Currency Wars, Coordination, and Capital Controls*

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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.

JEL Codes: F3, F36, F42.

1. 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" (Wheatley and Garnham 2010). 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

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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 main conclusions: (i) The scope for coordination was and is limited. (ii) Restrictions on capital flows were and are the more natural instrument to achieve a better outcome.

The paper is organized as follows. Section 2 briefly reviews the cross-border effects of advanced economies' monetary policies on emerging economies, through goods markets, foreign exchange markets, and financial markets. Section 3 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 4 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.

2. 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 their financial system. The first two are fairly well understood, the third much less.[1]

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

2.1 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 percent and 10 percent of their GDP.[2] For example, Chinese exports to the AEs are equal to 10 percent of Chinese GDP; Brazilian and Indian exports are equal to 5 percent of their respective GDP.[3] Using these numbers suggests small effects of higher output in AEs: A 1 percent increase in AE output leads to an increase of 0.1 percent 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 also 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] Third, multipliers are likely to increase the effect of exports on output. Overall, this suggests that an increase in U.S. output of 1 percent may lead, through higher imports (at a given exchange rate), to an increase in output in China around 0.2 percent and to a smaller number for most other emerging markets.

The other number we need is the semi-elasticity of AE demand to the real interest rate. Here again, uncertainty is substantial, but a typical number is that a sustained 100 bp decrease in the real policy rate leads, over time, to an increase in aggregate demand of 1 percent of GDP (this is roughly the semi-elasticity implicit in the FRB/US model used by the Federal Reserve).

Putting things together, and with the usual caveats, this suggests that a 1 percent sustained decrease in the AE real policy rate—or

[2]Data are 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]See, for example, Boz, Bussiere, and Marsilli (2015).

the equivalent of a 1 percent decrease in the policy rate in the case quantitative easing (QE) is used to decrease long rates instead—leads to an increase in EM GDP ranging from 0.1 percent to 0.2 percent, with the size of the effect depending on the ratio of exports to AEs to GDP.

This heterogeneity in the size of the effects of AE output on EMs is actually 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, and commodity importers benefit less and possibly not at all from an increase in U.S. output.

2.2 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 Federal Reserve indicated that it would slow down its purchases of bonds, leading to increases in long rates and large depreciations in a number of EMs.

EM policymakers 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 International Monetary Fund (IMF) study concludes that the Marshall-Lerner condition (appropriately modified to account for incomplete pass-through) still holds: A real depreciation of 10 percent leads, on average, to an increase in real net exports over time of 1.5 percent of GDP, with a fairly wide range from 0.5 percent to 3.0 percent of GDP, reflecting in part the variation in export shares across AEs and EMs.[5]

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 percent for, say, three years, this implies an initial EM real appreciation of 3 percent. 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 percent of GDP, with a range going from 0.15 percent to 0.9 percent of GDP, taking place over a number of years.

2.3 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 foreign exchange (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

[5] See IMF (2015, ch. 3). See also the study by Bussiere, Gaulier, and Steingrass (2016), which reaches similar conclusions.

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

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 policymakers are wrong when they think that AE monetary policy affects their financial system. Empirical work, in particular by Hèlène Rey (for example, Miranda-Agrippino and Rey 2015) suggests that U.S. monetary policy indeed has important and complex effects on other countries' financial systems. Why might this be? It is fair to say that, despite a great deal of recent and ongoing 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 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.[7]

3. The Scope for Coordination

Do these cross-border effects, these spillovers, imply a role 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, G-7 or G-20 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 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

[7]As a result of the difference between what we know about the first two channels and the third, the paper is a bit schizophrenic. The first two sections build on an old literature, with a few new twists. The third section is highly speculative. A more ambitious paper would integrate the three channels in one model, but we are/I am not there yet.

to have others do the same in the future if and when needed, is unlikely to convince policymakers.

