Capital Flow Policies, Monetary Policy and Coordination

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1. Introduction

The past six years have seen a controversial debate between advanced and emerging markets about the role and determinants of global capital flows, including in the G20 agenda under several presidencies. After the collapse of Lehman Brothers in September 2008, capital left many emerging markets on a massive scale, fleeing to so-called 'safe-haven' markets, in particular the United States. This was surprising to many, since the global financial crisis was not triggered by emerging markets, but had its origin in the United States. Furthermore, many emerging market economies (EMEs) had little direct exposure to the US subprime market. They were nevertheless strongly affected and experienced deep recessions, in many cases even deeper than those in the United States and in Europe.

The concerns about capital flight from EMEs in the initial aftermath of the collapse of Lehman Brothers were rather short-lived. The central banks in the United States and in most of Europe responded with an extraordinarily expansionary monetary policy stance, injecting massive liquidity into capital markets and into banks. From the second quarter of 2009, capital started coming back to EMEs on a massive scale. At the same time, the real economies of most EMEs started recovering, much more quickly than the economies in North America and Western Europe.

But policymakers in many EMEs started worrying as early as 2010 that these capital inflows could become excessive. This induced Brazilian President Rousseff to famously say: 'This crisis started in the developed world … it will not be overcome through quantitative easing policies that have triggered … a monetary tsunami, have led to a currency war and have introduced new and perverse forms of protectionism in the world'.

This quote illustrates the different dimensions of the concerns of policymakers in EMEs. The first concern is that monetary policy in the United States and other advanced economies (AEs), including the euro area, Japan and the United Kingdom, have negative externalities, or spillovers, to the rest of the world. In other words, the expansionary monetary policy stance by the Federal Reserve not only injected liquidity into US markets, pushed down interest rates and improved risk-taking by financial participants, but it may have had similar effects on other economies.

What may be optimal for the United States may thus not be optimal for other economies. One important development since 2009 was the strong divergence in the business cycle of EMEs on the one hand and AEs on the other. The United States and most of Europe had very low growth, high unemployment and low domestic demand, and most AE central banks lowered policy rates

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to virtually zero and used non-standard policy instruments to improve financing conditions. By contrast, the recovery of EMEs since 2009 had been quite strong. As a result, the discussion in international policy forums, including the G20, focused on this phenomenon of 'decoupling'. With strong growth, many EMEs were concerned about importing an excessive monetary stimulus from the United States and Europe.

This controversy illustrates that global capital markets have become highly integrated over the past few decades. The concerns of some policymakers about the expansionary monetary policy in the United States essentially reflect the fact that they no longer have full policy autonomy when it comes to macroeconomic policies, particularly monetary policy.

But the concerns of many EME policymakers have also had several additional dimensions. In particular, EME policymakers have been worried about the impact of capital flows on their exchange rates. Many EMEs tend to be open to trade and capital flows, yet still have relatively shallow capital markets. Capital inflows thus induced an appreciation of EME currencies from 2009 to 2013, with some interruptions. Also, the high degree of openness and importance of exports makes many EMEs highly sensitive to currency fluctuations.

A second concern is about financial stability. Capital inflows for some EMEs have led to a significant increase in the prices of domestic assets, such as equities and real estate, and have pushed down long-term interest rates. This, in turn, has been associated with a sharp increase in credit to the private sector. Over the past few years, therefore, we have also seen the share of non-performing loans rise in the balance sheets of many banks in EMEs.

Moreover, an appreciation of the domestic currency coupled with strong capital inflows and bank lending have contributed to a sharp deterioration of the current account positions and a build-up of private sector debt in several EMEs. For instance, in 2014 the term 'fragile five' was coined for Brazil, India, Indonesia, South Africa and Turkey, highlighting this substantial vulnerability to capital flow reversals.

What are the policy options to deal with such capital flow surges and volatility? And how have policymakers in EMEs actually responded? It is useful to think of the policy options along four different dimensions. The first is the macroeconomic policy stance. One option is to use domestic monetary policy and reduce policy interest rates to deter capital inflows. However, with diverging business cycles after 2009, lowering policy rates was not a very sensible policy option for many EME policymakers as this would have provided an even stronger domestic stimulus, thus exacerbating the bubble in financial markets and the risk of overheating.

Consequently, a much more effective macroeconomic policy option in this situation would be a tightening of fiscal policy. However, many EMEs found it very difficult to use this instrument flexibly. Brazil, for instance, ran sizeable fiscal deficits in the years after the global financial crisis, despite having high rates of economic growth, a strong domestic currency and large capital inflows. Hence, in many cases fiscal policy actually contributed to an overheating of the domestic economy and institutional factors made it difficult for many EMEs to use fiscal policy in a sufficiently countercyclical manner.

A second dimension is micro and macroprudential policies. These policies were used by a number of economies, emerging and advanced alike, and included raising reserve requirements for banks

and limiting foreign currency borrowing by financial institutions. However, in many cases such prudential tools were too limited in scope or supervisors lacked the experience to use them effectively. What complicates the task of many supervisors, particularly in EMEs, is the relatively small size and low depth and sophistication of domestic capital markets. This means that the capital flow surge since 2009 has had a much larger impact on asset prices in EMEs than in AEs that have experienced similar capital inflow surges but have deeper capital markets.

A third dimension relates to the quality of policy institutions and the investment environment. It was striking during the global financial crisis, and also during the subsequent European crisis, to observe the strength of the so-called 'flight-to-safety' phenomenon. Although many EMEs had little direct exposure to US markets in 2008 and 2009, they nevertheless were hit hard and experienced capital outflows because they were considered relatively risky. More generally, economies that were perceived to be relatively risky have had strong procyclical capital flows. This means that these economies generally experience capital inflows in periods when global risk appetite is high, and capital outflows when global risk appetite is low. Hence, the experience of the global financial crisis suggests that improving the institutional environment may be a relevant dimension for policymakers in dealing with capital flows.

The fourth policy dimension is that of capital controls and foreign exchange interventions. Many EME policymakers decided to impose capital controls on inflows or reduce capital controls on outflows to reduce net capital inflows. In fact, not since the 1980s has there been a period with so many economies imposing or raising existing controls as during the past few years. Moreover, EME central banks have further increased their holdings of foreign exchange, by intervening massively in FX markets, to at least partially absorb some of the capital coming into the economy and to reduce the upward pressure on the exchange rate.

In the policy discussion, there is still a strong controversy surrounding the question about the preferred pecking order of policies to deal with capital flow surges. Is it preferable to use macroeconomic policies to smooth capital flows? How important are institutions and prudential policies? For a long time, capital controls were widely considered detrimental, because they introduce a distortion into capital markets. But this view has changed rapidly over the last five years, with even the International Monetary Fund (IMF) now stating that capital controls might actually be a first-best option in some instances.

The quote above from Brazilian President Rousseff also underlines two further concerns by policymakers in EMEs. One is the worry about a 'currency war'. In essence, this stresses that policymakers are concerned about what policymakers in competing economies are doing. A currency appreciation in response to capital inflows is much more worrisome if other economies do not share this experience, thus implying a significant effective appreciation, a loss of competitiveness and lower growth.

Another concern expressed by President Rousseff is about protectionism. Policymakers in AEs like to think of capital controls and foreign exchange interventions as two forms of protectionism. Yet the criticism that their own monetary policy could be seen as a form of protectionism comes as a surprise to many of these policymakers. At several G20 meetings, then Federal Reserve Chairman Bernanke underlined that the motivation for US monetary policy is exclusively domestic.

Yet the same can be said of the motivations to implement capital controls or conduct foreign exchange interventions by many EMEs.

What the discussion over the past five years in international policy forums about capital flows therefore underlines is that there are important policy spillovers of domestic policy decisions, including monetary policy. This makes a strong case for policy coordination at the global level. As the example of the currency war illustrates, a lack of coordination can lead to an outcome where everyone is worse off. While the G20 and IMF appear to be the right institutions to tackle the issue of policy coordination on capital flows, little progress has been made on this front. Efforts were indeed made, including by the French G20 presidency in 2011, to arrive at a common understanding about capital flows and desirable policy responses – what was called 'coherent conclusions' on capital flow management. But little has happened since and it is fair to say that there is close to no coordination on the issue today. This remains a major shortcoming and may prove highly detrimental in the years to come.

The remainder of this paper addresses two central questions. First, Section 2 addresses the question about the drivers of global capital flows since 2009. In particular, it makes a distinction between push factors and pull factors. Push factors are those that are specific to the economies where capital flows originate. Pull factors, by contrast, are those that lie within the recipient economies. The question of the relative roles of push and pull factors is important, because the policy conclusions very much depend on the answer about which factors dominate. If the impetus for capital flows to a particular EME lies in the source economy, for instance monetary policy in the United States, then imposing controls in the recipient economy might be a sensible policy response. However, if the reasons are domestic, for example strong growth performance and high yields in the recipient economy, then capital controls imply a distortion, and one that cannot permanently deal with these capital inflows successfully. The paper will address this issue, presenting and discussing empirical findings for the period from 2005 to 2010.

Section 3 specifically turns to the role of US monetary policy since 2008 in inducing capital flows to EMEs and other AEs. Using a micro approach based on data on mutual funds and high-frequency data on policy announcements and operations by the Federal Reserve, the paper will discuss to what extent and through which channels US monetary policy has influenced capital flows to EMEs.

The second question the paper focuses on is how capital controls by EMEs have functioned. Brazil is an intriguing case to analyse, as it is one of the largest EMEs, has deep capital markets, and has implemented controls on equity portfolio and debt portfolio inflows during different episodes since 2008. This intriguing case study, outlined in Section 4, not only allows an analysis of whether these capital controls have been effective in reducing capital inflows into Brazil, but also of whether these controls had externalities on other EMEs. In other words, the analysis presented in this paper deals with the question of whether the implementation of capital controls in Brazil has increased or reduced capital flows to other EMEs. It also analyses whether we can identify the channels through which such potential externalities have occurred.

The overarching objective of the paper is to understand the drivers of global capital flows over the past decade, and to analyse the extent to which policy responses to these capital flow surges have been successful. Section 5 concludes by drawing out policy implications, underlining the importance of strengthening coordination of capital flow policies by the G20 and the IMF.

