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16-9 Currency Wars, Coordination, and Capital Controls

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Abstract

The strong monetary policy actions undertaken by advanced economies' central banks have led to complaints of "currency wars" by some emerging-market economies and to widespread demands for more macroeconomic policy coordination. This paper revisits these issues. It concludes that, while advanced economies' monetary policies indeed have had substantial spillover effects on emerging-market economies, there was and still is little room for coordination. It then argues that restrictions on capital flows were and are a more natural instrument for advancing the objectives of both macro and financial stability.

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Introduction

In September 2010, Guido Mantega, then minister of finance of Brazil, declared: "We are in the midst of an international currency war, a general weakening of currency. This threatens us because it takes away our competitiveness." His complaint was relayed and amplified by others, notably by Raghuram Rajan, governor of the Central Bank of India. In April 2014 for example, Rajan said: "The disregard for spillovers could put the global economy on a dangerous path of unconventional monetary tit for tat. To ensure stable and sustainable economic growth, world leaders must re-examine the international rules of the monetary game, with advanced and emerging economies alike adopting more mutually beneficial monetary policies."

Complaints by emerging market economies about advanced economies' monetary policies, together with calls for coordination, have been a staple of the last seven years. The purpose of this paper is to examine the validity of these complaints and the scope for coordination. It reaches two conclusions. The scope for coordination was and is limited. Restrictions on capital flows were and are the more natural instrument to achieve a better outcome.

The paper is organized as follows.

Section 1 briefly reviews the cross-border effects of advanced economies' monetary policies on emerging economies, through goods markets, foreign exchange markets, and financial markets.

Section 2 examines the scope for coordination, and concludes that it was and still is rather limited. It argues that, given the limits on fiscal policy, restrictions on capital flows were and still are the appropriate macroeconomic instrument to achieve better outcomes, both in advanced economies and in emerging economies.

Section 3 returns to the effects of capital flows on the financial systems in emerging economies, and argues for a second role for restrictions on capital flows, not only as a macroeconomic tool but also as a financial stability tool.

1 Cross-border effects

Expansionary monetary policy in advanced economies (AEs in what follows), conventional or unconventional, has affected emerging market economies (EMs

in what follows) through three channels: increased exports, exchange rate appreciation, and the effects of capital flows on the financial system. The first two are fairly well understood; the crisis has led economists to look at the third one more closely.[1]

Expansionary AE monetary policy leads to a higher demand for EM exports

This channel is straightforward: Lower interest rates lead to higher AE output, thus to higher AE imports, including higher imports from EMs.

It is useful for later to get a sense of potential magnitudes: For most EMs, exports to AEs represent between 5% and 10% of their GDP.[2] For example, Chinese exports to the AEs are equal to 10% of Chinese GDP, Brazilian and Indian exports are equal to 5% of their respective GDP.[3] Using these numbers suggests small effects of higher output in AEs: A 1% increase in AE output leads to an increase of 0.10% in Chinese output, and less than half that in the other two countries.

The relevant numbers are however higher. First, for any EM, higher AE output leads not only to a direct increase in exports to AEs, but to an indirect effect through higher induced output in other EM countries. Second, the elasticity of AE imports to GDP is higher than unity, reflecting the share of investment in imports, and the higher cyclicality of investment. Recent estimates suggest an elasticity between 1.5 and 2.0.[4]

Overall, this suggests that an increase in US output of 1% may lead, through higher imports (at a given exchange rate) to an increase in output in China around 0.2%, and to a smaller number for most other emerging markets. Putting things together, and with all the proper caveats, if we assume that a 1% sustained decrease in the AE real policy rate—or the equivalent of a 1% decrease in the policy rate in the case quantitative easing (QE) is used to decrease long rates instead—leads to a 1% increase in AE output, this suggests effects ranging from 0.1% to 0.2% of GDP in EMs, with the size of the effect depending on the ratio of exports to AEs to GDP.

[1] For a set of studies of the various cross-border effects, see the "Selected Issues" part of the 2011 IMF United States Spillover Report.

[2] Data from http://wits.worldbank.org/.

[3] Given the relevance of supply chains, and the fact that higher exports mechanically imply higher imports, the numbers somewhat overstate the relevant numbers.

[4] For example, Boz et al 2015.

This heterogeneity in the size of the effects of AE output on EMs is amplified through another related channel, namely the effect of AE output on commodity prices. An increase in AE output increases the demand for commodities and therefore increases their price. This implies further heterogeneity in the effects of AE output on EMs. Net commodity exporters benefit more from an increase in US output, commodity importers benefit less and possibly not at all.

