy on financial stability will inevitably play a bigger role in their decisions. In the face of a less favourable trade-off between financial and macro stability, they may well be forced farther from both.

[32] Ostry et al (2012) assess the effects of macroprudential and capital control policies for a sample of 51 EMEs over 1995–2008. While finding that these policies can favourably influence aggregate indicators of financial fragility, they note the difficulty of using macroprudential policy effectively when activity can migrate to unregulated venues.

[33] See Basel Committee on Banking Supervision (2011, p 58, footnote 49).

[34] Some countries are also taking unilateral action. For example, the Federal Reserve in February 2014 required foreign banking organisations with sufficiently large US assets to set up US intermediate holding companies for their US subsidiaries. These holding companies will be subject to US regulation.

6. Conclusion

Smaller economies face downsides in living with globalisation. There is an inherent tension between lowering trade barriers – an approach that offers a range of gains from trade – and the implied necessity of exposing oneself to shocks and trends from abroad. These foreign disturbances range from external relative price trends that alter the home income distribution to financial developments of the type discussed above. Government policies, including monetary and financial policies, have the potential to move the economy to a preferred point on the trade-off between downsides and benefits.

Inefficacy of one policy instrument, however, raises the burden on the others, leaving the economy worse off in general. I have argued that while globalisation places some limits on monetary policy, even with flexible exchange rates, the bigger problem is the enhanced difficulty of effective financial policy in an open economy: the financial trilemma. As for monetary policy, most emerging economies that have chosen a resolution of the monetary trilemma based on exchange rate flexibility have gained.

The paper's analysis raises questions for both future research and policy:

- One of the most potent channels for international monetary and financial transmission clearly runs through long-term interest rates. What factors are most important in determining these correlations – expected short-term rates, term premia or currency risk premia? And what are the implications for domestic monetary control?
- If capital flows create a severe trade-off problem and macroprudential policies are weakened by imperfect international coordination, then, as Rey (2013) points out, the costs and benefits of capital controls come into focus. When are capital controls helpful, what types of controls are even effective, and what globally agreed norms and procedures might allow controls to play a constructive role in the international system? In particular, in what ways does it matter that countries might use capital controls to pursue competitiveness as well as financial stability goals?
- If explicit regular coordination of central bank monetary policies is unrealistic, are there other areas for cooperation that could partially substitute and thereby supplement the Basel Process? One potential example is the network of central bank swap lines introduced during the GFC and established on a permanent basis among six advanced country central banks in October 2013. This innovation effectively allows the lender of last resort function to be practised in multiple currencies. Could it gradually be extended to a broader set of participant countries?

In discussing measures to mitigate the downsides of financial globalisation, it is important to keep the upsides in view. Financial market integration promotes not just gross debt expansion through two-way capital flows, but also international risk-sharing. The trend shift from foreign debt to equity finance illustrated in Figures 3 and 4 is a stabilising effect of globalisation with the potential to make domestic monetary policy more, not less, effective. Thus, policies to further discourage debt finance, including the very high debt levels of globally active banks, have considerable potential to raise national welfare.

Data appendix

Short-term interest rates: Three-month, local currency, short-term interest rates come from the Global Financial Data database. Three-month treasury bill rates are used for all countries, other than Libor-like three-month money market rates for Azerbaijan, Moldova, Oman, Qatar and Vietnam. In a few cases (eg Kenya), treasury bill rate data are the time series reported by central banks and government statistical agencies. The quarterly data analysed are averages of end-month rates.

Long-term interest rates: Ten-year, local currency, government bond rates come from Thomson Reuters Datastream and the Global Financial Data database. The quarterly data analysed are averages of end-month rates.

Consumer price indices: Monthly consumer price indices (CPI) from Thomson Reuters Datastream and Global Financial Data. For Australia, producer price index.

Real GDP: Quarterly seasonally adjusted GDP data from Thomson Reuters Datastream, OECD, Eurostat and the Federal Reserve Economic Data (FRED) database of the St Louis Fed. Where necessary, nominal GDP data were deflated by the GDP deflator and non-seasonally adjusted data were adjusted. Seasonal adjustments were based on the X-12-ARIMA quarterly seasonal adjustment method from the US Census Bureau. The following countries' GDP data were seasonally adjusted by this method: Armenia, Brazil, China, Croatia, Egypt, Hong Kong, Hungary, India, Indonesia, Jordan, Kazakhstan, Latvia, Nigeria and Poland.

Pegs/non-pegs: The paper uses Klein and Shambaugh's (2013) annual de facto coding method to distinguish pegs from non-pegs, but I apply it at quarterly frequency and require that a peg lasts at least eight consecutive quarters. In the present paper, only the most restricted classification of pegs is used (that is, soft pegs, as defined by Klein and Shambaugh, are not considered to be pegs). Pegs are defined as restricted within a ±2% band relative to the base country currency. The Klein-Shambaugh soft pegs move within a ±5% band.

Base countries: From Klein and Shambaugh (2013). The only exceptions are Cyprus and Malta, assigned the base country of Germany rather than France. Taiwan, not included in the Klein-Shambaugh sample, has the US as a base country.

CBOE Volatility Index (VIX): Quarterly average of end-month data, from Global Financial Data.

Data coverage for the dynamic interest rate equations is detailed by country in Tables 5 and 6. Coverage for the pooled/panel regressions (Tables 1–4) is as follows:

Table 1

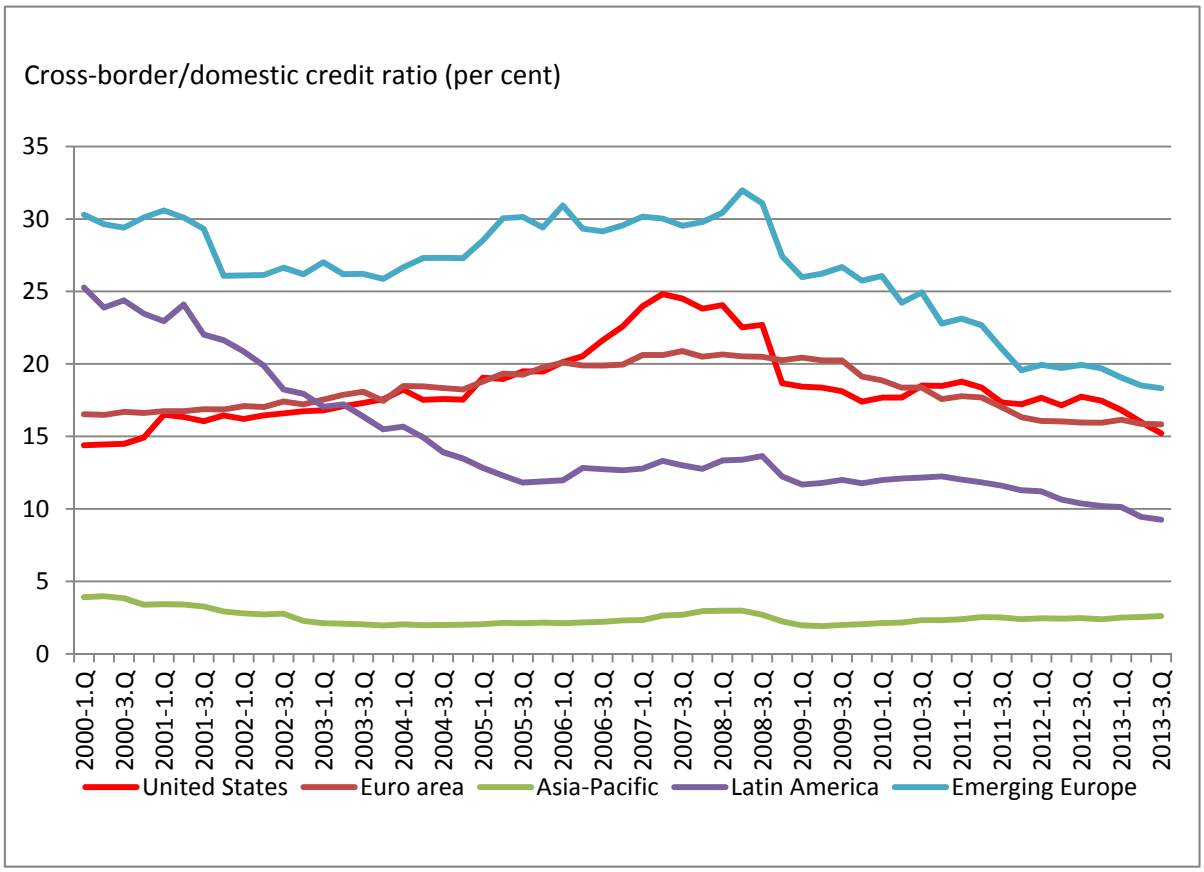
	Advanced	Base country	LR pooled/panel	SR pooled/panel
1	Australia	US	Q3 1989 – Q4 2013	Q3 1989 – Q4 2013
2	Austria	Germany	Q3 1989 – Q4 2013	Q3 1989–Q4 1990
3	Belgium	Germany	Q2 1995 – Q4 2013	Q2 1995 – Q4 2013
4	Canada	US	Q3 1989 – Q4 2013	Q3 1989 – Q4 2013
5	Cyprus	Germany	Q1 1998 – Q4 2013	Q2 1995 – Q1 2008
6	Denmark	Germany	Q2 1991 – Q4 2013	Q2 1991 – Q4 2013
7	Finland	Germany	Q2 1990 – Q4 2013	Q2 2012 – Q2 2013
8	France	Germany	Q3 1989 – Q4 2013	Q3 1989 – Q4 2013
9	Germany	US	Q2 1991 – Q4 2013	Q2 1991 – Q4 2013
10	Greece	Germany	Q2 2000 – Q2 2008	Q2 2000 – Q2 2008
11	Iceland	US/Germany	Q2 2004 – Q4 2013	Q2 1997 – Q1 2013
12	Ireland	Germany	Q2 1997 – Q4 2013	Q2 1997 – Q4 2013
13	Italy	Germany	Q2 1991 – Q4 2013	Q2 1991 – Q4 2013
14	Japan	US	Q3 1989 – Q4 2013	Q3 1989 – Q4 2013
15	Malta	Germany	Q2 2000– Q4 2007	Q2 2000 – Q4 2007
16	Netherlands	Germany	Q3 1989 – Q4 2013	Q3 1989 – Q4 2013
17	Norway	Germany	Q3 1989 – Q4 2013	Q3 1989 – Q4 2013
18	Portugal	Germany	Q2 1995 – Q4 2013	Q2 1995 – Q4 2013
19	Spain	Germany	Q2 1995 – Q4 2013	Q2 1995 – Q4 2013
20	Sweden	Germany	Q2 1993 – Q4 2013	Q2 1993 – Q4 2013
21	Switzerland	Germany	Q3 1989 – Q4 2013	Q3 1989 – Q4 2013
22	United Kingdom	Germany	Q3 1989 – Q4 2013	Q3 1989 – Q4 2013