2. Push Versus Pull Factors as Drivers of Capital Flows

I first turn to the question of the drivers of capital flows to EMEs. The objective of the empirical analysis, building on the work by Fratzscher (2012), is to explain the global dynamics of capital flows during and around the global financial crisis, and in particular the heterogeneity in capital flows across economies.

All of the empirical analysis in this paper uses data on portfolio equity and bond investment flows compiled by EPFR Global (EPFR). This dataset contains daily, weekly and monthly flows for more than 16 000 equity funds and 8 000 bond funds. The EPFR data capture about 5 to 20 per cent of the market capitalisation in equity and bonds for most economies. Importantly, it is a fairly representative sample as shown by Jotikasthira, Lundblad and Ramadorai (2010), Miao and Pant (2012) and Fratzscher (2012); EPFR portfolio flows and portfolio flows obtained from total balance of payments data mostly match quite closely.

At the fund level, EPFR data provide information on the total assets under management (AUM) at the end of each period, which is used to calculate each period's change in AUM. The data allow for a distinction between net capital injections and valuation changes (due to asset returns and exchange rate changes). Importantly, all of the analyses focus on total net injections into the funds (abstracting from valuation changes), aggregated at the economy level, because these flows reflect the active decisions of investors about whether or not to add to or reduce investments in a particular fund class. Therefore, the focus is not on analysing the portfolio allocation strategy of individual fund managers, but rather that of individual firms or other institutional investors.

The empirical methodology uses a factor model with two factors: a set of global/common factors and a set of domestic/idiosyncratic factors, $S_{i,t} = \left[S_t^G, S_{i,t}^D\right]$. To test whether portfolio capital flows during and around the global financial crisis reflected global/common factors or domestic/idiosyncratic factors, and whether there were any characteristics that affected the sensitivity of capital flows to these factors at the economy level, the following equations are used:

$$f_{i,t} = E_{t-1}\left[f_{i,t}\right] + \beta_{i,t-1}' S_{i,t} + e_{i,t} \tag{1}$$

$$\beta_{i,t-1} = \beta_{i,0} + \beta_1' Z_{i,t-1} + \gamma_{i,t-1} D_t \tag{2}$$

$$\gamma_{i,t-1} = \gamma_{i,0} + \gamma_1' Z_{i,t-1}. \tag{3}$$

In Equation (1), $f_{i,t}$ is the net capital flow to economy i during week t; $E_{t-1}[f_{i,t}]$ is the level of these net flows expected at time $t-1$, measured as a function of lagged values of net flows and changes in US and domestic interest rates; $S_{i,t}$ is the vector of the observable global and domestic factors. Equation (2) allows the sensitivity of net flows to global and domestic factors to be affected by: $Z_{i,t-1}$, which is a vector of determinants that vary across economies and time; and D_t, which is a financial crisis dummy that takes the value 1 from 7 August 2007 to 15 March 2009. The specification of the coefficient of the crisis dummy in Equation (2) allows for a change in the transmission during the crisis to be either due to an unconditional increase in the factor loadings ($\gamma_{i,0}$) or a change in the factor loadings conditional on the determinants (γ_1) (see Equation (3)).

The sample period from 12 October 2005 to 22 November 2010 has about 266 weekly observations for equity and bond flows to 50 economies. As most of the common factors are US variables, the United States is excluded from all model estimations as an economy receiving capital flows. The

factor model in Equations (1)–(3) is in the spirit of standard asset pricing models and is related to the work by Bekaert *et al* (2011), who focus on equity market contagion and equity returns at the firm level during the global financial crisis.

The first set of hypotheses to be tested relates to time invariant coefficients on the factors ($\beta_{i,0}$), the coefficients that describe how the sensitivity of net flows to global and domestic factors varies with economy-specific characteristics (β_1), and whether and how these coefficients have changed during the financial crisis ($\gamma_{i,0}$, γ_1). This allows us to understand the overall drivers of capital flows and the transmission channels of the crisis.

The second main hypothesis involves gauging the extent to which drivers associated with push factors (common to all economies) or pull factors (specific to individual economies and their own characteristics) account for the dynamics of capital flows during the crisis and non-crisis times.

Specifically, the contributions of push and pull factors to net capital flows are derived from the factor model in Equations (1)–(3) in the following way:

$$\hat{f}_{i,t}^{G} = \left(\beta_{i,0} + \gamma_{i,0} D_t\right)' S_t^{G} \tag{4}$$

$$\hat{f}_{i,t}^{D} = E_{t-1}\left[f_{i,t}\right] + \left(\beta_1' Z_{i,t-1} + \gamma_1 Z_{i,t-1} D_t\right)' S_{i,t} + \left(\beta_{i,0} + \gamma_{i,0} D_t\right)' S_{i,t}^{D}, \tag{5}$$

where $\hat{f}_{i,t}^{G}$ is the contribution of push factors (i.e. factors common to each economy i), and $\hat{f}_{i,t}^{D}$ is the contribution of pull factors, which is the sum of the expectations term and the components of net flows due to economy-specific determinants ($Z_{i,t-1}$) and economy-specific/idiosyncratic factors ($S_{i,t}^{D}$).

The first step is to estimate the model in Equations (1)–(3) including $S_{i,t}$, but excluding $Z_{i,t-1}$. Table 1 shows the estimated effect of shocks on capital flows in the non-crisis period ($\beta_{i,0}$) and of the additional effect during the crisis ($\gamma_{i,0}$) for each of the five common factors and two idiosyncratic factors. Recall that in Equations (1)–(3), $\gamma_{i,0}$ gives the difference in the effect of a particular factor during the crisis, while ($\beta_{i,0} + \gamma_{i,0}$) provides the overall effect during the crisis. The reported coefficients are averages across economy-specific coefficients as specified in Equations (1)–(3).

The key crisis events had a significant negative effect on net capital flows, yet only for EMEs and not for AEs. In terms of global or common factors, a worsening of liquidity conditions, captured by a rise in the difference between the 3-month overnight indexed swap rate and the 3-month US Treasury bill yield, or TED spread, induces net portfolio outflows. Still, the effect was smaller during the crisis than in the non-crisis period. However, it should not be interpreted that liquidity shocks have become less important as drivers of net capital flows during the crisis as the magnitude of such shocks increased enormously in the crisis.

Table 1: Total Net Portfolio Capital Flows

	Full sample		AEs		EMEs	
	Non-crisis	Crisis	Non-crisis	Crisis	Non-crisis	Crisis
Global shocks (S_t^G)						
Crisis events		–0.807***		0.134*		–1.333***
		(0.128)		(0.077)		(0.120)
Liquidity – TED spread	–0.340***	0.179***	–0.212***	0.189***	–0.404***	0.168***
	(0.044)	(0.032)	(0.023)	(0.027)	(0.069)	(0.052)
Risk – VIX	0.010	–0.106***	–0.052***	0.077***	0.044***	–0.214***
	(0.012)	(0.025)	(0.011)	(0.017)	(0.016)	(0.022)
US macro shocks	–0.703***	0.873***	–0.719***	0.800***	–0.670***	0.894***
	(0.089)	(0.158)	(0.124)	(0.122)	(0.129)	(0.258)
US equity shocks	0.096***	–0.009	0.051***	–0.004	0.125***	–0.011
	(0.006)	(0.005)	(0.003)	(0.005)	(0.005)	(0.008)
Domestic shocks ($S_{i,t}^D$)						
Domestic macro shocks	0.213	1.231	–0.259	–1.190**	0.526	2.846***
	(0.568)	(1.373)	(0.399)	(0.591)	(0.936)	(1.218)
Domestic equity shocks	0.042***	–0.001	0.022***	0.002	0.057***	–0.003
	(0.006)	(0.005)	(0.006)	(0.008)	(0.008)	(0.008)
Controls ($E_{t-1}[f_{i,t}]$)						
Lagged flows	0.394***	–0.023	0.306***	0.059	0.453***	–0.072**
	(0.019)	(0.029)	(0.039)	(0.049)	(0.013)	(0.034)
US interest rate change	0.756***	–0.446***	0.634***	–0.644***	0.838***	–0.303***
	(0.046)	(0.050)	(0.050)	(0.075)	(0.069)	(0.053)
Domestic interest rate change	–0.005	0.087	0.247*	0.187	–0.166	0.030
	(0.114)	(0.179)	(0.129)	(0.293)	(0.171)	(0.244)
Constant	0.150***	–0.304***	0.067***	–0.282***	0.192***	–0.316***
	(0.017)	(0.020)	(0.013)	(0.015)	(0.022)	(0.031)
R^2	0.583					
No of obs	13 515					

Notes: Coefficients are averages across estimates for individual economies; ***,** and * denote significance at 1, 5 and 10 per cent level, respectively; standard errors in parentheses

Source: Fratzscher (2012)

The response of portfolio capital flows to changes in risk, as proxied by the option implied volatility on the S&P 500 index (VIX), during the crisis is striking. While higher risk during the crisis is associated with some net portfolio outflows, there is a remarkable heterogeneity in the effect across economy groups. While a rise in the VIX led to net outflows from AEs and net inflows into EMEs before the crisis, this effect reversed during the crisis, when the sharp increase in global risk induced net inflows into AEs and net outflows out of EMEs. This suggests that the pricing of risk changed fundamentally during the crisis. The finding is consistent with the flight-to-safety phenomenon commonly stressed as a key driver of global capital flows in the crisis.

In the non-crisis period, a positive US macro shock – that is, macroeconomic announcement surprises, cumulated for each respective time period – induces capital outflows, presumably as capital is repatriated into the United States, while a positive domestic macroeconomic shock leads to net capital inflows into the domestic economy. Yet the absolute magnitude of the effect of domestic macroeconomic shocks increases in the crisis for AEs, suggesting that negative domestic shocks during the crisis triggered capital outflows from EMEs and net inflows into AEs (e.g. a repatriation of capital from abroad by investors based in AEs). If one considers AEs as relatively safe, this finding is again consistent with the flight-to-safety hypothesis. This is further corroborated by the change in sign for US macroeconomic news, similarly indicating a repatriation of capital into the United States in response to negative US macroeconomic shocks during the crisis.