- Coordination is not about asking policymakers 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, policymakers should take them into account on their own. This does not qualify as coordination.
- Coordination is not about asking policymakers to follow policies that they feel they cannot or simply do not want to adopt. I feel that this is part of what the "G-20 map" process, which is the G-20 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 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]

[8] See, for example, Caruana (2015).

[9] See https://www.imf.org/external/np/exr/facts/g20map.htm for a description of the G-20 map 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.

[10] This is the standard academic definition and the one used, for example, by Jeff Frankel in the paper presented at the 2015 Asian Monetary Policy Forum (Frankel 2016). His paper, titled "International Coordination," 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 harmonization of financial regulations, etc. These are obviously important but are a very different form of coordination.

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, and there is no room for coordination to improve outcomes for all countries. The reason is obvious: Whatever other countries do, countries have sufficiently many instruments to achieve the targets they want.

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, and financial stability, and instruments as being monetary policy, fiscal policy, macroprudential policy, FX intervention, and 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.

3.1 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 microfoundations.[12] Given the logic behind the conclusions, I am confident that they would hold in a more microfounded and more general model. Second, it leaves out the third channel discussed earlier, 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

[12]For a treatment of the scope for coordination in a microfounded model, see Obstfeld and Rogoff (2002).

a stand-in for emerging market economies). Foreign variables are denoted by an asterisk.

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. This normalization implies that 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 internal balance, i.e., the deviation of output from potential, and external balance, the deviation of net exports from zero.

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

To start with, assume that each country can use both fiscal and monetary policies. As there 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, given the normalization, 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]

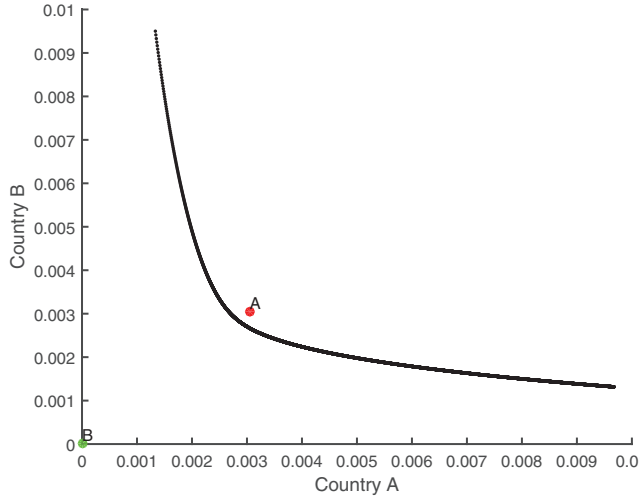
One may worry about the fact that, in the model and clearly counterfactually, the two countries completely offset the shock and return to the pre-shock equilibrium. This is not essential. The shock may be (and indeed was) a more complex one, affecting for example the supply side, so that the countries 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 made 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.

3.2 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. Policymakers may/do care 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

[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.

Figure 1. AE and EM Welfare under Nash and Coordination



been the extreme reliance on monetary policy due to the perceived limits on the use of fiscal policy.[14]

What happens if we assume that fiscal policy cannot be used, so that $G = G^* = 0$?[15] 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

[14]Many economists, including me, have questioned whether fiscal policy is really unavailable. They have argued that, even at the currently high debt levels, there may be room for fiscal expansion. I leave this debate aside here. All I need for the argument made here is that there are some perceived limits on the use of fiscal expansion.