Table 2

	Non-Advanced	Base country	LR pooled/panel	SR pooled/panel
1	Albania	Germany	..	Q2 2005 – Q4 2013
2	Argentina	US	..	Q4 2002 – Q4 2013
3	Armenia	US	..	Q2 1996 – Q4 2013
4	Brazil	US	Q1 2000 – Q4 2006	Q2 1995 – Q4 2012
5	Bulgaria	Germany	Q3 1993 – Q3 2009	Q2 1997 – Q1 2008
6	Chile	US	Q4 2004 – Q4 2013	Q2 2003 – Q3 2012
7	China	US	Q1 2007 – Q4 2013	Q3 1997 – Q4 2013
8	Colombia	US	Q4 2002 – Q4 2013	Q2 2000 – Q3 2012
9	Croatia	Germany	Q2 2012 – Q3 2013	Q2 2006 – Q3 2013
10	Czech Republic	Germany	Q3 2000 – Q4 2013	Q1 1996 – Q4 2013
11	Egypt	US	..	Q2 2007– Q4 2013
12	Ghana	US	..	Q2 2006 – Q2 2013
13	Hong Kong	US	Q1 1997– Q4 2013	Q3 1991 – Q4 2013
14	Hungary	US/Germany	Q2 1999 – Q4 2013	Q2 1995 – Q4 2013
15	India	US	Q3 2004 – Q4 2013	Q3 2004 – Q4 2013
16	Indonesia	US	Q3 2009 – Q4 2013	Q2 2000 – Q4 2003
17	Israel	US	Q2 2006 – Q4 2013	Q2 2006 – Q4 2013
18	Kazakhstan	US	Q2 1998 – Q4 2013	Q3 1994 – Q4 2013
19	Kenya	US	Q2 2011 – Q3 2013	Q2 2000 – Q3 2013
20	Latvia	US/Germany	Q1 1999 – Q4 2013	Q2 1995 – Q4 2013
21	Mexico	US	Q1 2000 – Q4 2013	Q2 1993 – Q4 2013
22	Nigeria	US	Q2 2009 – Q3 2013	Q3 1995 – Q3 2013
23	Philippines	US	Q2 1999 – Q3 2013	Q2 1998 – Q4 2013
24	Poland	Germany	Q3 1999 – Q4 2013	Q2 1996 – Q4 2013
25	Romania	US/Germany	Q2 2012 – Q4 2013	Q2 2000 – Q3 2005
26	Russia	US	Q2 2003 – Q3 2013	Q2 2003 – Q3 2013
27	Singapore	Malaysia	Q3 1998 – Q4 2013	Q3 1989 – Q4 2013
28	Slovakia	Germany	Q2 1997– Q4 2013	Q2 1997 – Q4 2007
29	Slovenia	Germany	Q2 2002 – Q4 2013	Q3 2000 – Q4 2013
30	South Africa	US	Q3 1989 – Q4 2013	Q3 1989 – Q4 2013
31	South Korea	US	Q1 2001 – Q4 2013	Q4 2006 – Q4 2013
32	Taiwan	US	Q2 1995 – Q4 2013	Q3 1989 – Q4 2013
33	Thailand	US	Q2 1993 – Q4 2013	Q2 1997 – Q4 2013
34	Turkey	US	Q2 2012 – Q4 2013	Q2 1998 – Q4 2013

Cross-border credit as a fraction of domestic credit, by region

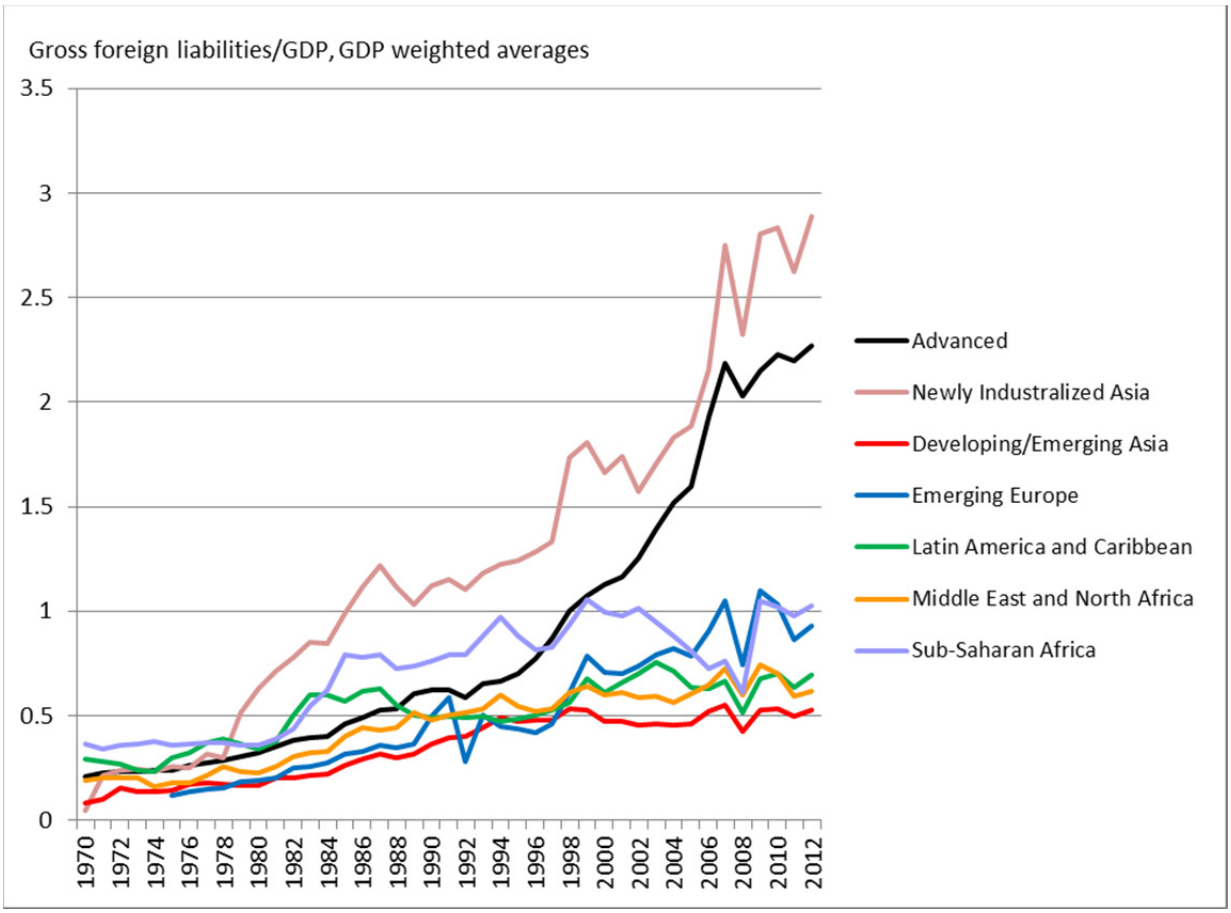
Figure 1



Source: BIS global liquidity indicators.