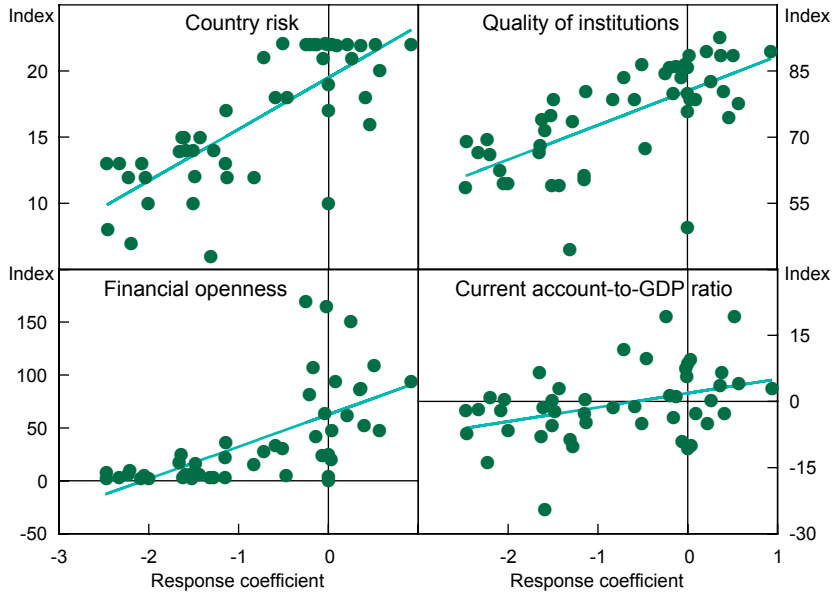
Finally, an increase in both US and domestic equity returns leads to an increase in net capital inflows into all economies. The coefficients do not change markedly during the crisis, suggesting that the transmission mechanism of asset price changes to capital flows did not change materially.

What explains the high degree of heterogeneity in capital flows across economies? And in particular, what accounts for the change in the sign and size of the sensitivity of economies' net capital flows to common and idiosyncratic shocks during the global financial crisis? These questions are approached by estimating the factor model in Equations (1)–(3) including the vector of country-specific determinants $Z_{i,t-1}$. These variables relate to an economy's economic fundamentals (size of reserves, current account position, fiscal position, growth, etc), its institutional environment (sovereign risk, institutional quality), its financial policies during the crisis and its external exposure (through trade and financial linkages).[1]

The main question is whether any of these determinants have been important during the crisis as a facilitator or insulator of capital flows in response to common and idiosyncratic shocks. A first look at the data is quite informative. For each of the economies in the sample, Figure 1 plots the estimates of the impact of the crisis on capital flows ($\gamma_{i,0}$) based on the analysis of the previous subsection against the country-specific determinants $Z_{i,t-1}$. The panels show a strikingly strong correlation pattern. Specifically, economies with a high sovereign rating and with a good quality of policy institutions have net capital flows that are less sensitive to adverse crisis events.

1 Note that all determinants are defined so that a higher value means better fundamentals, better institutions, the implementation of better financial policies, and more trade and financial integration. This is helpful so that the coefficients can be interpreted more easily across variables.

Figure 1: Determinants of the Effect of Crisis Events on Capital Flows



Notes: The horizontal axis shows the response coefficients of portfolio capital flows to key crisis events for each of the economies in the sample; the vertical axis shows the values of the four respective determinants for each of the economies

Source: Fratzscher (2012)

The purpose of the final step of the analysis is to gauge the economic relevance of the identified effects and to compare the overall importance of different drivers associated with push factors versus pull factors in explaining global capital flows.

Looking at the fitted values of the model is one way to gauge what share of net capital flows can be accounted for by drivers associated with push factors and what share by drivers related to pull factors. Using the definitions in Equations (4) and (5), Table 2 shows actual net capital flows during each of three sub-periods (pre-crisis, crisis and post-crisis) and the fitted cumulated flows estimated from the factor model described by Equations (1)–(3). Table 2 also shows the shares of fitted net capital flows accounted for by global factors and by domestic factors calculated, respectively, as $X^G_{i,t} = \hat{f}^G_{i,t} / \hat{f}_{i,t}$ and $X^D_{i,t} = \hat{f}^D_{i,t} / \hat{f}_{i,t}$.

The main finding of Table 2 is that global factors are, overall, about as important as domestic factors as drivers of net capital flows over the period 2005–2010. However, there are some interesting differences across regions and over time. Importantly, while global factors appear to have been more important during the crisis – accounting for about 73 per cent of fitted net capital flows on average – domestic factors have come to dominate net capital flows since 2009. Looking at different regions, domestic factors have become particularly important for EMEs in Latin America and Asia in the 2009–2010 surge in net capital flows to EMEs, accounting for most of the cumulated net capital flows during that period.

Table 2: Actual Versus Fitted Net Capital Flows – Global Factors Versus Domestic Factors

	Net capital flows % of AUM			Fitted					
	Actual			Global factors					
	Pre-crisis	Crisis	Post-crisis	Pre-crisis		Crisis		Post-crisis	
				% of AUM	% of fitted	% of AUM	% of fitted	% of AUM	% of fitted
Total sample	**12.7**	**–15.7**	**26.4**	**9.2**	**65.4**	**–11.6**	**72.8**	**10.3**	**45.0**
EM Asia	18.3	–9.6	39.7	9.1	48.3	–7.8	84.9	6.3	18.1
EM Europe	9.2	–29.5	35.7	9.0	86.6	–28.3	93.2	23.9	80.3
Latin America	27.4	–14.0	53.6	15.8	48.8	–21.2	150.0	17.3	36.9
Africa/Middle East	1.5	–5.1	28.1	4.8	109.3	–5.7	104.4	13.0	54.8
Advanced Europe	8.7	–18.5	5.0	8.1	90.8	–4.4	23.2	3.7	84.2
Other advanced	14.3	–14.2	13.3	12.2	76.1	–12.0	80.5	7.0	58.8
	Fitted			Domestic factors					
	Pre-crisis	Crisis	Post-crisis	Pre-crisis		Crisis		Post-crisis	
				% of AUM	% of fitted	% of AUM	% of fitted	% of AUM	% of fitted
Total sample	**14.1**	**–16.0**	**22.8**	**4.9**	**34.6**	**–4.4**	**27.2**	**12.6**	**55.0**
EM Asia	18.8	–9.2	34.6	9.7	51.7	–1.4	15.1	28.3	81.9
EM Europe	10.4	–30.4	29.7	1.4	13.4	–2.1	6.8	5.9	19.7
Latin America	32.4	–14.1	47.0	16.6	51.2	7.1	–50.0	29.6	63.1
Africa/Middle East	4.4	–5.5	23.8	–0.4	–9.3	0.2	–4.4	10.8	45.2
Advanced Europe	8.9	–18.8	4.4	0.8	9.2	–14.5	76.8	0.7	15.8
Other advanced	16.1	–14.9	11.9	3.8	23.9	–2.9	19.5	4.9	41.2

Notes: Actual cumulated flows during each of the three sub-periods and fitted cumulated flows from the factor model described in Equations (1)–(3); fitted net capital flows are split up into a part explained by global factors and a part accounted for by domestic factors, as outlined in Equations (4)–(5); numbers are averages across economies in each region

Source: Fratzscher (2012)

3. The Role of US Monetary Policy for Explaining Capital Flows to EMEs

How important has US monetary policy been in explaining the capital outflows from EMEs during the financial crisis in 2008 and in early 2009? And how has it contributed to the subsequent surge in net capital inflows? This section tries to answer these questions by building on the work by Fratzscher, Lo Duca and Straub (2012).

The empirical approach for evaluating the impact of quantitative easing (QE) is to analyse the response of portfolio decisions, asset prices and exchange rates to specific unconventional policy actions and events. Importantly, there is a differentiation between US and foreign variables (further distinguishing between EMEs and other AEs). This allows for testing whether foreign markets were affected differently from the United States, as well as whether different types of investment were influenced differently. The impact of QE is evaluated using the following model:

$$y_{i,t} = E_{t-1}\left[y_{i,t}\right] + \left(\beta + \gamma^{EME} D_i^{EME} + \gamma^{AE} D_i^{AE}\right) MP_t + \varepsilon_{i,t} \tag{6}$$

with $MP_t = \left[AN1_t, AN2_t, LQ_t, TR_t, MBS_t\right]'$.

The dependent variable, $y_{i,t}$, for economy i and day t is alternatively: the net inflows (into bonds or into equities), expressed as a percentage of all AUM; equity price returns; the first difference of long-term bond yields; or exchange rate returns. D_i^{EME} is a dummy variable equal to 1 if economy i is an EME, and D_i^{AE} is a dummy variable equal to 1 if economy i is an AE (other than the United States). Hence, the impact of a particular policy measure, MP_t, on the United States is given by the coefficient β, while the additional impact on EMEs and other AEs is denoted by the respective coefficients γ^{EME} and γ^{AE}.

There is a distinction drawn between two sets of unconventional monetary policy measures in the analysis. The first set, announcements (denoted *AN*1 and *AN*2), are impulse dummy variables equal to 1 for a number of announcements related to QE1 and QE2 policies, respectively. Such announcements mostly occur in the weeks or even months before actual operations are implemented. As is common in the literature (Gagnon *et al* 2011; Wright 2011), Fratzscher *et al* (2012) analyse 12 key announcements by the Federal Reserve, which are primarily related to Federal Reserve purchases (or their reversals) of US Treasuries and span from 2008 to 2010.

The second set of policy measures relates to actual market interventions by the Federal Reserve and is measured as the weekly changes of outstanding amounts of the following operations in the Federal Reserve balance sheet:[2] (i) liquidity support measures for the financial sector (LQ_t); (ii) purchases of long-term Treasury bonds (TR_t); and (iii) purchases of long-term mortgage-backed securities and government-sponsored enterprise debt (MBS_t).[3] Note that all of these measures can take positive or negative values, for example in the latter case when such operations are reversed.

Importantly, a set of control variables are included to capture the expected component, $E_{t-1}[y_{i,t}]$, of changes in portfolio allocations and asset prices for economy i at time t. In the basic setting, the following factors are accounted for: (i) economy fixed effects to capture economy-specific, time-invariant elements; (ii) lagged variables reflecting financial shocks, risk and global market

2 This classification is based on a lecture by Federal Reserve Chairman Ben Bernanke given on 13 January 2009 at the London School of Economics (Bernanke 2009); see also Carlson *et al* (2009).