Expansionary AE monetary policy leads to EM exchange rate appreciation

This effect has been in evidence since the beginning of the crisis, although monetary policy has been only one of the factors moving exchange rates. The acute phase of the crisis was dominated by an increase in market risk aversion and by repatriations of funds by AE banks, leading to large capital outflows and depreciations of EM currencies despite a sharp decrease in AE policy rates. Thereafter, low interest rates in advanced economies led to a return of capital flows to EMs. Adjustments in policies, current or anticipated, have led to large exchange rate movements, among them the "taper tantrum" of 2013 when the Fed indicated that it would slow down its purchases of bonds, leading to large depreciations in a number of EMs.

EM policy makers have complained about the "unconventional" character of monetary policy in this context, but there is no reason to think that, with respect to exchange rate movements, unconventional monetary expansion works very differently from conventional monetary policy: To the extent that unconventional policy decreases spreads on domestic bonds, whatever their type or maturity, it makes them less attractive, and leads to depreciation.

Depreciation in turn leads to an increase in net exports. The argument has been made that exchange rate changes no longer improve the trade balance. The evidence suggests however that they still do. A recent IMF study concludes that the (appropriately modified to account for incomplete passthrough) Marshall-Lerner condition still holds: A real depreciation of 10% leads, on average, to an increase in real net exports over time of 1.5% of GDP, with a fairly wide range from 0.5% to 3.0% of GDP, reflecting in part the variation in export shares across AEs and EMs.[5]

[5]IMF World Economic Outlook, 2015, Chapter 3.

Again, it is useful for later to do a back of the envelope computation. Assuming that uncovered interest parity (UIP) holds at least as an approximation, assuming that AE real interest rates are expected to be lower than EM interest rates by 1% for, say, 3 years, this implies an initial EM real appreciation of 3%. Putting this together with the previous numbers, and with all the proper caveats, the exchange rate channel suggests an average decrease in EM real net exports of 0.45% of GDP, with a range going from 0.15% to 0.9% of GDP, taking place over a number of years. For later reference, note that there is clearly more uncertainty about the strength of this second channel than about the first.

Expansionary AE monetary policy affects EMs' financial systems

Perhaps the loudest complaints about AE monetary policies have been those aimed at gross inflows, at the so-called "tsunamis of liquidity" [6] triggered by AE monetary policies, and their perceived adverse effects on EMs' financial stability.

The image of tsunamis of liquidity rushing into EM financial systems, is a very powerful one. It is however also a very misleading one. A decrease in the AE policy rate indeed leads AE investors to increase their demand for EM assets. Thus, at a given exchange rate, it indeed leads to an increase in gross inflows to EMs. In the absence of FX intervention, and on the assumption that net exports only adjust over time, these gross inflows must however be matched by equal gross outflows in order for the foreign exchange market to clear. Put another way, whatever "tsunami" of inflows is triggered by AE monetary policy must be matched by an equal tsunami of outflows: "Net tsunamis" must be equal to zero. This is achieved through the decrease in the AE exchange rate—equivalently the appreciation of the EM currency.

This does not mean however that EM policy makers are wrong when they think that AE monetary policy affects their financial system. Empirical work, in particular by Hèlène Rey, suggests that US monetary policy indeed has important and complex effects on other countries' financial systems.[7] Why might this be? It is fair to say that, despite a great deal of recent and on-going research, we do not yet have a good sense of the specific channels and of their relative importance. For this reason, I shall leave the effect of AE monetary

[6] I believe the expression was first used by Dilma Rousseff in 2012

[7] For example, see Miranda-Agrippino and Rey 2015.

policy on EM financial stability out of the model in the next section. I shall however return to the issue in Section 3, review what we know and do not know, and discuss potential implications.

2 The scope for coordination

Do these cross-border effects, these spillovers, imply a scope for coordination, as the Rajan quote in the introduction suggests? The first step in exploring the answer is to define coordination more precisely, and here I want to take exception with some of the existing rhetoric:

Coordination is not about more communication. Surely, in the current environment, a better understanding of each other's macroeconomic policies can only help. Thus, G7 or G20 meetings and discussions are clearly desirable. This is however too unambitious a definition of coordination.

Coordination is not about asking some countries to modify their policies to help others, even if it is at their own expense. This is too ambitious a definition of coordination, and unlikely to ever happen. The argument that countries play repeated games, and thus may be willing to sacrifice in the short run in order to have others do the same in the future if and when needed, is unlikely to convince policy makers.

Coordination is not about asking policy makers to take into account "spillbacks", i.e. the effects of their policies on their country through their effects on other countries.[8] This may be the case if, for example, AE policies lead to major difficulties in EMs, which lead in turn to doubts about financial claims on EMs, which, finally, lead to financial problems for AE banks. Typically, these spillbacks are small, and, in any case, policy makers should take them into account. This does not qualify as coordination.