Gross external liabilities relative to GDP, by region

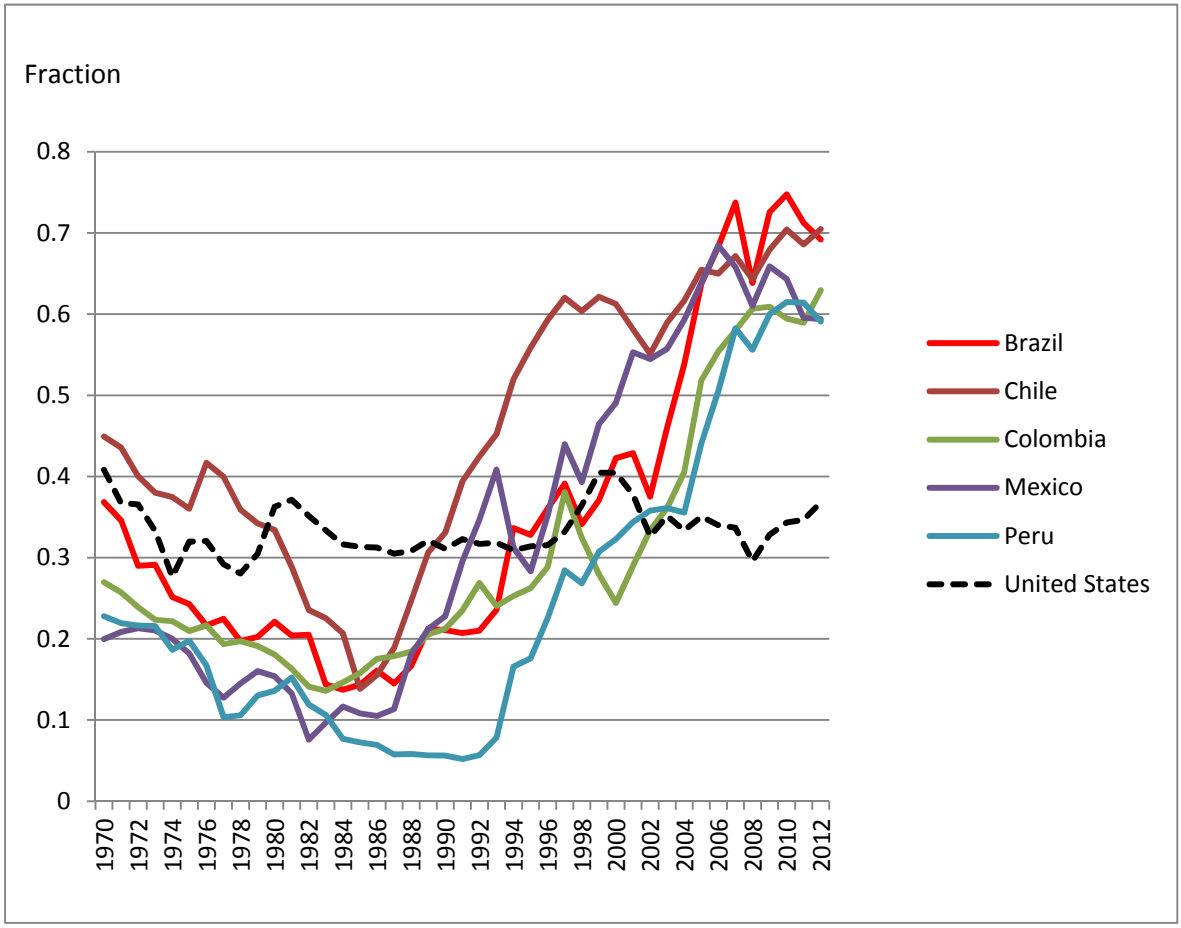
Figure 2



Source: Updated data from Lane and Milesi-Ferretti (2007), by courtesy of Gian Maria Milesi-Ferretti.

External equity liabilities relative to total external liabilities, by country: western hemisphere

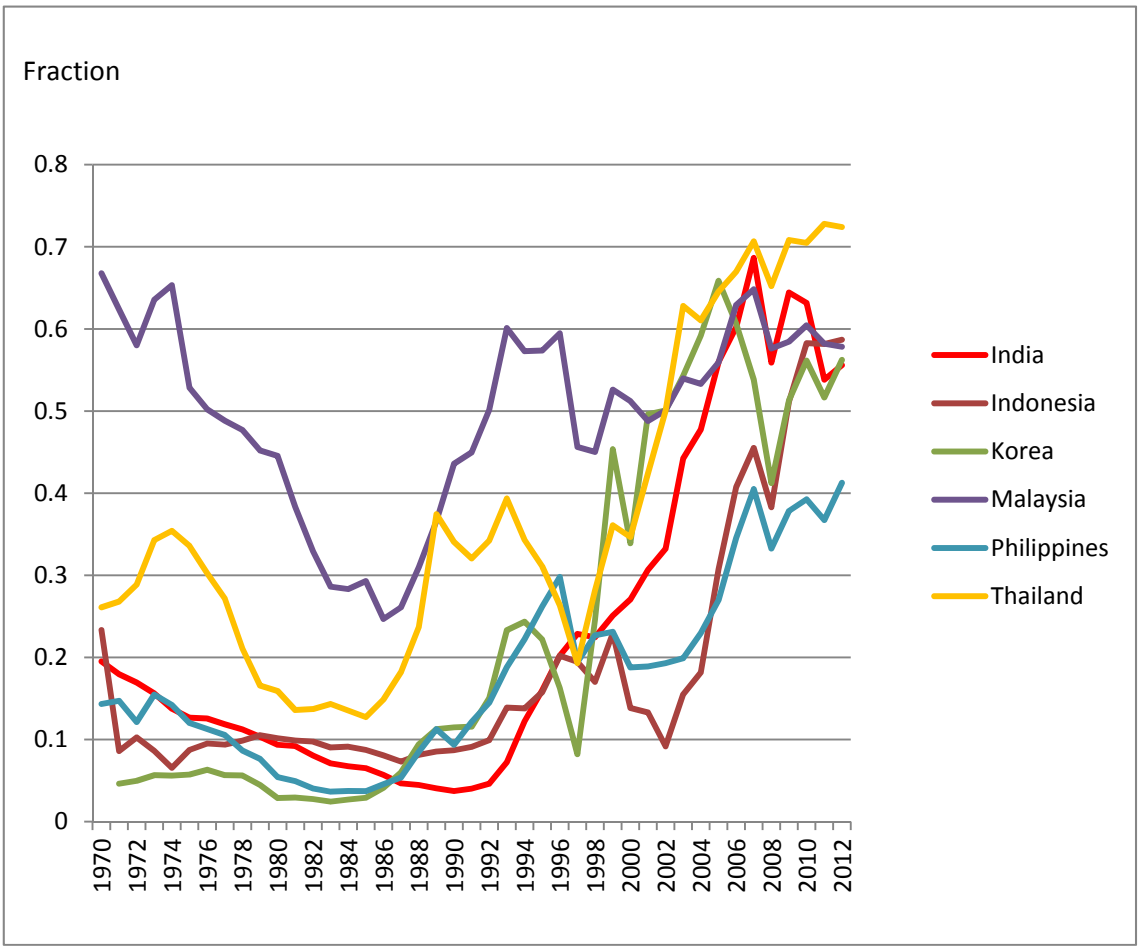
Figure 3



Source: Updated data from Lane and Milesi-Ferretti (2007).

External equity liabilities relative to total external liabilities, by country: Asia

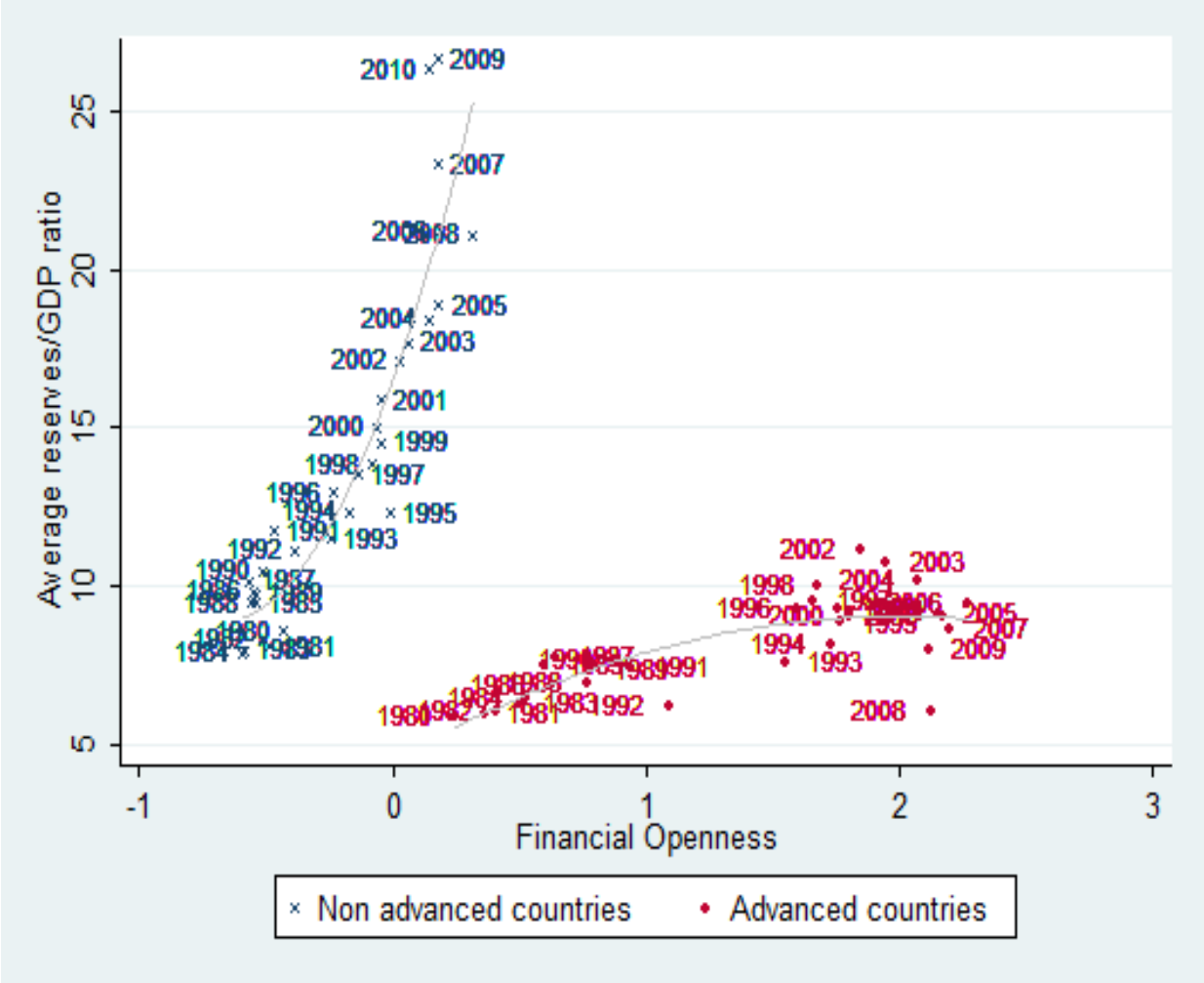
Figure 4



Source: Updated data from Lane and Milesi-Ferretti (2007).