3 I separate purchases of long-term mortgage-backed securities (MBS) and purchases of long-term Treasury bonds, since the latter only became prominent following the QE2 announcement in August 2010.

conditions, such as the VIX, the 10-year US Treasury bond yield and the TED spread; and (iii) lagged returns of the domestic market.[4] In practice, it turns out that the inclusion of different sets of controls only modestly influences the magnitude of the estimated coefficients, but does not alter their sign or statistical significance.

An important methodological caveat is that Federal Reserve operations and market interventions may, to some extent, be endogenous to market developments. For instance, a decision by the Federal Reserve to provide more liquidity support to banks is likely to have been influenced by market conditions and banks' needs for liquidity, and thus may have been higher during weeks when spreads were high, equity markets fell and investors withdrew capital from markets.

It is very hard to deal with this issue, and Fratzscher *et al* (2012) try to do so in several different ways. In particular, their analysis controls for market developments and previous trends in the empirical model, as outlined above, and also uses interventions with lags in the robustness exercise. Moreover, in robustness tests, a more sophisticated two-stage approach is adopted where the first calculation estimates the unexpected component of Federal Reserve operations and this is then used as an explanatory variable in the benchmark model. Most importantly, Fratzscher *et al* (2012) note that if there is an endogeneity bias, removing it should strengthen the estimates of the empirical findings because Federal Reserve operations in most cases were of a 'leaning-against-the-wind' type where the Federal Reserve responded to market distortions and attempted to mitigate them.

The estimated coefficients of the benchmark regression are reported in Table 3 for portfolio flows, in Table 4 for asset returns/yields and in Table 5 for exchange rate returns. The tables show the estimated coefficients of Equation (6) for the five variables capturing the US unconventional monetary policy measures. The discussion of the findings distinguishes between policy measures that fall under the QE1 period – primarily QE1 announcements, liquidity operations and MBS purchases – and QE2 measures, which are mainly QE2 announcements and Treasury purchases.

For the QE1 period of 2008–2009, recall that the main objective of Federal Reserve policy was one of market repair and the provision of liquidity to financial institutions, as an extension of the Federal Reserve's role as a lender of last resort, to avoid a credit crunch in the US economy. Table 3 indicates that the Federal Reserve was fairly successful in pursuing this objective as its policy measures primarily caused a portfolio rebalancing across economies, with capital flowing mainly out of EMEs and into US equity and bond funds. Starting with QE1 announcements, these mainly triggered inflows into both US equities and, to a lesser extent, into US bonds. Hence, unlike what has been discussed in the previous literature, the portfolio rebalancing that appears to have been most pronounced in response to QE1 announcements has been one across economies, rather than across asset classes. This portfolio rebalancing pattern is also clearly visible in the reaction of asset prices as each of the QE1 announcements reduced US 10-year Treasury yields on average by 16 basis points (Table 4), which is consistent with the findings of the literature (for example, see Neely (2010) for the impact of QE1 on AEs' yields).

4 There are some differences in the precise specification of the models for flows and for asset prices. For example, the model for the former includes levels of the VIX, the TED spread and the 10-year US Treasury bond yield, while the model for prices includes changes of these variables.

Table 3: Impact of Federal Reserve Unconventional Monetary Policy Measures – Portfolio Allocations and Capital Flows

Per cent of AUM in the economy of destination

	β	$\beta + \gamma^{EME}$	$\beta + \gamma^{AE}$	γ^{EME}	γ^{AE}	$\gamma^{EME} - \gamma^{AE}$
Dependent variable: inflows into equity funds						
*AN*1	0.44802***	0.04111*	0.08289***	***	***	
	(0.01839)	(0.022)	(0.02097)			
*AN*2	0.00831	0.14094***	–0.00445	***		***
	(0.0101)	(0.0192)	(0.0167)			
LQ	0.00247***	–0.00077***	0.00068**	***	***	***
	(0.00015)	(0.00027)	(0.00029)			
MBS	–0.00209***	0.00045	0.00042	***	***	
	(0.00016)	(0.0006)	(0.00037)			
TR	–0.00128*	0.00621***	0.00003	***		***
	(0.00077)	(0.00108)	(0.00133)			
Controls	Yes					
Fixed effects	Yes					
R^2	0.03					
No of obs	56 084					
Dependent variable: inflows into bond funds						
*AN*1	0.23752***	–0.08502***	0.08410**	***	***	***
	(0.01872)	(0.01879)	(0.03823)			
*AN*2	–0.20395***	0.02930**	–0.06269**	***	***	***
	(0.00944)	(0.01406)	(0.0239)			
LQ	0.00173***	–0.00232***	0.00033	***	***	***
	(0.00014)	(0.00017)	(0.00024)			
MBS	0.00419***	0.00434***	0.00478***			
	(0.00012)	(0.0004)	(0.00046)			
TR	–0.01851***	–0.01988***	–0.00392**		***	***
	(0.00057)	(0.00121)	(0.00176)			
Controls	Yes					
Fixed effects	Yes					
R^2	0.25					
No of obs	54 429					

Notes: Estimated impact of the different non-standard monetary policy instruments on portfolio flows according to Equation (6); control variables are included but not shown; sample includes daily observations from January 2007 to December 2010; β is the estimated impact of monetary policy instruments on US flows; $\beta + \gamma^{EME}$ ($\beta + \gamma^{AE}$) is the estimated impact of monetary policy instruments on flows into EMEs (other AEs); γ^{EME} (γ^{AE}) indicates whether the effect is statistically different from the impact on the United States; $\gamma^{EME} - \gamma^{AE}$ indicates whether the coefficients γ^{EME} and γ^{AE} are statistically different; ***, ** and * denote significance at 1, 5 and 10 per cent level, respectively; standard errors of the coefficients in parentheses

Source: Fratzscher *et al* (2012)

Table 4: Impact of Federal Reserve Unconventional Monetary Policy Measures – Equity Returns and Government Bond Yields

	β	$\beta + \gamma^{EME}$	$\beta + \gamma^{AE}$	γ^{EME}	γ^{AE}	$\gamma^{EME} - \gamma^{AE}$
Dependent variable: equity returns – per cent						
*AN*1	1.08812***	–0.08615	–0.42340**	***	***	
	(0.09322)	(0.20506)	(0.16762)			
*AN*2	0.96743***	0.37365***	0.44304***	***	***	
	(0.01607)	(0.12271)	(0.07349)			
LQ	–0.01411***	–0.01434***	–0.01363***			
	(0.0002)	(0.00143)	(0.00157)			
MBS	–0.00528***	–0.00081	–0.00203	***	*	
	(0.00018)	(0.00153)	(0.00169)			
TR	0.02542***	0.03043***	0.03203***			
	(0.00103)	(0.00622)	(0.00417)			
Controls	Yes					
Fixed effects	Yes					
R^2	0.08					
No of obs	56 062					
Dependent variable: change in 10-year bond yields – percentage points						
*AN*1	–0.16317***	–0.12211*	–0.05923*		**	
	(0.01141)	(0.07099)	(0.0346)			
*AN*2	–0.02050***	–0.00386	–0.01777	*		
	(0.00192)	(0.00837)	(0.01807)			
LQ	–0.00037***	0.00126	–0.00027***		***	
	(0.00002)	(0.00125)	(0.00004)			
MBS	0.00007*	–0.00041	–0.00029			
	(0.00004)	(0.00065)	(0.00022)			
TR	0.00234***	–0.00158	0.00007	**	***	
	(0.00009)	(0.0018)	(0.00076)			
Controls	Yes					
Fixed effects	Yes					
R^2	0.01					
No of obs	48 825					

Note: See notes to Table 3
Source: Fratzscher *et al* (2012)

Table 5: Impact of Federal Reserve Unconventional Monetary Policy Measures – Exchange Rates

Per cent, positive values mean appreciation of the US dollar

	β	$\beta + \gamma^{EME}$	$\beta + \gamma^{AE}$	γ^{EME}	γ^{AE}	$\gamma^{EME} - \gamma^{AE}$
Dependent variable: exchange rate returns						
AN1	–0.84485***	–0.21177	–1.45310***	***	***	***
	(0.05801)	(0.12946)	(0.07388)			
AN2	–0.06209***	–0.08910***	–0.28847***		***	***
	(0.00426)	(0.03308)	(0.05537)			
LQ	0.00378***	0.00523***	0.00435***			
	(0.00008)	(0.00096)	(0.00067)			
MBS	0.00427***	0.00274**	–0.00055		***	***
	(0.0001)	(0.00115)	(0.00047)			
TR	–0.00899***	–0.00492**	–0.00892***	*		
	(0.00037)	(0.00229)	(0.00147)			
Controls	Yes					
Fixed effects	Yes					
R^2	0.04					
No of obs	59 205					

Note: See notes to Table 3
Source: Fratzscher *et al* (2012)

A second, crucial element of the Federal Reserve's strategy during the QE1 period was its liquidity operations. These also induced a cross-economy rebalancing from EME assets into US equities and bonds (Table 3) and a drop in US bond yields (Table 4), while putting upward pressure on the US dollar as a result (Table 5). This finding again seems sensible against the background of the underlying objective of the Federal Reserve's liquidity operations. There may also have been a moral suasion component, that is, market participants that receive funding from the Federal Reserve might be inclined not to reduce their exposures to the domestic economy, but rather achieve their desired deleveraging by selling off foreign asset holdings in EMEs. In addition, by expanding the pool of collateral eligible to obtain central bank liquidity, the Federal Reserve might have increased the willingness of investors to hold US assets at times of global liquidity shortages.

The third main element of QE1 policies, MBS purchases by the Federal Reserve, induced net inflows into bond funds of all regions and groups, and net outflows from US equity funds (Table 3), while asset prices only reacted weakly (Table 4). This finding is consistent with the argument that MBS purchases helped improve the functioning of particular US bond market segments, making them more attractive to investors and hence attracting private capital into funds investing in bond markets. Indeed, the Federal Reserve stated that its goal for the MBS purchases was to 'reduce the cost and increase the availability of credit for the purchase of houses' (Federal Reserve 2008). As discussed in Hancock and Passmore (2011), the Federal Reserve's MBS purchase program re-established a robust secondary mortgage market, which meant that loans to the marginal mortgage borrower could be funded via capital markets. This is consistent with the finding of net inflows into US bond markets.