[15]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.

the specific set of parameters.) All the points to the southwest of A yield higher welfare for both countries.[16]

The improvement in welfare is small, and this conclusion is consistent with the literature, from Oudiz and Sachs (1984) to a recent paper by Taylor (2013).[17] The next question is what form coordination should actually 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 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 and a weaker response of the foreign policy rate than under Nash. When the second channel dominates the first, however, the coordination equilibria

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

[17]Given the simplicity of the model and the lack of a serious calibration, this conclusion cannot be given too much weight. But the result is, in fact, quite robust, and is related to the discussion that comes below: A change in the AE interest rate has two opposite effects on EM countries, higher demand for exports and an exchange rate appreciation. These largely cancel out, with the implication that the net effect on EMs of the AE policy, and thus the scope for coordination, is limited. The same reasoning applies to the model presented by Taylor. His model is a two-country Mundell-Fleming model, with a specification of demand close to this paper and a supply side characterized by staggered nominal wage setting. Each country has two targets, the standard deviations of output and of inflation, and one instrument, the policy rate. Given that there are fewer instruments than targets, there is room for coordination to improve the outcome. The effects of coordination are small, however, because the two effects of AE monetary policy on EMs, namely higher exports and an exchange rate appreciation, largely cancel out, both for output and for inflation.

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

are associated with a weaker response of the domestic policy rate and a stronger response of the foreign rate. When the two channels cancel, the coordinated equilibrium is the same as the Nash equilibrium: In other words, coordination does not help.

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 are 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 and 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 with –86.8 bps. In the second case, the second channel dominates, and coordination yields a weaker response, –75.9 bps compared with –76.7 bps.[18]

These results point to the practical problem in achieving coordination in this context, namely whether we know which way the inequality goes. My reading of the history of the last seven years is that it 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

[18]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.

of AE monetary policy on the exchange rate. To quote Rajan again, "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."[19]

Advanced economy policymakers, on the other hand, have typically 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)" (Bernanke 2016).

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. Indeed, different econometric models give different results. Taylor (2013) gives the results of simulations from two large multicountry models, one based on the TMCM model built by Taylor himself (1993) and the other by Carabenciov et al. (2013). The first simulation focuses on the effects of U.S. monetary policy on Japan and finds a small positive impact of a U.S. monetary expansion on

[19] John Taylor (2013) has suggested an alternative interpretation of the source of EM complaints. He has argued that the problem came from suboptimal policies in AE countries, namely too-low interest rates, leading to larger adverse effects on EM economies. Within the logic of the model presented here, as well as in the logic of the model he uses, this is not convincing. Because the net effects of a change in the AE interest rate on EMs are small, the "wrong" interest rate in AEs is unlikely to have a major impact on EMs' output, trade balance, or inflation outcomes. Whether effects through other channels, such as effects on EM financial systems, can strengthen the argument is discussed in the next section.

Table 2. Effects of an AE Monetary Expansion on Output in 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

Japan's output. The second simulation also finds a small positive effect of a U.S. monetary expansion on Japan, but a negative effect on both Latin America's and emerging Asia's output. The IMF modeling team was kind enough to run another simulation of that model for this paper, and the results are given in table 2. The experiment is an AE monetary expansion in response to a decrease in domestic demand in AEs, and the table shows the effects of the monetary expansion on both AE and EM output, from year 1 to 6 (the numbers show the difference between output with and without the monetary expansion). The numbers show a net positive effect of the AE monetary response on EM output.

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 likely 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 and the lack of solid evidence, coordination means something different for AE and EM policymakers, so it is unlikely to happen.

3.3 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 policymakers improve on the Nash outcome? The short answer is yes, if they are willing and able to use an additional instrument: restrictions on capital flows, i.e., capital controls.

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, 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 that 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.

4. 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.

4.1 Gross Flows and AE Monetary Policy: Theoretical Considerations

Let me first dispose quickly of the simplest but fallacious version of the "tsunami" argument, namely that monetary policy "unleashes large flows into EMs." Write down the equilibrium condition in the foreign exchange market as

$$FI = FO + FX - NX,$$

where FI denotes gross inflows, FO denotes gross outflows, FX denotes foreign exchange intervention, and NX is the current account surplus. In the very short run (say from a few minutes to a few months), the current account balance does not move very much. So, in the absence of foreign exchange intervention, to a close approximation the following equality $FI = FO$ must hold. Gross inflows must be matched by gross outflows. Put another way, foreign exchange market equilibrium implies that "tsunami" inflows must be matched by equal outflows.[20]

Even if gross inflows are offset by gross outflows, this does not imply that their effects on EM financial systems cancel each other. If both go up, for example, it may be that the effects of larger inflows are quite different from the effects of the larger outflows. To explore this, one must first look into what happens to gross inflows (and by implication, gross outflows) in response to a monetary expansion in AEs. This requires one to specify the determinants of the gross inflows and outflows.