Financial openness and international reserves of advanced and developing/emerging countries, by year

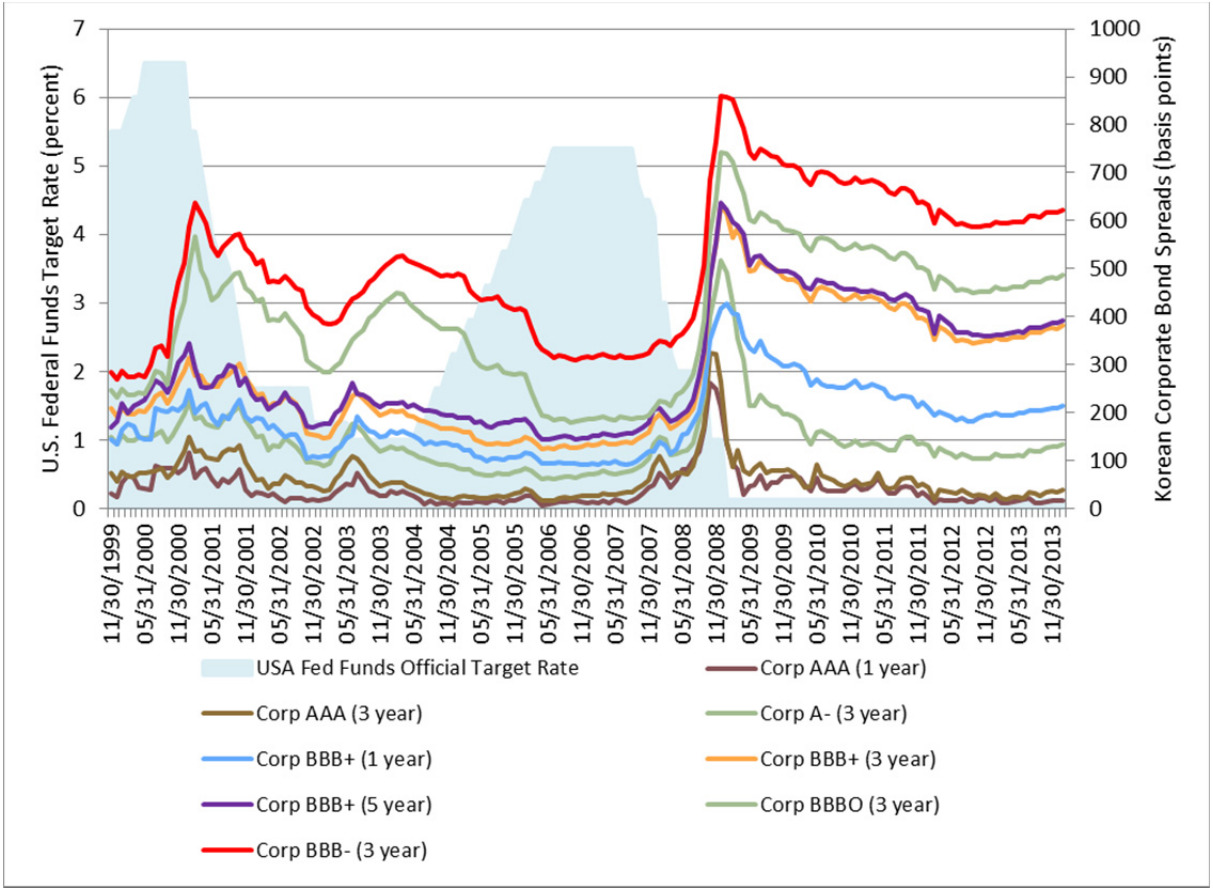
Figure 5



Source: Bussière et al (2014), by courtesy of Menzie Chinn, based on the updated Chinn and Ito (2006) index.

Korea, corporate bond spreads versus US federal funds target rate

Figure 6

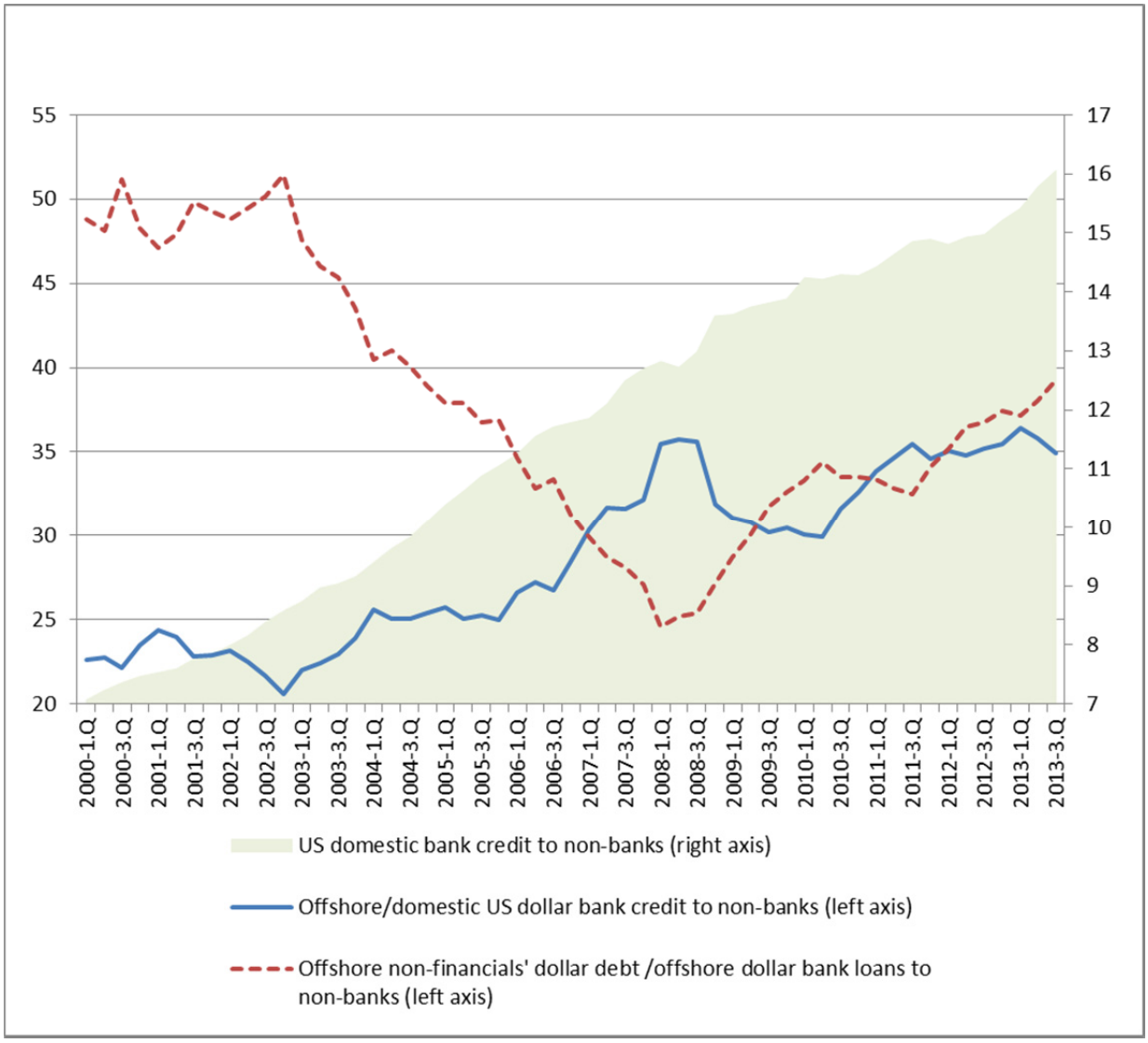


Source: Asian Development Bank, Asian Bonds Online.

Offshore US dollar bank credit and offshore US dollar debt

In billions of US dollars

Figure 7



Source: BIS global liquidity indicators.

Pooled and panel regressions of nominal interest rate changes on base currency changes

Table 3

	(1) US-base SR	(2) Multi-base SR	(3) Multi-base SR with time effects	(4) Multi-base SR with VIX percentage change	(5) US-base LR	(6) Multi-base LR	(7) Multi-base LR with time effects	(8) Multi-base LR with VIX percentage change
US-base SR change	0.0605							
	(0.158)							
Multi-base SR change		0.201	0.0121	0.241				
		(0.172)	(0.228)	(0.177)				
US-base LR change					0.354***			
					(0.0597)			
Multi-base LR change						0.552***	0.433***	0.636***
						(0.0670)	(0.136)	(0.0616)
VIX percentage change				0.00252*				0.00298***
				(0.00131)				(0.000668)
Constant	–0.00170**	–0.00154**	0.000170	–0.00153**	–0.000798***	–0.000626***	–0.00113**	–0.000636***
	(0.000755)	(0.000760)	(0.000724)	(0.000755)	(0.000173)	(0.000166)	(0.000438)	(0.000166)
N	3258	3258	3258	3258	3071	3071	3071	3071
Adj R^2	0.035	0.036	0.061	0.037	0.048	0.085	0.138	0.095
Optimal lags	5	5	5	5	0	0	0	0
P-value for F Test that growth and inflation change variables (and their lags, where applicable) do not enter	2.13011E–11	6.3826E–11	1.01883E–06	3.12899E–10	0.0713856	0.183389806	0.041894423	0.138324958

Clustered standard errors in brackets (at country level).

1* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Exchange rate pegging versus non-pegging

Table 4

	(1) US-base SR	(2) Multi-base SR	(3) Multi-base SR with time effects	(4) Multi-base SR with VIX percentage change	(5) US-base LR	(6) Multi-base LR	(7) Multi-base LR with time effects	(8) Multi-base LR with VIX percentage change
US-base SR change	0.0261							
	(0.178)							
Peg * US-base SR change	0.122							
	(0.256)							
Multi-base SR change		–0.0256	–0.0948	0.0290				
		(0.312)	(0.394)	(0.322)				
Peg * multi-base SR change		0.375	0.278	0.362				
		(0.310)	(0.298)	(0.311)				
US-base LR change					0.348***			
					(0.0638)			
Peg * US-base LR change					0.0189			
					(0.158)			
Multi-base LR change						0.495***	0.430***	0.583***
						(0.0976)	(0.157)	(0.0870)
Peg * multi-base LR change						0.0964	0.00816	0.0890
						(0.111)	(0.101)	(0.107)
VIX percent change				0.00301*				0.00297***
				(0.00158)				(0.000672)
Constant	–0.00181**	–0.00116	0.00123	–0.00114	–0.000836***	–0.000629***	–0.00112**	–0.000643***
	(0.000767)	(0.000760)	(0.00138)	(0.000756)	(0.000202)	(0.000162)	(0.000422)	(0.000161)
N	3258	3258	3258	3258	3071	3071	3071	3071

Exchange rate pegging versus non-pegging

Table 4

	(1) US-base SR	(2) Multi-base SR	(3) Multi-base SR with time effects	(4) Multi-base SR with VIX percentage change	(5) US-base LR	(6) Multi-base LR	(7) Multi-base LR with time effects	(8) Multi-base LR with VIX percentage change
Adj R^2	0.066	0.087	0.113	0.088	0.048	0.085	0.137	0.095
Optimal lags	5	5	5	5	0	0	0	0
P-value for F Test that growth and inflation change variables (and their lags, where applicable) do not enter	0.000271181	5.45319E–05	3.56323E–05	4.27134E–05	0.054861746	0.271829271	0.138256524	0.225336173
P-value for F Test that controls and peg interaction term coefficients (and lags, where applicable) sum to zero	3.95008E–18	1.28064E–07	1.08185E–08	1.24208E–07	0.355502	0.661292639	0.265738535	0.569184142

Clustered standard errors in brackets (at country level).

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Developing/emerging economy subsample

Table 5

	(1) US-base SR	(2) Multi-base SR	(3) Multi-base SR with time effects	(4) Multi-base SR with VIX percentage change	(5) US-base LR	(6) Multi-base LR	(7) Multi-base LR with time effects	(8) Multi-base LR with VIX percentage change
US-base SR change	–0.313							
	(0.412)							
Peg * US-base SR change	0.377							
	(0.430)							
Multi-base SR change		–0.407	–0.260	–0.337				
		(0.515)	(0.560)	(0.550)				
Peg * Multi-base SR change		0.480	0.300	0.449				
		(0.500)	(0.542)	(0.513)				
US-base LR change					0.0590			
					(0.132)			
Peg * US-base LR change					0.211			
					(0.188)			
Multi-base LR change						0.194	0.622	0.332***
						(0.125)	(0.490)	(0.113)
Peg * Multi-base LR change						0.0995	0.0390	0.0729
						(0.163)	(0.186)	(0.159)
VIX percentage change				0.00344				0.00375**
				(0.00276)				(0.00141)
Constant	–0.00230	–0.00180	–0.000213	–0.00178	–0.00113**	–0.000971***	–0.00122	–0.000992***
	(0.00153)	(0.00144)	(0.00126)	(0.00144)	(0.000456)	(0.000332)	(0.000832)	(0.000332)
N	1775	1775	1775	1775	1286	1286	1286	1286

Developing/emerging economy subsample

Table 5

	(1) US-base SR	(2) Multi-base SR	(3) Multi-base SR with time effects	(4) Multi-base SR with VIX percentage change	(5) US-base LR	(6) Multi-base LR	(7) Multi-base LR with time effects	(8) Multi-base LR with VIX percentage change
Adj R^2	0.073	0.099	0.153	0.099	0.005	0.014	0.088	0.022
Optimal lags	5	5	5	5	0	0	0	0
P-value for F Test that growth and inflation change variables (and their lags, where applicable) do not enter	0.012799281	1.00957E–08	6.81558E–10	2.26485E–09	0.363421235	0.073372722	0.009637445	0.040628087
P-value for F Test that controls and peg interaction term coefficients (and lags, where applicable) sum to zero	1.30925E–12	1.64653E–06	4.69456E–06	1.21227E–06	0.319557116	0.77502473	0.310767234	0.744519193

Clustered standard errors in brackets (at country level).

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Advanced economy subsample

Table 6

	(1) US-base SR	(2) Multi-base SR	(3) Multi-base SR with time effects	(4) Multi-base SR with VIX percentage change	(5) US-base LR	(6) Multi-base LR	(7) Multi-base LR with time effects	(8) Multi-base LR with VIX percentage change
US-base SR change	0.260***							
	(0.0415)							
Peg * US-base SR change	0.671***							
	(0.0936)							
Multi-base SR change		0.518***	0.306*	0.546***				
		(0.133)	(0.152)	(0.129)				
Peg * Multi-base SR change		0.223	0.129	0.225				
		(0.153)	(0.165)	(0.153)				
US-base LR change					0.484***			
					(0.0502)			
Peg * US-base LR change					0.454***			
					(0.0558)			
Multi-base LR change						0.753***	0.582***	0.798***
						(0.107)	(0.147)	(0.104)
Peg * Multi-base LR change						0.0590	–0.0317	0.0639
						(0.124)	(0.0992)	(0.120)
VIX percent change				0.00197*				0.00199***
				(0.00107)				(0.000475)
Constant	–0.00109***	–0.000694***	–0.0000462	–0.000705***	–0.000675***	–0.000394***	–0.00111**	–0.000397***
	(0.000158)	(0.000117)	(0.000145)	(0.000114)	(0.0000939)	(0.0000782)	(0.000481)	(0.0000786)
N	1598	1598	1598	1598	1785	1785	1785	1785

Advanced economy subsample

Table 6

	(1) US-base SR	(2) Multi-base SR	(3) Multi-base SR with time effects	(4) Multi-base SR with VIX percentage change	(5) US-base LR	(6) Multi-base LR	(7) Multi-base LR with time effects	(8) Multi-base LR with VIX percentage change
Adj R^2	0.086	0.215	0.298	0.221	0.233	0.388	0.482	0.399
Optimal Lags	0	0	0	0	0	0	0	0
P-value for F Test that growth and inflation change variables (and their lags, where applicable) do not enter	0.00050801	0.000189404	0.120686741	0.000332068	0.016935281	0.051729132	0.048043523	0.057385095
P-value for F Test that controls and Peg interaction term coefficients (and lags, where applicable) sum to zero	6.16506E–12	0.106312651	0.880379827	0.413387934	8.95003E–11	0.09259661	0.063848163	0.204935031

Clustered standard errors in brackets (at country level).

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Short-term interest rate dynamic equations with the US dollar as the base currency — Table 7

		Coverage	Number. of obser-vations (based on optimal number of lags)	ξ		θ		PSS F test statistic	PSS F statisti-cally signifi-cant. at 0	PSS F statisti-cally signif-icant at 1	PSS T test statistic	PSS T statisti-cally signifi-cant at 0	PSS T statisti-cally signifi-cant at 1	Half-life (in months)
	Advanced													
1	Australia	May 1989–Jun 2012	271	0.43	(0.30)	–0.03	(0.01)	6.13	1	1	–3.69	1	1	26.34
2	Belgium	May 1989–Jan 2014	297	1.27	(0.30)	–0.03	(0.01)	6.36	1	1	–3.27	1	0	26.06
3	Canada	May 1989–Feb 2014	297	1.07	(0.27)	–0.03	(0.01)	2.16	0	0	–2.53	0	0	21.06
4	Cyprus	May 1989–Mar 2008	227	0.58	(0.36)	–0.02	(0.01)	1.23	0	0	–1.67	0	0	34.60
5	Denmark	May 1989–Jan 2014	241	1.61	(0.63)	–0.03	(0.01)	2.12	0	0	–2.29	0	0	20.17
6	France	May 1989–Feb 2014	298	1.42	(0.36)	–0.03	(0.01)	3.98	1	0	–3.05	1	0	25.78
7	Germany	May 1989–Feb 2014	298	1.31	(0.26)	–0.02	(0.01)	6.86	1	1	–3.48	1	0	27.50
8	Greece	Nov 1992–Feb 2014	293	–2.03	(1.89)	–0.28	(0.05)	9.50	1	1	–5.34	1	1	2.13
9	Iceland	May 1989–Jan 2013	285	0.78	(0.23)	–0.10	(0.02)	11.91	1	1	–5.94	1	1	6.27
10	Ireland	Feb 1997–Feb 2014	205	0.88	(0.15)	–0.06	(0.02)	5.03	1	1	–3.40	1	0	11.55
11	Italy	May 1989–Jan 2014	297	1.14	(0.40)	–0.03	(0.01)	4.32	1	0	–3.33	1	0	20.60
12	Japan	May 1989–Jan 2014	296	0.73	(0.44)	–0.01	(0.01)	1.39	0	0	–1.88	0	0	62.04
13	Malta	May 1989–Feb 2014	298	0.90	(0.20)	–0.03	(0.01)	6.04	1	1	–3.02	1	0	26.68
14	Netherlands	May 1989–Jan 2014	297	1.48	(0.33)	–0.02	(0.01)	8.04	1	1	–3.35	1	0	35.77

Short-term interest rate dynamic equations with the US dollar as the base currency — Table 7

		Coverage	Number. of obser-vations (based on optimal number of lags)	ξ		θ		PSS F test statistic	PSS F statisti-cally signifi-cant. at 0	PSS F statisti-cally signif-icant at 1	PSS T test statistic	PSS T statisti-cally signifi-cant at 0	PSS T statisti-cally signifi-cant at 1	Half-life (in months)
15	Norway	May 1989–Feb 2014	296	1.18	(0.27)	–0.05	(0.01)	5.85	1	1	–3.92	1	1	12.46
16	Portugal	May 1989–Feb 2014	287	1.91	(0.74)	–0.01	(0.01)	2.07	0	0	–2.18	0	0	46.21
17	Spain	May 1989–Feb 2014	297	1.24	(0.39)	–0.02	(0.01)	5.53	1	1	–3.33	1	0	38.61
18	Sweden	May 1989–Jan 2014	297	1.20	(0.35)	–0.04	(0.01)	4.72	1	0	–3.61	1	1	17.04
19	Switzerland	May 1989–Feb 2014	296	0.91	(0.28)	–0.03	(0.01)	4.68	1	0	–3.05	1	0	24.25
20	United Kingdom	May 1989–Jan 2014	296	1.42	(0.22)	–0.03	(0.01)	3.95	1	0	–3.36	1	0	23.70
	Developing/ emerging													
1	Albania	Sep 1994–Oct 2013	228	3.11	(1.62)	–0.02	(0.01)	2.20	0	0	–2.02	0	0	38.61
2	Argentina	Nov 2002–Feb 2014	52	11.69	(16.79)	–0.18	(0.22)	0.79	0	0	–0.82	0	0	3.55
3	Armenia	Nov 1995–Feb 2014	165	4.32	(11.52)	–0.03	(0.03)	0.94	0	0	–0.77	0	0	25.48
4	Azerbaijan	Feb 2008–Feb 2014	66	2.40	(2.83)	–0.10	(0.07)	1.19	0	0	–1.43	0	0	6.35
5	Brazil	Mar 1995–Nov 2012	203	1.39	(0.61)	–0.15	(0.03)	9.56	1	1	–4.41	1	1	4.19
6	Bulgaria	Mar 1998–Jan 2008	118	0.49	(0.21)	–0.10	(0.03)	5.26	1	1	–3.20	1	0	6.74