Coordination is not about asking policy makers to follow policies that they feel they cannot or simply do not want to adopt. I feel that this is part of what the "G20 map" process, which is the G20 version of coordination, does.[9] It suggests to countries that they should do more structural reforms, and appropriately modify monetary and fiscal policies. This may be the right

[8] See for example Caruana 2015.

[9] See https://www.imf.org/external/np/exr/facts/g20map.htm for a description of the process, and the 2012 Umbrella Report for G-20 Mutual Assessment Process (http://www.imf.org/external/np/g20/pdf/062012.pdf) for more details.

advice, but if it is correct, countries should do much of it on their own, whether or not other countries do what is asked of them.

I shall instead take coordination to mean a set of changes in policies that makes all countries better off. More formally, I shall ask whether the decentralized equilibrium, which I shall take to be the Nash equilibrium, is efficient, or whether it can be improved upon.[10], [11]

With this definition, the general answer is simple and well known: If countries have as many non-distorting instruments as they have targets, then the Nash equilibrium is efficient. Coordination cannot deliver a better outcome for all countries. A general discussion of whether countries have as many instruments as targets can get very abstract and sterile. One can think of targets as being the output gap, inflation, the exchange rate, financial stability, and instruments as being monetary policy, fiscal policy, macro prudential policy, FX intervention, capital controls. Simple counting of instruments and targets is unlikely to resolve the issue: Some of the policy instruments are likely to create distortions, so that they enter both as targets (minimizing the distortion) and as instruments. If all instruments are distortionary for example, then it follows that there will always be more targets than instruments and there will always be room for coordination to improve the outcome. But if the distortions are small, the gains from coordination may be limited. It is more useful to work through a simple formal model and show what this implies.

A two-country Mundell-Fleming model

For my purposes, let me start with a simple and old fashioned two-country Mundell-Fleming model. The model is old fashioned in two ways: First, it is static and not derived from micro foundations.[12] Given the logic behind the conclusions, I am confident that they would hold in a more micro-founded and more general model. Second, it leaves out the third channel discussed earlier,

[10]This is the standard academic definition, and the one used for example by Jeff Frankel in the paper he presented last year at this Forum, called "International coordination". His paper touches on many of the same points I do.

[11]I leave aside the international provision of public goods, such as the provision of liquidity by the IMF or by central banks, the harmonisation of financial regulations, etc. These are obviously important, but are a very different form of coordination.

[12]For a treatment of the scope for coordination in a micro-founded model, see Obstfeld and Rogoff 2002.

the effects of AE monetary policy on EM financial stability. The reason is that I feel we/I do not know how to best extend the model to capture these effects. Thus, I leave this extension to an informal discussion in the next section.

The model has two (blocks of) countries, a domestic economy (as a stand in for advanced economies) and a foreign economy (as a stand in for emerging market economies). Foreign variables are denoted by a star.

Domestic output is given by:

$$Y = A + NX$$

$$A = G - cR + X$$

$$NX = a(Y^* - Y) - bE$$

Domestic output, Y, is equal to the sum of absorption, A, and net exports, NX. Absorption depends on fiscal policy, summarized by G, on the monetary policy rate, R, and on a shock to domestic demand, X. Net exports depend positively on foreign output, Y^*, negatively on domestic output, Y, and negatively on the real exchange rate, E.

Symmetrically, foreign output is given by:

$$Y^* = A^* - NX$$

$$A^* = G^* - cR^* + X^*$$

$$NX = a(Y^* - Y) - bE$$

Finally, following UIP, the exchange rate depends on the difference between the domestic and the foreign policy rates. Under the UIP interpretation, the coefficient d measures the expected persistence of the interest differential:

$$E = d(R - R^*)$$

A decrease in the domestic policy rate over the foreign policy rate leads to a depreciation of the domestic currency—equivalently to an appreciation of the foreign currency.

Absent shocks, G, G^*, X, X^* are normalized to zero. Equilibrium output in the absence of shocks, which I take to be potential output, is equal to zero. So are net exports, interest rates and the exchange rate.

Each country cares about the deviation of output from potential and about

the deviation of net exports from zero.

$$\Omega = \min Y^2 + \alpha\ NX^2$$

$$\Omega^* = \min Y^{*2} + \beta\ NX^2$$

Note, in relation to the previous discussion, that neither monetary nor fiscal policy is assumed to affect output in the way characterized above, and not to create additional distortions.