[20]This paragraph may be seen as fighting a straw man. In my time at the IMF, however, I found that this vision of gross flows as waves of cash finding their way into EM banks, the EM stock market, etc., without taking into account the necessary countervailing outflows, was quite widespread among policymakers.

Assume that gross inflows into EMs and gross outflows from EMs are given by

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

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.[21]

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 goes to zero, the equilibrium tends to the uncovered interest parity condition $E = d(R - R^*)$.[22]

Assume, as we did above, that we are looking at the short run so we can ignore movements in the current account, so equilibrium in the foreign exchange market is simply given by

$$FI = FO + FX.$$

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

[21]This assumes that it is the flows that respond to expected return differentials. A more appealing, but more complicated, assumption is that desired stocks respond to expected return differentials, with the stock adjustment taking place over time. Such a specification would, however, lead to similar conclusions as those reached in the text, with one caveat: To the extent that the wealth of domestic and foreign investors was affected differentially by the exchange rate, these wealth effects would affect inflows and outflows, and potentially lead to a change in gross flows in response to AE monetary policy. I ignore these effects here.

[22]Note also that just replacing the UIP condition in the previous section with these equations would not change the conclusions reached there about the role and the limits of coordination.

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.[23]

How can the result of unchanged gross flows be overturned?

Looking beyond the short run, the current account responds over time to the appreciation. Starting from the current account balance, the current account turns into deficit. Going back to the equilibrium condition, this implies a capital account surplus. Gross inflows increase, gross outflows decrease. Net inflows increase, corresponding to the deterioration of the current balance. This, however, takes time and the size of the net inflows may be small relative to the initial shift in gross flows (at a given exchange rate).

Keeping the focus on the short run, I can think of two ways to overturn the result:

(i) 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.[24]

(ii) 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

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

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

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

[24]Following on the caveat in a previous footnote, a stock-flow specification, allowing for wealth effects due to the change in the exchange rate, could lead to a change in equilibrium gross flows. While I have not explored its empirical relevance, I suspect the effect would be small.

> 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, depending on co-movements between the risk premium and monetary policy. For example, QE1 may have reassured AE investors that U.S. markets would be less dysfunctional, leading to a return of AE investors to the United States 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 led to a decrease in gross flows to EMs, not so much by tightening future U.S. monetary conditions but rather by increasing uncertainty about the course of future U.S. monetary policy.

4.2 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 lower 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. Bruno and Shin (2015), for example, using a VAR methodology over the pre-crisis period (1995:Q4 to 2007:Q4) find an effect of the federal funds rate on cross-border bank-to-bank flows; the effect is, however, barely significant. Fratzscher, Lo Duca, and Straub (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.[25] Their results, however, point to the different effects of apparently largely similar monetary measures. For example, they find that 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, and that different announcements had different effects on that 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, Claessens, and Puy (2015), using quarterly flows over 2001:Q2 to 2013:Q2, suggests two main conclusions. The most significant observable variable in explaining gross flows into EMs is the VIX index: An increase in the VIX leads to a decrease in gross 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 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 policymakers and even by researchers.[26]

4.3 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.

[25] See also Koepke (2015).

[26] 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.

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-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 foreign-currency-denominated 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 (so it does not explain the complaints of EM policymakers to AE monetary accommodation). 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.[27]

It is clear, for example, that, at the beginning of the crisis, the repatriation of funds by AE banks had such a composition effect. The decrease in funding to 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, Claessens, and Puy (2015), for example, there is no clear difference between the estimated effects of monetary policy variables on bank, portfolio debt, and portfolio equity flows.