Short-term interest rate dynamic equations with the US dollar as the base currency

Table 7

		Coverage	Number. of obser-vations (based on optimal number of lags)	ξ		θ		PSS F test statistic	PSS F statisti-cally signifi-cant. at 0	PSS F statisti-cally signif-icant at 1	PSS T test statistic	PSS T statisti-cally signifi-cant at 0	PSS T statisti-cally signifi-cant at 1	Half-life (in months)
7	Chile	Sep 1997–Sep 2012	171	0.08	(0.69)	–0.06	(0.02)	5.12	1	1	–3.05	1	0	11.81
8	China	Aug 1997–Dec 2013	194	–0.46	(0.45)	–0.05	(0.02)	5.75	1	1	–2.27	0	0	13.01
9	Colombia	Mar 1998–Feb 2014	165	0.88	(0.22)	–0.17	(0.03)	13.96	1	1	–6.42	1	1	3.62
10	Croatia	Feb 2001–Dec 2013	155	0.14	(0.42)	–0.06	(0.02)	2.00	0	0	–2.44	0	0	11.87
11	Czech Republic	Oct 1993–Jan 2014	243	1.05	(0.39)	–0.02	(0.01)	7.05	1	1	–3.46	1	0	27.66
12	Egypt	Mar 1991–Feb 2014	275	–0.23	(0.46)	–0.05	(0.01)	6.03	1	1	–3.21	1	0	14.51
13	Fiji	May 1989–Jun 2013	290	0.46	(0.25)	–0.09	(0.03)	5.38	1	1	–3.56	1	1	7.32
14	Ghana	Mar 1990–Mar 2013	277	3.83	(1.85)	–0.02	(0.01)	2.56	0	0	–2.58	0	0	31.97
15	Guyana	May 1989–Dec 2013	274	1.05	(1.24)	–0.02	(0.01)	3.09	0	0	–2.53	0	0	39.01
16	Hong Kong	Aug 1991–Feb 2014	271	1.09	(0.10)	–0.17	(0.04)	6.70	1	1	–4.41	1	1	3.72
17	Hungary	Mar 1992–Feb 2014	258	0.05	(1.01)	–0.03	(0.02)	1.90	0	0	–2.28	0	0	19.89
18	India	Mar 1993–Jan 2014	251	0.73	(0.28)	–0.09	(0.03)	3.29	0	0	–3.14	1	0	7.50
19	Israel	Mar 1992–Jan 2014	263	1.01	(0.34)	–0.05	(0.01)	30.97	1	1	–4.74	1	1	13.77
20	Kazakhstan	Jun 1994–Feb 2014	225	1.74	(0.65)	–0.08	(0.02)	7.84	1	1	–4.35	1	1	8.41

Short-term interest rate dynamic equations with the US dollar as the base currency — Table 7

		Coverage	Number. of obser-vations (based on optimal number of lags)	ξ		θ		PSS F test statistic	PSS F statisti-cally signifi-cant. at 0	PSS F statisti-cally signif-icant at 1	PSS T test statistic	PSS T statisti-cally signifi-cant at 0	PSS T statisti-cally signifi-cant at 1	Half-life (in months)
21	Kenya	May 1989–Dec 2013	293	1.48	(0.96)	–0.06	(0.01)	6.90	1	1	–4.36	1	1	11.73
22	Kuwait	May 1989–Jan 2005	189	1.78	(0.79)	–0.02	(0.01)	2.01	0	0	–1.47	0	0	31.50
23	Kyrgyz Republic	Mar 1994–Dec 2013	211	6.92	(1.71)	–0.15	(0.04)	4.82	1	0	–3.69	1	1	4.30
24	Latvia	July 1994–Jan 2014	234	1.19	(1.08)	–0.03	(0.01)	2.86	0	0	–2.74	0	0	22.83
25	Lebanon	Feb 2003–Feb 2014	124	–0.04	(0.09)	–0.07	(0.02)	5.82	1	1	–3.43	1	0	9.60
26	Malaysia	Jan 1989–Feb 2014	298	0.58	(0.21)	–0.04	(0.01)	3.81	1	0	–3.22	1	0	17.76
27	Mexico	May 1989–Dec 2013	293	3.14	(1.42)	–0.08	(0.04)	3.23	0	0	–1.82	0	0	8.68
28	Moldova	May 1995–Feb 2014	197	2.63	(1.14)	–0.08	(0.03)	3.57	0	0	–3.16	1	0	8.10
29	Nepal	May 1989–Dec 2013	296	0.76	(0.47)	–0.06	(0.02)	5.14	1	1	–2.86	0	0	12.23
30	Nigeria	Mar 1995–Feb 2014	228	0.53	(0.82)	–0.04	(0.02)	2.64	0	0	–2.56	0	0	16.69
31	Oman	Jun 1996–Feb 2014	213	1.02	(0.09)	–0.11	(0.03)	5.56	1	1	–4.00	1	1	6.00
32	Pakistan	May 1991–Feb 2014	274	1.27	(0.71)	–0.03	(0.01)	6.14	1	1	–2.64	0	0	24.92
33	Philippines	May 1989–Feb 2014	294	2.34	(0.52)	–0.06	(0.02)	5.03	1	1	–3.67	1	1	11.21
34	Poland	Jul 1991–Feb 2014	260	1.12	(0.37)	–0.07	(0.02)	8.64	1	1	–3.76	1	1	9.95

Short-term interest rate dynamic equations with the US dollar as the base currency

Table 7

		Coverage	Number. of obser-vations (based on optimal number of lags)	ξ		θ		PSS F test statistic	PSS F statisti-cally signifi-cant. at 0	PSS F statisti-cally signif-icant at 1	PSS T test statistic	PSS T statisti-cally signifi-cant at 0	PSS T statisti-cally signifi-cant at 1	Half-life (in months)
35	Romania	May 1994–Sep 2005	130	4.47	(2.49)	–0.31	(0.12)	3.13	0	0	–2.58	0	0	1.89
36	Russia	Sep 1994–Feb 2014	190	1.36	(1.16)	–0.28	(0.06)	7.98	1	1	–4.79	1	1	2.08
37	Rwanda	Mar 1999–Feb 2014	179	–0.08	(0.38)	–0.06	(0.03)	3.43	0	0	–2.39	0	0	10.62
38	Singapore	May 1989–Jan 2014	297	0.39	(0.05)	–0.23	(0.04)	13.06	1	1	–6.21	1	1	2.63
39	Slovakia	Apr 1993–Dec 2007	177	1.81	(2.40)	–0.03	(0.02)	1.82	0	0	–1.51	0	0	19.87
40	Slovenia	Mar 2000–Feb 2014	159	1.73	(0.51)	–0.04	(0.01)	3.95	1	0	–3.10	1	0	17.43
41	South Africa	May 1989–Jan 2014	291	1.31	(0.29)	–0.04	(0.01)	6.10	1	1	–4.08	1	1	15.97
42	South Korea	Nov 2006–Feb 2014	88	0.53	(0.09)	–0.09	(0.02)	11.48	1	1	–4.99	1	1	7.23
43	Taiwan	May 1989–Feb 2014	298	1.02	(0.29)	–0.02	(0.01)	2.27	0	0	–2.38	0	0	35.51
44	Tanzania	Feb 1994–Jan 2014	229	–0.22	(0.68)	–0.10	(0.03)	5.64	1	1	–3.62	1	1	6.72
45	Thailand	May 1989–Sep 1989; Mar 1997–Feb 2014	178	0.25	(0.17)	–0.07	(0.01)	19.49	1	1	–6.89	1	1	9.12
46	Turkey	May 1989–Feb 2014	281	1.10	(2.70)	–0.12	(0.04)	3.62	0	0	–3.16	1	0	5.36
47	Uganda	May 1996–Feb 2014	213	0.30	(0.54)	–0.09	(0.03)	5.11	1	1	–3.35	1	0	6.97

Short-term interest rate dynamic equations with the US dollar as the base currency

Table 7

		Coverage	Number. of obser-vations (based on optimal number of lags)	ξ		θ		PSS F test statistic	PSS F statisti-cally signifi-cant. at 0	PSS F statisti-cally signif-icant at 1	PSS T test statistic	PSS T statisti-cally signifi-cant at 0	PSS T statisti-cally signifi-cant at 1	Half-life (in months)
48	Uruguay	Feb 1993–Dec 2013	183	–0.14	(0.30)	–0.27	(0.04)	12.68	1	1	–6.13	1	1	2.23
49	Venezuela	Feb 1997–Dec 2003	83	–0.33	(2.50)	–0.10	(0.05)	1.74	0	0	–2.18	0	0	6.61
50	Zambia	May 1989–Feb 2014	292	–1.34	(2.76)	–0.06	(0.02)	6.95	1	1	–3.88	1	1	11.41
	Averages								PSS F statisti-cally signifi-cant at 0	PSS F statisti-cally signifi-cant at 1		PSS T statisti-cally signifi-cant at 0	PSS T statisti-cally signifi-cant at 1	Half-life (in months)
				ξ		θ								
			Advanced	0.97	(0.42)	–0.05	(0.01)		75%	50%		75%	25%	25.44
			Developing/ Emerging	1.43	(1.39)	–0.09	(0.03)		60%	54%		60%	38%	13.12

Standard errors in brackets.