To start with, assume that each country can use both fiscal and monetary policies. As they are two targets and two non-distorting instruments in each country, the theorem applies: The Nash equilibrium is efficient, and there is no room for coordination. Suppose we capture what has happened during the crisis by assuming that, starting from steady state in both countries—so all variables are equal to zero—the domestic economy is hit by an adverse demand shock, so $X < 0$. Then, the Nash equilibrium is trivially characterized: The domestic economy uses fiscal policy, $G = -X$ to offset the shock, and the foreign economy does not need to change either G^* or R^*.[13]

One may worry about the fact that, in the model and clearly counterfactually, the two countries have the tools to completely offset the shock, and can return to the pre-shock equilibrium. This is not essential. The shock may be (and indeed was) a more complex one, affecting for example the supply side, so that the countries want to return to a different equilibrium after the shock. And the model is easily extended to limit the ability of policy to offset the shocks. If for example, decisions about fiscal and monetary policies are taken before X is fully revealed, the economies will be affected by the shock, but the efficiency of the Nash equilibrium will remain. Coordination cannot improve the outcome.

Coordination when fiscal policy cannot be used

Why does the above result feel too strong? Probably because the potential role attributed to fiscal policy is too optimistic. Policy makers may/do care

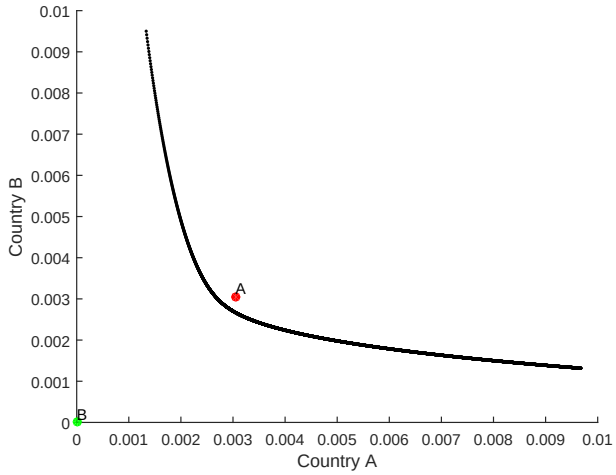
[13]Actually, the equilibrium set of policies is not unique. One can verify that any equilibrium where R and R^* move together, implying no change in the exchange rate, and G and G^* adjust so as to maintain demand constant in each country is efficient. But this is a curiosity.

about the fiscal balance, in which case, formally, there are now three targets and only two instruments. Related, and more relevant at this point, given the large increase in debt associated with the crisis, are the perceived limits on the current use of fiscal policy. Indeed, a recurring theme of policy discussions has been the extreme reliance on monetary policy due to the sharp limits on the use of fiscal policy.

What happens if we assume that fiscal policy cannot be used, so that $G = G^* = 0$?[14] In this case, each country has two targets and only one instrument. The Nash equilibrium is inefficient, and there is a set of policies that improve welfare in both countries.

The set of utilities that can be achieved through coordination is obtained by maximizing a weighted average of the two countries' welfare functions, $\Omega + \lambda\Omega^*$ for different values of λ. Figure 1 plots the Nash equilibrium, A, and the utility frontier for a given set of parameters (the qualitative feature of the Figure does not depend on the specific set of parameters.) All the points to the southwest of A yield higher welfare for both countries.[15]

Figure 1. AE and EM welfare under Nash and coordination



The improvement in welfare is small, and this conclusion is consistent with the literature, starting with Oudiz and Sachs (1984). Given however the simplicity of the model and the lack of a serious calibration, this conclusion should

[14]Equivalently, we could assume that fiscal policy can be used, but that it creates distortions, with these distortions entering the objective function. This would lead to a more limited role for fiscal policy, and the essence of the results below would go through.

[15]Given that we are minimizing a loss function, the closer to the origin, the better.

not be given too much weight. More important is the question of what form coordination should take. Should coordination lead AEs to adopt a more or a less aggressive monetary policy?

The answer turns out to depend on the sign of $(ac - bd)$. This expression has a simple interpretation. The first term, ac, reflects the strength of the first channel (higher AE output, leading to a stronger demand for EM exports) above, with c measuring the effect of the policy rate on domestic demand, and a measuring the share of imports. The second term, bd reflects the strength of the second channel (EM appreciation, leading to a decrease in demand for EM exports), with d measuring the effect of the policy rate on the exchange rate, and b measuring the effect of the exchange rate on net exports.

When the first channel dominates the second, the net effect of a decrease in the domestic policy rate is to increase foreign net exports and foreign output. The coordination equilibria (I use "equilibria" as there is a (small) range of equilibria that dominate the Nash equilibrium, namely all the points to the southwest of A) are associated with a stronger response of the domestic policy rate, a weaker response of the foreign policy rate than under Nash. When the second channel dominates the first however, the coordination equilibria are associated with a weaker response of the domestic policy rate, a stronger response of the foreign rate.

Table 1 shows the outcomes for two sets of parameters. The shock is taken to be a decrease in domestic demand, X, by 1, while X^* is unchanged. The parameters α, β, c and d are the same in both cases, and equal respectively to $0.5, 0.5, 1.0$ and 1.0. The two lines differ in the values of a and b (and thus the implied value of $ac - bd$, which is positive in the first case, negative in the second).