In contrast, for the QE2 period in 2010, Federal Reserve policy measures functioned in a fundamentally different way from those of the QE1 period. In particular, QE2 policies induced a portfolio rebalancing out of US equities and bonds, and partly into EME equities. This holds for both QE2 announcements as well as for the Federal Reserve's Treasury purchases (Table 3). Moreover, Treasury purchases by the Federal Reserve also induced a portfolio rebalancing across asset classes, as bond funds in all regions experienced net outflows and EME equity funds experienced net inflows. When the Federal Reserve buys long-term government bonds, it crowds out other investors and reduces yields in this market segment. This raises the demand for more risky assets. Relative to the size of AUM, the effects of US Treasury purchases by the Federal Reserve were even larger for many EMEs than for the United States itself, suggesting that these operations had a particularly strong impact on capital flows to EMEs. In fact, the estimates indicate some, albeit small, net outflows even from US equities compared with sizeable net inflows into EME equities. Moreover, opposite to the effects of liquidity operations, US Treasury purchases triggered stronger risk-taking by fund managers, particularly with regard to equity investment in EMEs.

The responses of asset prices are in line with the results for portfolio allocations. Table 4 suggests that QE2 announcements had a substantially smaller effect on US yields than QE1 announcements, reducing them on average by about 2 basis points, which is consistent with the findings by Wright (2011). Moreover, US Treasury purchases even raised their yields slightly (Table 4). Most importantly, both QE2 announcements and Treasury purchases by the Federal Reserve worked to weaken the US dollar significantly (Table 5).

How important are the effects of US monetary policy measures for changes in portfolio allocations, asset prices and exchange rates? Given the discussion of statistical significance and the underlying mechanisms and channels through which US unconventional monetary policy measures have functioned, to what extent can the large shifts in portfolio allocations of global capital flows observed during the crisis in 2007–2008 and also since 2009 be explained by such policy measures? Moreover, has Federal Reserve policy functioned in a procyclical or a countercyclical manner, thereby exacerbating or reducing capital flows and asset price movements?

Two different analyses are conducted to get at these questions. First, we calculate the cumulative effects of the different policy measures on total investment in the United States, and on other AE and EME bond and equity funds. Table 6 shows the cumulated effects of each US policy measure at the peak of the Federal Reserve's balance sheet exposure, while Table 7 shows the impact of the total change over the 2007 to 2011 sample period. The distinction between the two is important primarily for the liquidity operations, which reached a cumulated peak of US$2 000 billion in early 2009, but then were unwound to a large extent by the end of 2010. The same analysis is conducted for asset prices (equity returns, bond yields and exchange rates) in the B panels of Tables 6 and 7.

The second analysis is to cumulate across all five Federal Reserve policy measures; however, not at one particular point in time (as in Tables 6 and 7), but rather presenting the evolution of the total cumulated effect of US monetary policy measures over time. This is shown in Figure 2 for equity and bond flows into the United States, EMEs and other AEs.

Table 6: Economic Significance – Cumulated Impact of Federal Reserve Policy Measures – 'Peak' Impact

	Panel A: Portfolio allocations and capital flows					
	Equity funds			Bond funds		
	US	EME	Other AE	US	EME	Other AE
Total impact of:						
AN1						
Per cent of AUM	1.80	0.16	0.33	0.95	–0.35	0.34
US$m – EPFR	18 630	383	1 417	4 249	–123	231
US$m – IMF CPIS		1 474	8 780		–592	4 575
AN2						
Per cent of AUM	0.02	0.42	–0.01	–0.61	0.09	–0.19
US$m – EPFR	333	2 914	–107	–6 008	96	–348
US$m – IMF CPIS		3 844	–355		145	–2 534
LQ						
Per cent of AUM	4.88	–1.46	1.29	3.33	–4.37	0.62
US$m – EPFR	62 451	–5 067	7 396	14 354	–2 256	481
US$m – IMF CPIS					–7 338	8 457
MBS						
Per cent of AUM	–2.67	0.61	0.54	5.54	5.80	6.31
US$m – EPFR	–33 105	2 464	3 030	32 816	2 793	5 675
US$m – IMF CPIS					9 740	86 069
TR						
Per cent of AUM	–0.80	3.45	0.01	–9.73	–10.52	–2.04
US$m – EPFR	–11 136	17 725	38	–75 417	–8 210	–2 666
US$m – IMF CPIS		31 365	158		–17 666	–27 888

	Panel B: Asset prices and exchange rates								
	Equity prices Per cent			Bond yields Percentage points			Exchange rates Per cent		
	US	EME	Other AE	US	EME	Other AE	US	EME	Other AE
Total impact of:									
AN1	4.30	–0.34	–1.68	–0.66	–0.48	–0.25	–3.24	–0.62	–5.61
AN2	2.93	1.12	1.33	–0.07	–0.01	–0.06	–0.19	–0.30	–0.94
LQ	–23.56	–23.90	–22.87	–0.69	2.45	–0.69	7.45	11.44	8.39
MBS	–6.61	–1.03	–2.58	0.11	–0.57	–0.41	5.71	3.88	–0.11
TR	15.08	18.31	18.25	1.31	–0.87	0.11	–4.83	–2.89	–5.78

Notes: Total impact of each monetary policy instrument is calculated by multiplying the estimated coefficient for the operation (see Tables 3–5) by the size of the operation at each period *t* and by cumulating the effect from the beginning of the program to the day of the maximum expansion of the program; maximum expansion of the liquidity support measures was reached at the end of December 2008, while the maximum expansion of MBS purchases was reached at the end of June 2010; the maximum expansion of other monetary policy instruments was reached in December 2010; flows based on IMF Coordinated Portfolio Investment Survey (CPIS) data are computed on the basis of the stock of portfolio investment held by US residents in the target group of economies (i.e. EMEs and AEs) at the end of 2009

Source: Fratzscher *et al* (2012)

Table 7: Economic Significance – Cumulated Impact of Federal Reserve Policy Measures – Total Impact (Over Entire Sample Period)
(*continued next page*)

	Panel A: Portfolio allocations and capital flows					
	Equity funds			Bond funds		
	US	EME	Other AE	US	EME	Other AE
Total impact of:						
*AN*1						
Per cent of AUM	1.80	0.16	0.33	0.95	–0.35	0.34
US$m – EPFR	18 630	383	1 417	4 249	–123	231
US$m – IMF CPIS		1 474	8 780		–592	4 575
*AN*2						
Per cent of AUM	0.02	0.42	–0.01	–0.61	0.09	–0.19
US$m – EPFR	333	2 914	–107	–6 008	96	–348
US$m – IMF CPIS		3 844	–355		145	–2 534
LQ						
Per cent of AUM	0.44	–0.13	0.12	–0.29	–0.40	0.06
US$m – EPFR	12 305	–345	1 491	–2 193	–476	20
US$m – IMF CPIS		–1 226	3 112		–668	753
MBS						
Per cent of AUM	–2.38	0.54	0.49	4.92	5.13	5.59
US$m – EPFR	–28.197	1 995	2 536	26 977	2 100	4 379
US$m – IMF CPIS		4 917	12 927		8 616	76 297
TR						
Per cent of AUM	–0.80	3.45	0.01	–9.73	–10.52	–2.04
US$m – EPFR	–11 136	17 725	38	–75 417	–8 210	–2 666
US$m – IMF CPIS		31 365	158		–17 666	–27 888
All operations						
Per cent of AUM	–0.91	4.45	0.93	–4.76	–6.05	3.75
US$m – EPFR	–8 065	22 672	5 376	–52 391	–6 614	1 617
US$m – IMF CPIS		40 374	24 622		–10 165	51 203
Total flows						
Per cent of AUM	–4.64	25.43	–17.08	27.33	33.78	–3.94
US$m – EPFR	–41 222	130 015	–133 251	177 783	31 541	16 422
US$m – IMF CPIS		230 923	–452 651		56 726	–53 742

Table 7: Economic Significance – Cumulated Impact of Federal Reserve Policy Measures – Total Impact (Over Entire Sample Period)
(*continued*)

	Panel B: Asset prices and exchange rates								
	Equity prices Per cent			Bond yields Percentage points			Exchange rates Per cent		
	US	EME	Other AE	US	EME	Other AE	US	EME	Other AE
Total impact of:									
AN1	4.30	–0.34	–1.68	–0.66	–0.48	–0.25	–3.24	–0.62	–5.61
AN2	2.93	1.12	1.33	–0.07	–0.01	–0.06	–0.19	–0.30	–0.94
LQ	–2.11	–2.15	–2.00	–0.06	0.19	–0.05	0.54	0.81	0.61
MBS	–5.90	–0.92	–2.31	0.09	–0.52	–0.37	5.07	3.45	–0.69
TR	15.08	18.31	18.25	1.31	–0.87	0.11	–4.83	–2.89	–5.78
All operations	14.30	16.02	13.59	0.63	–1.70	–0.62	–2.65	0.45	–12.41
Total cumulated change over period	–20.31	–0.41	–35.08	–1.40	–0.23	0.25	–8.79	4.24	–7.31

Notes: Total impact of each monetary policy instrument is calculated by multiplying the estimated coefficient for the operation (see Tables 3–5) by the size of the operation at each period *t* and by cumulating the effect from the beginning of the program to the end of the sample in December 2010; see notes to Table 6
Source: Fratzscher *et al* (2012)

Three main findings emerge. First, the absolute effect of US monetary policy measures on portfolio allocations, capital flows and asset prices is substantial. For instance, in cumulative terms, US policy measures together explain EME net equity inflows of around 4½ per cent and EME net bond outflows of around 6 per cent as a share of the funds' AUM between mid 2007 and early 2011 (Table 7). As the size of EME equity assets held by foreigners is substantially larger than that for EME bond assets, these figures imply net inflows of US$23 billion into EME equities and net outflows of US$7 billion from EME bonds using the mutual fund database. Similarly for US funds and other AE funds, Federal Reserve non-standard policy measures induced significant effects on allocations. For example, cumulative inflows into AE bonds of a little under 4 per cent of AUM and net outflows from US bond funds of a little under 5 per cent of AUM.

Importantly, these cumulative figures mask the fact that some of the Federal Reserve measures exerted opposing effects on portfolio allocations. Looking at the breakdown by individual Federal Reserve measures in Table 6, for instance, shows that Federal Reserve purchases of US Treasuries caused large net outflows out of US bond funds of 9.7 per cent of AUM and out of EME bond funds of 10.5 per cent, while MBS purchases had the opposite effect, inducing net inflows into US and EME bond funds of between 5 and 6 per cent of AUM.