ξ: levels relationship.

θ: Adjustment speed to shocks in the levels relationship.

Significant at 0: Indicates whether we can reject no levels relationship at the 5% level if we assume the data are stationary.

Significant at 1: Indicates whether we can reject no levels relationship at the 5% level if we assume the data are non-stationary.

Half-life: The half-life of a shock (in months) based on the adjustment speed.

Long-term interest rate dynamic equations with the US dollar as the base currency

Table 8

		Coverage	Number of observations (based on optimal number of lags)	ξ		θ		PSS F test statistic	PSS F statistically significant at 0	PSS F statistically significant at 1	PSS T test statistic	PSS T statistically significant at 0	PSS T statistically significant at 1	Half-life (in months)
	Advanced													
1	Australia	May 1989– Jun 2012	271	0.74	(0.39)	–0.03	(0.01)	4.07	1	0	–2.28	0	0	24.3
2	Austria	May 1989– Jan 2014	297	1.10	(0.11)	–0.06	(0.02)	6.73	1	1	–3.90	1	1	11.4
3	Belgium	May 1989– Jan 2014	297	1.20	(0.15)	–0.05	(0.01)	5.06	1	1	–3.35	1	0	14.9
4	Canada	May 1989– Feb 2014	298	1.29	(0.11)	–0.05	(0.02)	3.21	0	0	–3.08	1	0	13.2
5	Cyprus	Jan 1998– Feb 2014	194	0.01	(0.71)	–0.02	(0.02)	1.28	0	0	–1.48	0	0	30.3
6	Denmark	May 1989– Jan 2014	297	1.40	(0.10)	–0.07	(0.02)	7.50	1	1	–4.30	1	1	9.2
7	Finland	May 1989– Jan 2014	297	1.71	(0.29)	–0.03	(0.01)	2.54	0	0	–2.70	0	0	22.8
8	France	May 1989– Feb 2014	298	1.18	(0.11)	–0.05	(0.01)	6.29	1	1	–3.98	1	1	12.3
9	Germany	May 1989– Feb 2014	298	1.15	(0.06)	–0.09	(0.02)	16.02	1	1	–5.84	1	1	7.1

Long-term interest rate dynamic equations with the US dollar as the base currency

Table 8

		Coverage	Number of observations (based on optimal number of lags)	ξ		θ		PSS F test statistic	PSS F statistically significant at 0	PSS F statistically significant at 1	PSS T test statistic	PSS T statistically significant at 0	PSS T statistically significant at 1	Half-life (in months)
10	Greece	May 1989– Jan 2014	255	–0.90	(2.14)	–0.03	(0.01)	1.93	0	0	–2.33	0	0	21.5
11	Iceland	May 2004– Jan 2014	117	1.09	(0.23)	–0.32	(0.07)	8.11	1	1	–4.73	1	1	1.8
12	Ireland	Feb 1997– Jan 2014	204	0.14	(0.95)	–0.02	(0.02)	1.48	0	0	–1.35	0	0	28.9
13	Italy	Mar 1989–Feb 2014	297	1.58	(0.55)	–0.02	(0.01)	2.15	0	0	–2.48	0	0	30.1
14	Japan	May 1989– Jan 2014	297	0.69	(0.21)	–0.03	(0.01)	2.70	0	0	–2.53	0	0	25.8
15	Malta	Feb 2000– Feb 2014	169	1.18	(0.62)	–0.03	(0.02)	2.24	0	0	–1.43	0	0	24.9
16	Netherlands	May 1989– Jan 2014	297	1.18	(0.08)	–0.07	(0.01)	9.86	1	1	–4.76	1	1	9.8
17	Norway	May 1989– Feb 2014	298	1.26	(0.13)	–0.05	(0.01)	4.83	1	0	–3.75	1	1	12.8
18	Portugal	May 1989– Jan 2014	264	0.99	(0.68)	–0.04	(0.01)	5.55	1	1	–3.97	1	1	17.5
19	Spain	May 1989– Feb 2014	298	1.11	(0.49)	–0.02	(0.01)	3.21	0	0	–2.38	0	0	30.6

Long-term interest rate dynamic equations with the US dollar as the base currency — Table 8

		Coverage	Number of observations (based on optimal number of lags)	ξ		θ		PSS F test statistic	PSS F statistically significant at 0	PSS F statistically significant at 1	PSS T test statistic	PSS T statistically significant at 0	PSS T statistically significant at 1	Half-life (in months)
20	Sweden	May 1989– Jan 2014	298	1.55	(0.20)	–0.04	(0.01)	4.53	1	0	–3.52	1	0	17.2
21	Switzerland	Mar 1989–Feb 2014	298	0.88	(0.07)	–0.07	(0.02)	8.69	1	1	–4.63	1	1	9.5
22	United Kingdom	May 1989– Jan 2014	297	1.37	(0.11)	–0.07	(0.02)	6.35	1	1	–4.02	1	1	9.8
	Developing/ emerging													
1	Brazil	Jan 2000– Dec 2006	84	–3.42	(8.78)	0.04	(0.06)	4.34	1	0	0.75	0	0	..
2	Bulgaria	Mar 1998–Nov 2009	141	0.46	(1.17)	–0.05	(0.03)	1.54	0	0	–2.05	0	0	12.5
3	Chile	Sep 2004–Feb 2014	94	0.39	(0.14)	–0.21	(0.05)	6.31	1	1	–3.91	1	1	2.9
4	China	Dec 2006– Feb 2014	87	0.11	(0.14)	–0.13	(0.04)	4.51	1	0	–3.38	1	0	5.1
5	Czech Republic	Jun 2000– Feb 2014	165	1.16	(0.33)	–0.06	(0.02)	3.43	0	0	–2.60	0	0	11.2
6	Fiji	Feb 2001– Jun 2013	149	0.83	(1.08)	–0.03	(0.02)	1.07	0	0	–1.51	0	0	19.5
7	Hong Kong	Dec 1996– Jan 2014	206	1.53	(0.27)	–0.09	(0.03)	3.24	0	0	–3.08	1	0	7.7

Long-term interest rate dynamic equations with the US dollar as the base currency

Table 8

		Coverage	Number of observations (based on optimal number of lags)	ξ		θ		PSS F test statistic	PSS F statistically significant at 0	PSS F statistically significant at 1	PSS T test statistic	PSS T statistically significant at 0	PSS T statistically significant at 1	Half-life (in months)
8	Hungary	Mar 1999– Feb 2014	180	0.11	(0.29)	–0.12	(0.04)	3.70	0	0	–3.31	1	0	5.4
9	India	May 1989– Jan 2014	297	0.98	(0.44)	–0.03	(0.01)	3.15	0	0	–2.25	0	0	21.2
10	Israel	Mar 1997– Feb 2014	204	1.23	(1.11)	–0.02	(0.01)	6.24	1	1	–1.46	0	0	33.6
11	Kazakhstan	May 1998– Feb 2014	190	2.01	(1.00)	–0.02	(0.01)	1.91	0	0	–1.81	0	0	29.0
12	Latvia	Feb 1999– Dec 2013	177	–0.05	(1.12)	–0.03	(0.01)	2.42	0	0	–2.20	0	0	21.5
13	Malaysia	Mar 1996– Jan 2014	215	0.64	(0.23)	–0.04	(0.02)	3.78	0	0	–2.69	0	0	16.7
14	Mexico	Dec 1999– Feb 2014	104	0.64	(0.23)	–0.11	(0.04)	3.76	0	0	–2.92	1	0	5.9
15	Pakistan	May 1989–Feb 2014	290	–1.12	(0.69)	–0.02	(0.01)	4.43	1	0	–1.92	0	0	36.46
16	Philippines	Apr 1999– Jul 2013	172	2.66	(0.95)	–0.04	(0.02)	1.34	0	0	–1.99	0	0	16.9
17	Poland	Jul 1999– Feb 2014	176	1.44	(0.40)	–0.06	(0.02)	5.25	1	1	–3.31	1	0	11.4
18	Russia	Feb 1997– Feb 2014	205	1.82	(2.20)	–0.07	(0.04)	1.94	0	0	–1.76	0	0	10.3

Long-term interest rate dynamic equations with the US dollar as the base currency

Table 8

		Coverage	Number of observations (based on optimal number of lags)	ξ		θ		PSS F test statistic	PSS F statistically significant at 0	PSS F statistically significant at 1	PSS T test statistic	PSS T statistically significant at 0	PSS T statistically significant at 1	Half-life (in months)
19	Singapore	Aug 1998– Feb 2014	185	0.64	(0.06)	–0.19	(0.04)	9.83	1	1	–5.33	1	1	3.3
20	Slovakia	Jan 1995– Feb 2014	226	5.49	(3.20)	–0.03	(0.02)	2.74	0	0	–1.62	0	0	25.0
21	Slovenia	May 2002–Feb 2014	142	–0.56	(0.39)	–0.09	(0.03)	4.82	1	0	–3.52	1	0	7.5
22	South Africa	May 1989– Feb 2014	298	1.49	(0.29)	–0.05	(0.02)	5.57	1	1	–3.62	1	1	12.3
23	South Korea	Dec 2000–Feb 2014	158	0.92	(0.24)	–0.08	(0.03)	2.29	0	0	–2.59	0	0	8.9
24	Taiwan	May 1995–Jan 2014	227	1.16	(0.25)	–0.03	(0.01)	2.45	0	0	–2.68	0	0	21.8
25	Tanzania	Dec 2002–Jan 2014	134	0.18	(1.35)	–0.06	(0.03)	2.00	0	0	–2.42	0	0	10.91
26	Thailand	May 1989–Feb 2014	298	1.50	(0.24)	–0.04	(0.01)	9.66	1	1	–3.91	1	1	15.1
27	Vietnam	Jul 2009– Feb 2014	56	2.75	(1.60)	–0.07	(0.04)	3.73	0	0	–1.90	0	0	9.88
28	Zambia	Oct 2007– Feb 2014	77	–0.16	(1.77)	–0.05	(0.04)	0.80	0	0	–1.14	0	0	13.23

Long-term interest rate dynamic equations with the US dollar as the base currency

Table 8

Coverage	Number of observations (based on optimal number of lags)	ξ		θ		PSS F test statistic	PSS F statistically significant at 0	PSS F statistically significant at 1	PSS T test statistic	PSS T statistically significant at 0	PSS T statistically significant at 1	Half-life (in months)
Averages		ξ		θ			PSS F statistically significant at 0	PSS F statistically significant at 1		PSS T statistically significant at 0	PSS T statistically significant at 1	Half–life (in months)
Advanced	1.00	(0.39)	–0.06	(0.02)			59%	45%		59%	45%	17.54
Developing /emerging	0.89	(1.07)	–0.06	(0.03)			36%	21%		36%	14%	14.64

Standard errors in brackets.