The coordinated equilibria that dominate the Nash equilibrium all have very similar interest rates, so we can just look at one of them. The table reports the Nash equilibrium domestic and foreign interest rates, and those associated with one of the dominating coordinated equilibria, the equilibrium associated with $\lambda = 1$. In the first case, the first channel dominates, and coordination yields a stronger response of the domestic rate, -88.2 bps compared to -86.8 bps. In the second case, the second channel dominates, and coordination yields a weaker response, -75.9 bps compared to -76.7 bps.[16]

[16]The differences between the rates under Nash and coordination are small, but again, the calibration is too crude for this aspect to be given too much weight.

Table 1. Policy Rates under Nash and Coordination

a	b	R (Nash)	R^* (Nash)	λ	R (Coord)	R^* (coord)
0.4	0.2	-.868	-.131	1	-.882	-.117
0.2	0.4	-.767	-.230	1	-.759	-.241

These results point to the practical problem in achieving coordination in this context, namely whether we know which way the inequality goes. The history of the last seven years is one of major disagreements about the strength of the two effects, and by implication, disagreements about what coordination should achieve.

To go back to the quotes at the beginning, both Guido Mantega and Raghu Rajan emphasized the second channel, the effect of AE monetary policy on the exchange rate. To again quote Rajan: "Rather the mandates of systemically influential central banks should be expanded to account for spillovers, forcing policymakers to avoid unconventional measures with substantial adverse effects on other economies, particularly if the domestic benefits are questionable". In terms of our model, Rajan had in mind a small effect of the policy rate on domestic demand, a small value for c. In the limit where c tends to zero, this is indeed a zero sum game between the two countries, and coordination should lead to smaller policy rate cuts. Thus, the use of the term "currency wars".

Advanced economy policy makers, on the other hand, have emphasized the first channel. Strong AE growth, they have argued, is essential for the world in general, and for EMs in particular. In terms of the model, they have emphasized the importance of a, the effect of AE output on AE imports. In his 2015 Mundell-Fleming lecture, which deals very much with the same topics as this paper, Ben Bernanke argued: "US growth during the recent recovery has certainly not been driven by exports, and, as I will explain, the expenditure-augmenting effects of US monetary policies (adding to global aggregate demand) tend to offset the expenditure-switching effects (adding to demand in one country at the expense of others)."

Who is right? The back of the envelope computations given in Section 1 suggest that it is hard to assess which way the inequality works. Simulations using IMF models and reported in IMF spillover reports suggest that monetary expansion in AEs was on net good for emerging economies. Such a simulation is reported in Table 2. It shows the dynamic effects of an AE monetary

expansion in response to a decrease in domestic demand in AEs, on both AE and EM output, from year 1 to 6.[17] In that simulation, the net effects on EMs are small, but positive.

Table 2. Effects of an AE monetary expansion on AEs and EMs

Year	1	2	3	4	5	6
Advanced Economies	1.00	1.60	1.38	0.94	0.61	0.39
Emerging Economies	0.17	0.39	0.39	0.33	0.28	0.22

While such a simulation is much more sophisticated than the simple computations in Section 1, it still comes with many caveats. In particular, it comes with large differences across EMs. EM countries with strong trade links to AEs, such as China, may indeed be better off, and be in favor of more AE expansion. EM countries with weaker links to AEs, such as Brazil or India, may be worse off, and want less AE expansion; this may explain why Brazil and India may have been among the most vocal critics of AE policy.

In short, given the diverging views, coordination means something different for AE and EM policy makers, so it is unlikely to happen.

A Deus ex machina? Capital controls

If, because of limits on fiscal policy, the Nash equilibrium is inefficient and the room for coordination is limited, can policy makers improve on the Nash outcome? The short answer is yes, if they are willing to use an additional instrument: restrictions on capital flows, i.e. capital controls.[18]

The logic for why capital controls are useful in this context is straightforward. Advanced economies suffer from a lack of domestic demand. As we saw earlier, if they could freely use fiscal policy, they could just offset the decrease in domestic demand through a fiscal expansion. This would return both countries to the pre-shock equilibrium levels of output and exchange rate. If fiscal policy is not available, they must use monetary policy. Monetary policy

[17]The table shows the difference between output with monetary expansion and output without monetary expansion. Courtesy of the IMF modelling team.

[18]Many economists have questioned whether fiscal policy is really not available. They have argued that, even at the currently high debt levels, there may be room for fiscal expansion. I leave this debate aside. All I need for the argument made here is that there are some limits on the use of fiscal expansion.

however not only increases domestic demand but also affects the exchange rate through interest differentials. Capital controls can, at least within the logic of the model, eliminate the effect of the interest differential on the exchange rate.