The responses of asset prices and exchange rates reveal a similar picture; Federal Reserve policies have exerted economically meaningful effects on equity returns and bond yields in all three geographical areas – the United States, EMEs and other AEs. Panels B of Tables 6 and 7 show that, for instance, the QE1 announcement raised US equity prices by 4.3 per cent and lowered 10-year US Treasury yields by 66 basis points (Table 7), which is in line with the stylised facts presented above.

Similarly, Federal Reserve operations – specifically Treasury purchases – exerted an even larger effect on asset prices in all financial market segments globally. Federal Reserve Treasury purchases raised US equity prices by 15 per cent (and EME and other AE equity prices by 18 per cent), and led to an effective depreciation of the US dollar of 4.8 per cent.

The second main result is that although these effects of Federal Reserve policies obviously constitute sizeable magnitudes in absolute terms, they are moderate compared with the total cumulative changes in portfolio allocations, capital flows and asset prices when taking a longer-term perspective over the entire sample period. For instance, the total increase in net equity inflows to EMEs over the period 2007–2011 was more than 25 per cent, while the total increase in net bond inflows to EMEs was 34 per cent. These growth rates are far larger than what can be accounted for by the estimated effects of Federal Reserve announcements and operations. In fact, Figure 2 shows that the control variables (common risk, liquidity and yield factors, and local asset returns) have been substantially more important as drivers of capital flows to EMEs than US monetary policy measures. The same holds for allocations to US funds and to other AE funds. Hence, overall, a key finding is that Federal Reserve non-standard measures account for only a small share of changes in portfolio allocations and capital flows.

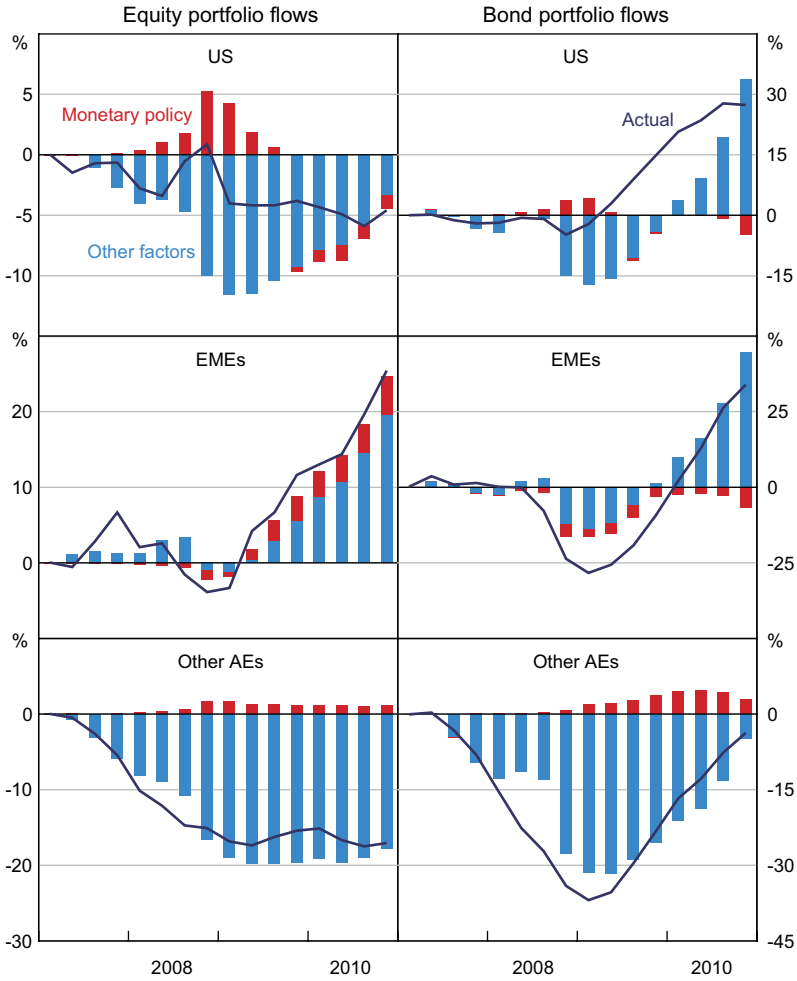
Another important aspect of the results is that capital flows to EMEs have in most cases been substantially more sensitive to Federal Reserve policy measures than flows into US funds or other AE funds, when measured relative to fund AUM. This again confirms that Federal Reserve measures have indeed exerted a substantial and economically meaningful effect, particularly on capital flows to EMEs.

Another point is that the effects of Federal Reserve announcements have, overall, been substantially smaller than the effects of actual Federal Reserve operations on portfolio flows and asset prices. For instance, QE1 announcements caused net inflows of about 1.0 per cent of AUM into US bond funds and 1.8 per cent into US equity funds. In contrast, Federal Reserve purchases of US Treasuries lowered the private mutual fund holdings of US bonds by close to 10 per cent and of US equities by 0.8 per cent. A similar finding holds for asset prices, although QE announcements did exert very substantial effects on equity returns and in particular on US Treasury yields.

This finding is important because it challenges the approach in the literature that focuses exclusively on the effects of QE announcements, rather than the operations themselves. It also underlines and confirms the role of the market repair and liquidity provision functions of Federal Reserve policies, which means that the mere announcement or anticipation of such measures alone do not meet these objectives, but that it takes the operations to truly accomplish the goals. What the findings also suggest is that while QE announcements indeed triggered substantial changes in US asset prices, most of the effects on capital flows as well as on asset prices for EMEs and other AEs were caused by operations. Hence, analysing operations is key for understanding how the Federal Reserve's unconventional monetary policy measures have functioned and, in particular, gauging their global repercussions.

Figure 2: Cumulated Impact of Federal Reserve Quantitative Easing and Other Control Variables

Per cent of AUM in economy of destination



Source: Fratzscher *et al* (2012)

The third main finding is that the evidence suggests US unconventional monetary policy measures since 2007 have significantly exacerbated the procyclicality of capital flows to EMEs. By contrast, these Federal Reserve measures have worked in a countercyclical manner for investments in US equity and bond markets, as well as those of other AEs. Figure 2 shows how during the height of the 2007–2008 crisis, Federal Reserve liquidity operations pulled capital out of EMEs and into US equity and bond funds. In contrast, during the recovery period of 2009, when overall capital inflows into EMEs surged, the combination of a partial reversal of Federal Reserve liquidity operations with Treasury and MBS purchases contributed to the capital flow surge into EME equities.

4. Externalities of Capital Controls – The Case of Brazil

Some policymakers have recently become more supportive of controls on capital inflows, particularly if they are aimed at limiting the appreciation of overvalued currencies and reducing financial fragilities resulting from large and volatile capital flows. This support has been bolstered by theoretical work showing that taxes on capital inflows can improve an economy's welfare by reducing negative feedback effects due to capital flow volatility (Jeanne and Korinek 2010; Korinek 2010) or by adjusting the terms of trade to shift consumption across periods (Costinot, Lorenzoni and Werning 2011). This theoretical work has been supported by empirical work showing that even if capital controls cannot significantly affect the total volume of capital inflows, they can improve the economy's liability structure and increase its resilience to crises (Ostry *et al* 2010).[5] Even the IMF, formerly an avid promoter of capital market liberalisation, has recently started to support the use of controls on capital inflows in certain circumstances (see IMF (2011) and Ostry *et al* (2011)).

The evidence used in support of capital controls, however, has largely focused on the direct benefits to the economy implementing the controls and ignored any externalities on other economies. If controls reduce certain capital inflows for the host economy, do they simply shift these flows and the corresponding challenges to another economy in a 'bubble-thy-neighbour' effect? These externalities could be particularly important in the current environment in which macroeconomic policies in some economies are already distorting capital flows in ways that foster fragilities and create future challenges (see, for example, Rajan (2010)).[6] Only two recent theoretical papers consider these multilateral effects of capital controls and model how controls in one economy can affect welfare in other economies (see Costinot *et al* (2011) and Korinek (2011)). They show that these externalities could be positive or negative, depending on the model's assumptions. Due to concerns about the possibility of negative externalities, Jeanne (2012) proposes a framework for multilateral oversight of capital controls. Despite this recent theoretical and policy-related work, however, there has not yet been any empirical analysis of whether the use of controls on capital inflows generates meaningful externalities on other economies.

This lack of empirical assessment is surprising given the related evidence in other areas, such as trade diversion and financial market contagion. An important focus of the trade literature has been on how trade restrictions can create 'trade diversion' as well as trade creation. Similarly, the literature on financial contagion has documented that portfolio investors respond to wealth, valuation, liquidity and information shocks in one economy by adjusting portfolio allocations in the economy where the shock occurs as well as in other economies. There have not been many analogous attempts so far to document if capital account restrictions create 'capital flow diversion' or related portfolio adjustments.

This section builds on the work by Forbes *et al* (2011), which attempts to fill this void by testing for any portfolio effects of capital controls on the economy instituting the controls, as well as for

5 In contrast, Forbes and Warnock (2012) find that capital controls do not significantly reduce the probability of an economy experiencing surges or stops in foreign capital flows. For surveys on the effects of capital controls, see Prasad *et al* (2003), Forbes (2004), Henry (2007), Cardarelli, Elekdag and Kose (2009), Cline (2010), Ostry *et al* (2010) and Magud, Reinhart and Rogoff (2011).

6 Jeanne (2012) discusses how capital controls in China have supported an undervalued exchange rate, suppressing domestic demand and acting as an impediment to a global recovery and reduction in global imbalances.

any externalities on other economies. Previous empirical analyses of capital controls focused on effects on macroeconomic variables – such as the exchange rate, total volume of inflows, interest rates or liability structures. The approach presented in this section analyses how capital controls affect equity and bond fund allocations in response to changes in capital controls, using the EPFR database.