[27]See Blanchard et al. (2016).

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 policymakers must monitor. This takes me back to the issue of capital controls, now in the context of financial stability.

4.4 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 macroeconomic 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 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 clearly dominate FX intervention.

5. 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 overreliance 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 over-reliance 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.

Despite some progress, how AE monetary policy affects EM financial systems remains largely unsettled, 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

Bernanke, B. S. 2016. "Federal Reserve Policy in an International Context." Forthcoming in *IMF Economic Review*. Mundell-Fleming lecture.

Blanchard, O., J. Ostry, A. Ghosh, and M. Chamon. 2016. "Capital Flows: Expansionary or Contractionary?" *American Economic Review: Papers and Proceedings* 106 (5): 565–69.

Boz, E., M. Bussiere, and C. Marsilli. 2015. "Recent Slowdown in Global Trade: Cyclical or Structural?" In *The Global Trade Slowdown: A New Normal?* ed. B. Hoekman, 55–70 (chapter 3). VoxEU.org E-book. CEPR Press.

Bruno, V., and H. S. Shin. 2015. "Capital Flows and the Risk-Taking Channel of Monetary Policy." *Journal of Monetary Economics* 71: 119–32.

Bussiere, M., G. Gaulier, and W. Steingress. 2016. "Global Trade Flows: Revisiting the Exchange Rate Elasticity." Manuscript, Banque de France (September).

Carabenciov, I., C. Freedman, R. Garcia-Saltos, D. Laxton, O. Kamenik, and P. Manchev. 2013. "GPM6: The Global Projection Model with Six Regions." IMF Working Paper No. 13/87.

Caruana, J. 2015. "The International Monetary and Financial System: Eliminating the Blind Spot." Panel remarks at the IMF conference "Rethinking Macro Policy III: Progress or Confusion?" Washington, DC, April 16.

Cerutti, E., S. Claessens, and D. Puy. 2015. "Push Factors and Capital Flows to Emerging Markets: Why Knowing Your Lender Matters More than Fundamentals." IMF Working Paper No. 15/127.

Frankel, J. 2016. "International Coordination." NBER Working Paper No. 21878.

Fratzscher, M., M. Lo Duca, and R. Straub. 2013. "On the International Spillovers of U.S. Quantitative Easing." ECB Working Paper No. 1557 (June).

International Monetary Fund. 2011. "United States Spillover Report." July 22.

———. 2015. "Exchange Rates and Trade Flows: Disconnected?" In *World Economic Outlook: Adjusting to Lower Commodity Prices* (October). Washington, DC: International Monetary Fund.

Koepke, R. 2015. "Fed Policy Expectations and Portfolio Flows to Emerging Markets." IIF Working Paper (June).

Miranda-Agrippino, S., and H. Rey. 2015. "World Asset Markets and the Global Financial Cycle." NBER Working Paper No. 21722 (October).

Obstfeld, M., and K. Rogoff. 2002. "Global Implications of Self-Oriented National Monetary Rules." *Quarterly Journal of Economics* 117 (2): 503–35.

Oudiz, G., and J. Sachs. 1984. "Macroeconomic Policy Coordination among the Industrial Economies." *Brookings Papers on Economic Activity* (1): 1–75.

Rajan, R. 2014. "Containing Competitive Monetary Easing." Project Syndicate, April 28.

Taylor, J. B. 1993. *Macroeconomic Policy in a World Economy: From Econometric Design to Practical Operation.* New York: W. W. Norton.

———. 2013. "International Monetary Policy Coordination: Past, Present, and Future." BIS Working Paper No. 437 (December).

Wheatley, J., and P. Garnham. 2010. "Brazil in 'Currency War' Alert." *Financial Times*, September 27.