This argument can be formalized as follows. Extend the equation for the exchange rate to:

$$E = d(R - (R^* - x))$$

where x may be interpreted as a tax per unit on foreign inflows (such as has been used in Chile, or more recently in Brazil). Assume, as above, that fiscal policy cannot be used, that AEs can use monetary policy, R, and EMs can use monetary policy R^* and the tax x. Assume again that the shock is a decrease in X by 1.

Then the Nash equilibrium takes a simple form. AEs decrease the policy rate R by $1/c$. EMs increase x by $1/c$, leaving the exchange rate unchanged. AE output and net exports return to their pre-shock level (zero, by normalization). In terms of Figure 1, the two countries achieve the point at the origin, a large improvement relative to the Nash or the coordinated equilibrium absent controls. Not only do EMs protect themselves, but AEs also benefit from being able to use monetary policy without having to worry about the exchange rate.

In short, (varying) capital controls are the logical macroeconomic instrument to use when fiscal policy is not available. It reduces the problems associated with an increased reliance on monetary accommodation. Such an endorsement of capital controls comes with many caveats. Before returning to them, I turn to the case for capital controls as a financial instrument.

3 Monetary policy, capital controls and FX intervention

In the previous section, I left aside the third channel, i.e. the potential effects of AE monetary policy on gross inflows into EMs and on the EM financial system. But, as I discussed earlier, many of the EM complaints have been aimed precisely at those gross inflows and their perceived adverse effects on financial stability.

How does AE monetary policy affect gross flows to EMs and the EM financial system? Despite a lot of recent work, the answers are less clear than one would like, on both theoretical and empirical grounds.

Gross flows and AE monetary policy: Theoretical considerations

Return to the "tsunami" argument briefly discussed in Section 1. Does expansionary AE monetary policy trigger larger gross flows to EMs? Simple arithmetic will again help here. Assume that gross inflows into EMs and gross outflows from EMs are given by:

$$FI = \alpha + \beta(d(R^* - R - z) + E)$$

$$FO = \alpha^* - \beta^*(d(R^* - R - \gamma z) + E)$$

Equilibrium in the foreign exchange market is given by:

$$FI = FO + FX$$

where FX is foreign exchange intervention, and the current account is assumed not to change in the short run so I ignore it here.[19]

Both inflows and outflows are now assumed to be less than fully elastic with respect to expected returns. Both α and α^*, and β and β^* are allowed to differ, reflecting potentially different preferences and types of AE and EM investors.

The variable z shifts inflows and outflows; it can be thought of as reflecting a risk premium, reflecting the convolution of perceptions of risk and risk aversion; its effect may be different for AE and EM investors, and this is captured by the presence of coefficient γ. For example, "risk off" may lead AE investors to become more risk averse, while having less of an effect on EM investors, in which case $\gamma < 1$.

Note that as β and β^* go to infinity, and z is equal to zero, the equilibrium tends to the uncovered interest parity condition $E = d(R - R^*)$.

[19]This assumption is surely correct over short periods of time, such as the minute or the day. Over time, net exports will adjust in response to the movement in the exchange rate, and the equation should be modified to include NX. The conclusions below—namely that, in the short run, changes in gross inflows have to be matched by changes in gross outflows—would still apply.

Suppose now that the AE central bank decreases its policy rate R by $\Delta R < 0$, that the EM central bank does not adjust its policy rate, so $\Delta R^* = 0$, and does not intervene, so $FX = 0$. Solving for the equilibrium gives:

$$\Delta E = d\Delta R \quad \text{and} \quad \Delta FI = \Delta FO = 0$$

In words, the exchange rate adjusts so as to keep expected relative returns the same, just as under the UIP condition, and the decrease in the exchange rate leads to unchanged gross inflows (and outflows). This is true despite less than fully elastic flows, different preferences of AE and EM investors, and possibly different risk premia.[20]

How can the result of unchanged gross flows be overturned? In one of two ways:

Demands for domestic and foreign investors differ in more fundamental ways than introduced here. I do not however have a sense of what plausible deviations to introduce.

Or monetary policy works partly through its effects on the risk premium. Suppose for example that lower AE rates decrease the risk premium z by Δz. Then:

$$\Delta E = d\,\frac{\beta + \beta^*\gamma}{\beta + \beta^*}\,\Delta z$$

$$\Delta FI = \Delta FO = d\,\frac{\beta^*(\gamma - 1)}{\beta + \beta^*}\,\Delta z$$

If γ is less than one, that is if EM investors are less sensitive to z than AE investors, then the exchange rate appreciation is more limited, and gross inflows and outflows increase. Thus, if a decrease in the policy rate is associated with a decrease in the risk premium, and if $\gamma < 1$, then a monetary expansion is associated with higher gross flows.