The empirical analysis focuses on changes in Brazil's capital controls from 2006 to 2011. Brazil had a fairly open capital account during this period, but on several occasions added, removed or raised a tax on certain types of foreign portfolio inflows. Focusing on one economy has the disadvantage that the analysis may not generalise to other economies' experiences with controls – or even to different types of controls within the same economy. I focus on this specific example, however, for two important reasons. First, one challenge with the cross-economy analysis of controls is that different economies have adopted very different types of controls, with different levels of enforcement, different goals and at different levels of financial development. Imposing the assumption in a cross-economy study that these very different experiences have the same effect would bias estimates toward finding no effect (which is a common result in the empirical literature). Second, the introduction of capital controls in economies with small equity and debt markets is less likely to have measurable externalities on portfolio investors. Since Brazil is the largest equity and debt market in Latin America, and is a large component of most emerging market indices against which portfolio investors are benchmarked, it is a logical place to start.[7] If there is no evidence of externalities in this setting, it is unlikely (although not impossible) that there would be economically significant externalities from smaller economies implementing capital controls.

In order to analyse the effects of Brazil's capital controls, I focus on an empirical framework in which investors adjust the portfolio shares allocated to each economy based on the economy's weight in the relevant benchmark. I find that changes in Brazil's capital controls have a significant effect on the share of funds' portfolios allocated to Brazil. More specifically, the estimates imply that if Brazil had *not* instituted a 6 per cent tax on foreign purchases of fixed income (i.e. if Brazil had kept the tax at 0 per cent), global emerging equity and bond funds would have increased their portfolio allocations to Brazil by about 3 to 5 per cent relative to their existing levels. Global equity funds (that invest primarily in developed markets and have smaller portfolio allocations to Brazil) would have increased their allocations to Brazil by about 17 to 20 per cent.[8] Back-of-the envelope calculations suggest that this effect is not only significant, but that the magnitude of the impact on portfolio flows could be large. Although these calculations involve a number of assumptions and should be interpreted cautiously, they suggest that foreign portfolio investors would have held roughly US$28 to US$32 billion more in equity and debt investments in Brazil if Brazil had not implemented these capital controls. This is large relative to annual portfolio flows (US$71 billion in 2010), but moderate relative to total foreign portfolio investment in Brazil (US$554 billion at the end of 2009).

7 Brazil's share of J.P. Morgan's Emerging Markets Bond Index Global benchmark ranged from 7 per cent to 11 per cent over the sample period from 2006 to mid 2011.

8 To put this in context, average portfolio allocations to Brazil at the end of the sample in July 2011 were 11.6 per cent for global emerging market bond funds, 15.9 per cent for global emerging market equity funds and 1.8 per cent for global equity funds.

The analysis considers four episodes when Brazil's Tax on Financial Operations (IOF) – a tax on capital inflows – changed during the sample period (January 2006 to July 2011). The IOF was originally established in 1993 and has been used intermittently since then. The four episodes are:

03/2008	Increased IOF from 0 to 1.5 per cent on fixed income.
10/2008	Reduced IOF on fixed income to 0 per cent.
10/2009	Increased IOF from 0 to 2 per cent on fixed income and equities.
10/2010	Increased IOF to 4 per cent on fixed income; then increased IOF to 6 per cent on fixed income and adopted a number of restrictions to close loopholes that were used to avoid the tax over next two months; Finance Minister Mantega also announced that other measures were under consideration.

Basic theoretical models of portfolio allocation (e.g. Stulz 1981) show that an increase in the cost of holding foreign assets will cause investors to reduce the share of their portfolios allocated to those assets (holding everything else constant). Gelos (2011) provides an excellent survey of the series of papers building on this basic framework to analyse portfolio allocation across economies. Although none of these papers directly tests for the effect of capital controls on portfolio allocation, several papers show that foreign investors tend to invest less in economies with more restrictions on foreign ownership, weaker investor protection, less transparency, weaker shareholder rights, greater corruption and a weaker legal framework. These results suggest that new capital controls – which are generally viewed as increasing policy uncertainty, reducing government transparency, weakening investor protection and providing greater opportunities for corruption – could reduce foreign investors' portfolio allocations to the economy.

More specifically, the analysis below builds on Gelos and Wei (2005), which uses a model in which a fund's portfolio allocation across economies is based on the economy's weight in the benchmark, a fund fixed effect and an error term. This framework can be derived directly from the International Capital Asset Pricing Model. I also include variables to capture the effect of Brazil's capital controls on portfolio allocations to Brazil (the direct portfolio effect) and allocations to economies other than Brazil (the externality), as well as a set of control variables:

$$\omega_{i,j,t} = \alpha_{i,j} + \gamma_D Control_t^{Brazil} + \gamma_E Control_t^{Ex-Brazil} + \beta\omega_{i,t}^{benchmark,j} + \delta\chi_{i,j,t} + \varepsilon_{i,j,t}, \quad (7)$$

where $\omega_{i,j,t}$ is the share of the portfolio allocated to economy i for fund group j at time t; $\alpha_{i,j}$ is the economy-fund-group fixed effect; $Control_t^{Brazil}$ is the level of Brazil's IOF if economy i is Brazil; $Control_t^{Ex-Brazil}$ is the level of Brazil's IOF if economy i is any economy other than Brazil; $\omega_{i,t}^{benchmark,j}$ is the weight of economy i in the relevant benchmark for fund group j at time t; $\chi_{i,j,t}$ is the set of control variables; and $\varepsilon_{i,j,t}$ is the error term.

In order to focus on how changes in Brazil's capital controls affect changes in portfolio allocations to other economies, I take the first difference of Equation (7):

$$\Delta\omega_{i,j,t} = \gamma_D \Delta Control_t^{Brazil} + \gamma_E \Delta Control_t^{Ex-Brazil} + \beta\Delta\omega_{i,t}^{benchmark,j} + \delta\Delta\chi_{i,j,t} + \mu_{i,j,t}. \quad (8)$$

Equation (8) is the base case for the analysis. It estimates how changes in capital controls in Brazil are related to changes in funds' portfolio weights allocated to each economy. I also estimate the model with the portfolio shares and portfolio weights expressed in logarithmic form, so that the

effect of changes in Brazil's capital controls on the percentage changes in funds' portfolio weights allocated to each economy can be estimated. I assume that the magnitude of a change in capital controls affects the magnitude of any portfolio reallocation rather than use a dummy variable that takes the value one when there is any change in capital controls; this assumes that any such change would have an equal-sized effect on reallocations. I focus on testing two hypotheses from Equation (8):

- the direct portfolio effect: $\gamma_D < 0$, an increase in the IOF decreases the share of funds' portfolios allocated to Brazil
- the externality effect: $\gamma_E > 0$, an increase in the IOF increases the share of funds' portfolios allocated to economies other than Brazil.

Table 8 reports the base-case estimates of Equation (8) predicting changes (and percentage changes) in economy-portfolio weights as a function of changes in Brazil's IOF and changes (or percentage changes) in economy benchmark weights for the sample of EME equity and bond funds. Columns (1) and (2) report results without any additional control variables and columns (3) and (4) report results with the full set of control variables. All estimates include robust standard errors clustered by fund group and economy. Columns labelled 'First difference' report results when portfolio weights are measured as changes and columns labelled 'Log difference' report results when portfolio weights are measured as percentage changes. The results are presented for both specifications as each estimates a different relationship, both of which are useful in understanding the portfolio effects of capital controls. The log-differenced specification is more straightforward to interpret as it focuses on percentage changes in portfolio weights and gives equal weighting to each economy in the sample. The first-differenced specification puts more weight on larger adjustments in portfolio allocations, and therefore greater weight on larger markets. This has the benefit of capturing the major shifts in portfolio allocations of most interest to investors, but results may not be as applicable for smaller markets.

Before focusing on the central results, it is useful to mention several of the significant coefficient estimates for the control variables, which all follow *a priori* expectations.[9] The coefficient on $\omega^{benchmark}$ is positive, sizeable in magnitude, and consistently significant at the 1 per cent level, supporting the claims made in investor interviews that mutual fund investors closely track changes in their benchmark indices. The negative and significant coefficient on *Overweight* indicates that funds tend to increase (decrease) their economy allocations after they are underweight (overweight), thereby supporting a rebalancing effect when funds deviate from their benchmarks. The negative coefficient on *Outperformance* has fluctuating significance and suggests that funds may engage in portfolio rebalancing rather than return chasing. The significant negative coefficient on *Off-benchmark share* indicates that when funds increase allocations to economies that are not in the benchmark, they simultaneously decrease allocations to economies in the benchmark.

9 The two variables that are not significant in this base specification are also not surprising. The coefficient on *Global risk* is not significant, undoubtedly reflecting that although changes in global risk may affect total flows into emerging markets, this may not have differentiated effects on individual economy weights within a fund. The coefficient on *Interest spread* is also not significant. This may reflect the various ways in which economy interest rates could interact with portfolio allocations. Higher interest rate spreads would be expected to increase capital inflows and fund allocations if they simply reflect higher returns, but if the higher interest rates reflect greater economy risk, this could decrease fund allocations.

I have also estimated the full set of regressions with a range of other control variables that have been used in the literature on portfolio flows. These additional control variables are rarely significant, even at the 10 per cent level, and including different combinations of them has no significant effect on the main results for the capital control variables as reported below. In fact, although many of the control variables used in the main analysis are individually significant and including them improves the explanatory power of the regression, they rarely change the key results.

Table 8: Regression Results – Effects of Capital Controls

	Without additional control variables		Full set of control variables	
	First difference (1)	Log difference (2)	First difference (3)	Log difference (4)
$Control^{Brazil}$	–0.037**	–0.129***	–0.036*	–0.062**
	(0.017)	(0.021)	(0.018)	(0.030)
$Control^{Ex\text{-}Brazil}$	0.005	0.082	0.003	0.076
	(0.006)	(0.210)	(0.006)	(0.213)
$\omega^{benchmark}$	0.723***	0.656***	0.729***	0.664***
	(0.042)	(0.087)	(0.041)	(0.084)
Other control events			–0.041*	–0.997**
			(0.022)	(0.476)
Global risk			–0.000	0.015
			(0.000)	(0.009)
Overweight			–0.012***	–0.015***
			(0.004)	(0.003)
Outperformance			–0.002***	–0.023
			(0.000)	(0.017)
Interest spread			–0.002	0.027
			(0.002)	(0.038)
Off-benchmark share			–0.068***	–0.060**
			(0.025)	(0.022)
R^2	0.468	0.140	0.479	0.151
No of obs	2 545	2 545	2 545	2 545

Notes: ***, ** and * denote significance at 1, 5 and 10 per cent level, respectively; standard errors in parentheses, clustered by country and fund group; regressions of Equation (8) predicting the change (labelled 'First difference') or percentage change (labelled 'Log difference') in the economy share in the fund group's portfolio; *Control* captures any effect of changes in the IOF on fixed income in Brazil over a three-month window on either Brazil or other economies in the sample (*Ex-Brazil*); fund groups included in the regressions are: global EME equity and bond funds and Latin America regional equity funds

Source: Forbes, Fratzscher and Straub (2013)

Moving to the central results, the negative and significant coefficient on $Control^{Brazil}$ indicates that an increase in the IOF corresponds to lower portfolio allocations to Brazil. Using the estimate for the first-differenced equation with the full set of controls in column (3), the –0.036 coefficient

indicates that removing the 6 per cent tax corresponds to funds increasing their portfolio weights allocated to Brazil by 0.22 percentage points over each of the three months starting with the change in the tax. The corresponding –0.062 coefficient in the log-differenced specification in column (4) indicates that a 6 per cent reduction in the IOF corresponds to funds increasing their portfolio weights allocated to Brazil by 0.37 per cent over each of the three months. Combining these estimates, if the tax was removed at the end of the sample in July 2011, the average portfolio share allocated to Brazil (across all funds in this sample) would increase from 18.0 per cent to 18.2–18.7 per cent after three months. Although this appears to be small in magnitude, it can imply substantial effects on capital flows, especially when considering more precise estimates for different types of funds.