ξ: levels relationship.

θ: Adjustment speed to shocks in the levels relationship.

Significant at 0: Indicates whether we can reject no levels relationship at the 5% level if we assume the data are stationary.

Significant at 1: Indicates whether we can reject no levels relationship at the 5% level if we assume the data are non-stationary.

Half-life: The half-life of a shock (in months) based on the adjustment speed.

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Comment by Otmar Issing[35]

This paper is rich on insights into the complexity of the global financial system. The well known monetary trilemma has its counterpart in the form of a newer and lesser known financial trilemma. The focus of the paper is on emerging markets economies (EMEs), but here and there Obstfeld discusses whether his observations also apply to industrialised countries (ICs).

Does a flexible exchange rate allow EMEs to conduct a national monetary policy, ie to control the domestic inflation rate? There is no final answer to this question. Managed floating regimes might be the consequence of the too high costs of potentially wild movements in the nominal exchange rate.

Capital movements are the link between the monetary and the financial trilemmas. However, the financial trilemma is, de facto, a dilemma, a potential conflict between financial integration and financial stability. I would argue that it depends on the circumstances, which might allow for cases in which financial integration could foster and not endanger domestic financial stability.

How should EMEs react to financial integration? Capital controls have lost their stigma but implementation faces a number of difficulties, technically as well as conceptually. For EMEs the sequence whereby financial markets are liberalised and a stable domestic financial environment is established remains a key challenge. There is a tendency to see capital movements as a restriction to national policies and not as a means of increasing welfare – at home and at the global level.

Europe or rather the euro area, as a large economic area with its own currency, represents a special case in the world of globalised financial markets. A flexible exchange rate is the appropriate answer to the monetary trilemma, and the banking union plus macroprudential supervision are intended to foster financial stability if not to guarantee it.

Is international coordination the appropriate response if we are to avoid negative feedback effects from global financial integration? Given the fact that legal mandates for central banks are national, I share the view that it is unrealistic to ask for monetary policy coordination. Would this even be desirable?

A serious risk for monetary and financial stability would come from subordinating monetary policy to politics and from agreeing on a model that undermines the priority of price stability. As far as possible, central banks should consider – internalise is going too far – the spillover effects of their policy. Having the same domestic goals, namely price stability or low and stable inflation, would serve as an important anchor for the global economy. However, inflation targeting as it was practised is not enough. Monetary and credit developments must not be ignored. This is in the interest of individual countries as well as that of the world economy. Coordination of rules for macroprudential policies is indispensable to avoid regulatory arbitrage.

Maurice Obstfeld's paper gives deep insights into the complexity of the financial system and the importance of various transmission mechanisms. It implicitly reveals

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the need for a robust framework for the orientation of capital flows, and for the guidance of national policies, as well as the size of the challenge involved in designing one. This message is important not only for EMEs but also for ICs.

Comments by Takatoshi Ito[36]

This paper shows that adopting the floating exchange rate regime helps solve the traditional monetary policy trilemma (the "impossible trinity"). However, its power is constrained by a "financial policy trilemma." The new financial policy trilemma asserts the incompatibility of national responsibility for financial policy, international financial integration, and financial stability. To achieve these multiple objectives seems to be a daunting task given the recent financial crises in the United States, United Kingdom and the euro zone since 2007. The difficulty comes from a lack of reliable policy instruments.

As background factors for the new financial policy trilemma, Obstfeld lists several central bank actions since 2008 and associated issues. First, quantitative easing and spillovers to emerging market economies; Second, global liquidity and synchronous credit cycles; and third, the taper tantrum and credit reversal.

Let us recall the old trilemma which is sometimes called the impossible trinity.

Monetary trilemma (impossible trinity)

autonomous monetary policy	yes	yes	no
fixed exchange rate	yes	no	yes
free capital mobility	no	yes	yes
	China	Thailand, Indonesia	Hong Kong

Providing examples for each case where one of the conditions must be sacrificed are China, Thailand (after 1998), and Hong Kong SAR. If a country tries to achieve all of the objectives, as Thailand did in 1994–96, then it will end up in a crisis. Now, let us try to understand the new financial trilemma.

Financial trilemma (Obstfeld)

financial trilemma	Case A	Case B	Case C
national financial policy	yes	yes	no
international financial integration	yes	no	yes
financial stability	no	yes	yes

The trilemma means that any attempt to meet all three objectives may end up in a crisis, just like the old trilemma. It is not immediately clear to me how we can think of an example that satisfies only two of the three conditions; and what would happen if a country tried to pursue all three conditions. Case A may be understood as follows: if a country maintains a national financial policy, which may not be consistent with the international one, and its financial markets are fully integrated with the rest of the world, then financial stability cannot achieved. Which country fits into this category, I wonder. Case B seems to be straightforward. Countries such

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as China, Thailand and other emerging market economies in Asia maintain capital controls so that the domestic financial markets are not fully integrated with the global financial market. This allows the country to maintain control over domestic financial policy and financial stability. Case C may be puzzling. What does it mean not to have a national financial policy? Does it mean to subscribe to Basel III? Or perhaps there is no financial policy at all?

Anyway, the current trend is that it is important to adopt an appropriate macroprudential policy. Macroprudential policy may be a thought of as a silver bullet for achieving financial stability in countries with internationally integrated financial markets; and a national financial policy.

Examples of a crisis caused by "excessively large capital flows and a sudden reversal" are nothing new. This can be understood as the old trilemma. Most emerging market crises occurred when the United States raised interest rates – the Latin American crisis in the 1980s and the Mexican crisis of 1994. It seems that this is true both in the conventional regime and in the QE world. The spillover effects of the QE world may have been overemphasised. One possible explanation of many complaints about QE from emerging market economies is that the transmission channel for QE as a means of stimulating the economy is perceived to be limited to exchange rate depreciation.

Whether a financial crisis due to capital outflows can be avoided depends on how the country deals with capital flows at the inflow stage. One extreme view may be stated in a hypothesis: "If excessively large capital inflows are managed well, a sudden reversal can be managed easily". A recommended package of countermeasures to a sudden surge in capital inflows includes a bit of currency appreciation, some intervention (resulting in an accumulation of reserves), a Chilean-type withholding tax on short-term inflows, and imposing a loan-to-value ratio to prevent a bubble in the domestic economy. It is widely recognised that monetary policy alone cannot manage the situation because raising the policy rate to prevent overheating coupled with the bubble in the domestic economy invites additional short-term capital inflows. At the same time, lowering the policy rate to discourage the short-term capital inflows would fuel a bubble in the domestic economy. Instead, so-called macroprudential policies are needed to address this dilemma.

We have had discussions, among central bankers and the BIS economists, over a related hypothesis of separation of monetary policy and financial policy: "If financial supervision and macroprudential policy are effective, then monetary policy can restrict itself to pursuing flexible inflation targeting (without paying direct attention to asset prices)." According to this view, there is no trade-off between monetary policy and financial stability. If one believes in the separation hypothesis, ie no trade-off, then the new financial trilemma does not seem to be so relevant in understanding the problem of capital flows in the QE world.

Japan and Asian emerging market economies managed their economies successfully through the turbulent period of the global financial crisis. No major financial institutions in Asia failed, or even suffered a major deterioration in their capital ratios. There were several factors behind this achievement. As for the exchange rate regime, many Asian emerging-market countries have maintained a managed float. They piled up foreign reserves between 2000 and 2007 in what was called a "self-protection" strategy. When the Asian emerging market economies experienced capital outflows in 2008–09, the exchange rate was allowed to

depreciate and foreign reserves were used to moderate the decline. Except in the case of Korea for a brief period in 2009, the use of foreign reserves was enough to keep capital outflows under control. Foreign reserves started to increase again in 2010. Macroprudential policies, such as adjustments in the loan-to-value ratio, were also used in some countries. In a sense, they were not fully integrated in global financial markets. So this still supports the new financial trilemma view.

In future, I would like to see research on several lines of thought that are suggested by the Obstfeld paper. In connection with financial stability, the benefits from intervention and from the accumulation of foreign reserves as a buffer for capital outflows should be examined carefully. Asian countries seem to have firmly believed in the benefits, but this belief may not be shared in the West. Second, the types of macroprudential policies that can be used by emerging market economies should be reviewed. Some of the measures may be regarded as capital controls, which may prompt protests from IMF or western countries. Emerging market economies, whether in the normal process of policy rate adjustment or in the QE world, should be prepared for policy changes by the United States. It is most important to make domestic financial markets robust and to find the least costly ways of managing excessively large capital inflows that may be followed by a sudden stop and reversal. In examining these questions and hypotheses, some of the recent Asian experience may provide lessons for other emerging market economies.