This line of explanation suggests a complex relation between monetary policy—conventional or unconventional—and gross flows. For example, QE1 may have reassured AE investors that US markets would be less dysfunctional, leading to a return of AE investors to the US, and a decrease in gross flows to EMs. In contrast, QE2 may have had little effect on perceived risk, and led AE investors to increase gross flows to EMs. The taper tantrum may have

[20]This remains true even if R^* adjusts. The adjustment has an effect on the exchange rate, not on the gross flows.

led to a decrease in gross flows to EMs not so much by tightening future US monetary conditions but rather by increasing uncertainty about the course of future US monetary policy.

Gross flows and AE monetary policy: Empirical evidence

Despite a large number of empirical studies, the evidence on the effects of AE monetary policy on gross flows is also unclear. The empirical difficulties are many, from the usual difficulty of identifying monetary policy shocks, compounded since the crisis by the zero bound and the lack of movement in the policy rate, to the use of unconventional instruments, to the issue of separating out expected and unexpected monetary policy actions, to quality or coverage issues with the flow data.

A number of studies have found an effect of monetary policy on specific gross flows.[21] Bruno and Shin (2015) for example, using a VAR methodology over the pre-crisis period (1995:4 to 2007:4) find an effect of the federal funds rate on cross-border bank to bank flows; the effect is however barely significant. Fratzscher et al (2013), using daily data on portfolio equity and bond flows, find significant effects of different monetary policy announcements and actions since the beginning of the crisis.[22] Their results however point to the complexity of the effects of apparently largely similar monetary measures. For example, they find QE1 announcements decreased bond flows to EMs, while QE2 announcements increased them. In terms of the equations above, this indeed suggests that, in each case, monetary policy worked partly through its effects on the risk premium.

These studies cannot settle however the issue of whether total gross inflows increase with AE monetary expansions: The increase in the inflows the researchers have identified may be offset by a decrease in other inflows. Studies of total inflows, or of the set of inflows adding up to total inflows, yield mixed conclusions. A representative and careful paper, by Cerutti et al (2015), using quarterly flows over 2001:2 to 2013:2, suggests two main conclusions. The most significant observable variable in explaining flows into EMs is the VIX index: An increase in the VIX leads to a decrease in inflows to EMs. The coefficients on the monetary policy variables, namely the expected change in the policy rate and the slope of the yield curve, typically have the expected

[21] For obvious reasons, I ignore the studies that look at the effects of policy on net flows.
[22] See also Koepke 2015.

sign, but are rarely significant. Together, these two variables explain only a small part of overall variations in capital flows.

Thus, on both theoretical and empirical grounds, the relation of monetary policy to gross inflows into EMs is less clear than is often believed by policy makers and even by researchers.[23]

Gross inflows and EM financial systems: Other channels?

Leaving aside the effects if any on the volume of gross flows, how may AE monetary policy affect the EM financial systems? One can think of two channels:

The first channel, which the Asian crisis put in evidence, is through the effect of the exchange rate itself on the financial system. To the extent that financial institutions, the government, firms, or households, have foreign currency (FX)-denominated claims and liabilities, the appreciation triggered by AE monetary policy will affect their balance sheets. Even if financial institutions are largely hedged, unhedged positions by the others will affect the value of their claims, and affect financial stability. The effects on financial stability are likely to vary in magnitude, and even in sign, across countries, depending on the structure of FX claims. In general, given that most EM countries still borrow largely in foreign currency, the effect of an appreciation triggered by AE monetary policy should be favorable. The exact structure of claims and liabilities will however matter.

The second channel is through changes in the composition of gross inflows and outflows triggered by AE monetary policy. If for example foreign investors increase their holdings of sovereign bonds and domestic investors decrease theirs, then the effects on the financial system are likely to be limited. If instead, inflows take the form of additional funds to domestic banks, and outflows come from a decrease in holdings of sovereign bonds, then this is likely to lead to an increase in domestic credit supply. Depending on its nature and intensity, this increase may be desirable, or instead lead to an unhealthy credit boom.

It is clear for example that, at the beginning of the crisis, the repatriation

[23]This suggests that statements like "The empirical literature has long established that US interest rates are an important driver of international portfolio flows, with lower rates "pushing" capital to emerging markets" (Koepke 2015) are too strong. To be clear, the issue is not whether they affect exchange rates—they do— but whether they lead to large increases in gross flows—which is less settled.

of funds by AE banks had such a composition effect. The decrease in funding in EM banks by AE banks was not compensated by an increase in funding of EM banks by EM investors, leading to a tightening of credit. The issue at hand is however about the effects of monetary policy per se. Just as for the effect of AE monetary policy on overall gross flows, the evidence on the composition of the flows triggered by AE monetary policy is not clear. In Cerutti et al (2015), for example, there is no clear difference between the estimated effects of monetary policy variables on bank, portfolio debt and portfolio equity flows.

Thus, overall, it is difficult to conclude that AE monetary policy has had major, predictable effects on EM financial systems. Nevertheless, it is clearly a potentially important dimension that EM policy makers must monitor. This takes us back to the issue of capital controls, now in the context of financial stability.

Capital controls versus FX intervention

While the use of capital controls has been limited, many countries have relied on FX intervention to limit the movements in exchange rate caused by AE monetary policy. From the point of view of the previous section, i.e. leaving implications for gross inflows aside, controls and FX intervention are largely substitutes. Under the assumption that the elasticity of flows to return differentials is finite—a necessary condition for FX intervention to have an effect—both can limit the effects of lower AE interest rates on the exchange rate, and achieve the same macroeconomic outcome. If however, we take into account the third channel discussed in this section, the two have very different implications. Capital controls, by assumption, can limit gross inflows. FX intervention, by limiting the exchange rate adjustment, increases gross inflows. This can be seen straightforwardly from above. If, in response to a decrease in the AE policy rate, FX intervention keeps the exchange rate unchanged, gross flows increase by

$$\Delta FI = -bd\Delta R > 0$$

Thus, if the purpose is to limit the effects of AE monetary policy on the EM financial system, capital controls dominate FX intervention.

4 Conclusions

I have looked at the interactions between AE and EM macro policies since the beginning of the crisis, interactions characterized by complaints of "currency wars" and demands for more coordination. I have offered three main sets of conclusions.

In AEs, limits on fiscal policy have led since the beginning of the crisis to an over reliance on monetary policy. This potentially opens the scope for coordination. Whether coordination would entail an increase or a decrease in interest rates in AEs is however difficult to assess, with AEs and EMs disagreeing about the sign. This has made and still makes coordination de facto impossible to achieve.

If there are limits on the use of fiscal policy, leading to the overreliance on monetary policy and undesirable effects on the exchange rate, the natural instrument in this context is the use of capital controls by EMs. It allows AEs to use monetary policy to increase domestic demand, while shielding EMs from the undesirable exchange rate effects. In the context of limits on fiscal policy, controls are a natural macroeconomic instrument. Given the high levels of debt in many countries, this is likely to remain the case for some time to come.

Despite some progress, how AE monetary policy affects EM financial systems remains largely to be understood, both theoretically and empirically. To the extent that AE monetary policy leads to gross inflows into EMs, to the extent that these gross flows affect the EM financial systems, and to the extent that EMs want to avoid these effects, capital controls rather than FX intervention are the right instrument.

These conclusions come with the usual and strong caveats. Technical and political issues associated with the use of capital controls as contingent instruments are still relevant. This is not an unconditional endorsement of controls, but an exploration and a starting point to a discussion.

References

[1] Ben Bernanke. Federal reserve policy in an international context. *IMF Review, forthcoming*, 2016. Mundell-Fleming lecture.

[2] Emine Boz, Matthieu Bussiere, and Clement Marsilli. Recent slowdown in global trade: Cyclical or structural? *E-book, VoxEU*, pages 55–70, June 2015. Bernard Hoekman, editor.

[3] Valentina Bruno and Hyun Song Shin. Capital flows and the risk-taking channel of monetary policy. *Journal of Monetary Economics*, 71:119–132, 2015.

[4] Jaime Caruana. The international monetary and financial system: Eliminating the blind spot. April 2015. BIS.

[5] Eugenio Cerutti and Stijn Claessens and Damien Puy. Push factors and capital flows to emerging markets: Why knowing your lender matters more than fundamentals. 2015. IMF WP 15/127.

[6] Jeffrey Frankel. International coordination. 2015. NBER working paper 21878.

[7] Marcel Fratzscher, Marco Lo Duca, and Roland Straub. On the international spillovers of us quantitative easing. June 2013. ECB working paper 1557.

[8] IMF. United States spillover report. July 2011.

[9] IMF. *World Economic Outlook, Exchange Rates and Trade Flows: Disonnected?* October 2015. Chapter 3.

[10] Robin Koepke. Fed policy expectations and portfolio flows to emerging markets. June 2015. IIF working paper.

[11] Guido Mantega. Brazil in 'currency war" alert. *Financial Times*, 2010. Interview.

[12] Silvia Miranda-Agrippino and Hèlène Rey. World asset markets and the global financial cycle. October 2015. NBER working paper 21722.

[13] Maurice Obstfeld and Kenneth Rogoff. Global implications of self oriented national monetary rules. *Quarterly Journal of Economics*, 117(2):503–535, 2002.

[14] Gilles Oudiz and Jeffrey Sachs. Macroeconomic policy coordination among the industrial economies. *Brookings Papers on Economic Activity*, (1):1–75, 1984.

[15] Raghu Rajan. Containing competitive monetary easing. April 2014. Project Syndicate.