The coefficient estimates on the other variables related to capital controls also yield noteworthy results. The negative coefficient on *Other control events* provides additional evidence of the direct, negative effect of capital controls; when other economies in the sample increase their capital controls, investors reduce the share of their portfolios allocated to these economies.[10] In contrast, the coefficient estimates on $Control^{Ex\text{-}Brazil}$ are positive but not significant. This indicates that there are no significant externalities from changes in the IOF on average portfolio allocations to all other economies in the sample.

To test if different determinants had a significant effect on how investors reallocated their portfolios in response to changes in the IOF, the base model in Equation (8) is estimated isolating the externalities due to these four strategies from any general externalities. More specifically, I estimate:

$$\begin{aligned}\Delta\omega_{i,j,t} = {} & \gamma_D \Delta Control_t^{Brazil} + \gamma_{EG} \Delta Control_t^{ExternalityGroup} + \gamma_{EO} \Delta Control_t^{Other} \\ & + \beta \cdot \Delta\omega_{i,t}^{benchmark,j} + \delta \Delta\chi_{i,j,t} + \mu_{i,j,t},\end{aligned} \tag{9}$$

where $\Delta Control_t^{ExternalityGroup}$ is the change in the IOF if economy *i* is in one of the four externality groups discussed below; $\Delta Control_t^{Other}$ is the change in the IOF if economy *i* is other than Brazil and not in the externality group; and all other variables are defined as above. I can then test not only for a direct effect of changes in the IOF on portfolio allocations to Brazil ($\gamma_D < 0$) but also any positive or negative externalities on economies in a specific group ($\gamma_{EG} \neq 0$) as well as to the other economies in the portfolio ($\gamma_{EO} \neq 0$). The externalities in global emerging market equity funds are the initial focus for several reasons: (i) interviews with investors indicated that these are the funds most likely to reallocate portfolios in response to changes in the IOF; (ii) sample coverage for the equity funds is significantly better than for bond funds; and (iii) the simple regression framework and model is more successful in predicting equity than debt allocations. Also, dedicated Latin America regional funds or global funds are not included in the initial analysis as many of the spillovers would be difficult to capture in these funds; results including these broader fund groups are reported in the sensitivity tests below and largely agree with those in the smaller sample.

The definition of externality groups relies on investor interviews, but then data are used to ensure that all relevant economies are included in each group. *Region* includes all economies in Latin America. *Market size* includes economies that constitute at least 4 per cent of the relevant

10 This coefficient is only significant at the 10 per cent level for the first-differenced equation. This may reflect that *Other control events* includes a number of very different capital controls which had different effects in different economies – an argument used in this paper to justify focusing on the capital controls in one economy.

benchmark for equities. *Dragon play* includes economies that are major commodity exporters or Asian export-oriented emerging markets, both of which could benefit substantially from rapid growth in China. *Control risk* is a group of economies that are believed to have a greater risk of implementing controls on capital inflows in the future. This includes economies that are traditionally fairly open to foreign investment but implemented new controls on portfolio inflows from 2006 to 2010 as well as economies that have traditionally maintained widespread capital account restrictions as measured in Chinn and Ito (2008).

Table 9 uses these definitions to estimate Equation (9) and test for externalities from changes in the IOF on each of these specific groups of economies individually. The results suggest that there are significant externalities to some groups. Specifically, columns (1)–(2) and columns (5)–(6) indicate that an increase in Brazil's IOF causes investors to significantly increase the share of their portfolios allocated to other economies in Latin America and to other dragon play economies. Columns (3) and (4) do not, however, find any significant externalities on large markets. Columns (7) and (8) suggest that an increase in the IOF causes investors to significantly decrease the share of their portfolios allocated to other economies believed to be a greater control risk.

The results in Table 9 suggest that changes in the IOF not only caused investors to adjust their portfolio allocations to Brazil, but also created significant positive and negative externalities for other economies. When Brazil increased the IOF, investors increased the share of their portfolios allocated to dragon play economies and decreased the share allocated to economies viewed as more likely to implement capital controls in the future. This further supports the hypothesis that changes in capital controls can act as a signal to investors, by causing them to reassess the risks in other economies that are also sympathetic to the use of capital controls.

But even if capital controls generate significant externalities by changing portfolio allocations to other economies, are these externalities economically meaningful? In order to get a rough sense of the magnitude of these externalities, I begin by considering each externality group as an aggregate share in a portfolio. Then I compute the spillover effects for each group in US dollars. The counterfactual for comparison is again that Brazil removes the IOF of 6 per cent on fixed income and everything else remains constant. Then the coefficient estimates for both the first-differenced and log-differenced estimates in Table 9 (which estimate the effect on each externality group separately and then simultaneously) suggest that reducing the IOF to zero would correspond to global emerging market equity funds reducing the share of their portfolios allocated to other dragon play economies by 7.8 to 10.2 per cent. The same reduction in the IOF would also correspond to global emerging market equity funds increasing the share of their portfolios allocated to other control risk economies by 3.3 to 9.1 per cent. Holding AUM constant and assuming no changes in benchmark weights, this corresponds to decreased investment of about US$13 to US$17 billion into the group of dragon play economies and increased investment of US$6 to US$16 billion into the group of control risk economies.

Table 9: Externalities of Capital Controls

	Region		Market size		Dragon play		Control risk	
	First difference (1)	Log difference (2)	First difference (3)	Log difference (4)	First difference (5)	Log difference (6)	First difference (7)	Log difference (8)
$Control^{Brazil}$	–0.028***	–0.275***	–0.028***	–0.276***	–0.027***	–0.271***	–0.028***	–0.276***
	(0.003)	(0.061)	(0.003)	(0.062)	(0.003)	(0.061)	(0.003)	(0.062)
$Control^{ExternalityGroup}$	0.002	0.017	–0.002	–0.017	–0.018*	–0.343**	0.016	0.175
	(0.009)	(0.187)	(0.008)	(0.308)	(0.008)	(0.139)	(0.010)	(0.232)
$\omega^{benchmark}$	0.847***	0.975***	0.847***	0.975***	0.845***	0.975***	0.845***	0.974***
	(0.021)	(0.043)	(0.021)	(0.043)	(0.022)	(0.044)	(0.022)	(0.043)
Other control events	–0.042*	–2.076***	–0.034**	–2.007**	–0.085*	–2.860**	–0.001	–1.687***
	(0.023)	(0.670)	(0.014)	(0.749)	(0.049)	(1.322)	(0.034)	(0.403)
Region	0.012**	0.207***						
	(0.005)	(0.052)						
Market size			0.009	0.098				
			(0.014)	(0.137)				
Dragon play					0.025**	0.416**		
					(0.009)	(0.194)		
Control risk							–0.018**	–0.184**
							(0.008)	(0.070)
Macro controls	Y	Y	Y	Y	Y	Y	Y	Y
R^2	0.702	0.555	0.702	0.555	0.704	0.558	0.703	0.556
No of obs	1 086	1 086	1 086	1 086	1 086	1 086	1 086	1 086

Notes: See notes for Table 8; sample restricted to global emerging market equity funds; $Control^{ExternalityGroup}$ represents all allocations apart from Brazil and the respective externality group
Source: Forbes *et al* (2013)

5. Conclusions

This paper has provided an overview of research about the determinants of capital flows since the global financial crisis in 2008. The empirical results presented in Section 2 indicate that push factors in the form of shocks to liquidity and risk as well as to macroeconomic conditions and policies in advanced economies, in particular the United States, have indeed exerted a significant effect on capital flows to EMEs as well as other AEs. Although these effects were larger during the 2007–2008 crisis, they have continued to exert a sizeable effect on global capital flows during the subsequent recovery. However, the findings also underline that the drivers of capital flows are strongly related to pull factors and, in particular, the recipient economy's macroeconomic fundamentals, institutions and policies, which in fact have been the dominant drivers of capital flows in the 2009–2010 recovery.

Monetary policy has been blamed as a main driver of global capital flows since the global financial crisis, in particular to EMEs. The results of Section 3 suggest that there is indeed an important global dimension to and externalities from monetary policy decisions in AEs. However, the paper is mute on whether such externalities are overall positive or negative for other economies – as the potentially undesirable effects of these measures on the procyclicality of EME capital flows need to be weighed against potential benefits, such as higher economic activity and a better financial market functioning in the global economy. In any case, US monetary policy is found to explain only about 20 per cent of capital flows to EMEs on average since 2009.

Finally, the results of Section 4 suggest that although new controls on capital inflows can affect portfolio flows to the economy imposing the controls, thereby potentially helping to manage the risks from inflow surges, these policies should not be considered in isolation. There will be multilateral consequences as investors reallocate their portfolios in response to capital controls. The results are consistent with arguments that the capital controls may have slightly reduced the risk of bubbles and overheating in Brazil, but at the same time it may have aggravated these challenges in other economies, and especially other 'dragon play' economies linked to China's economy.

The key insight is that any model or discussion of capital controls should consider not only the impact on the economy implementing the controls, but also the externalities to other economies. If a large economy or a number of economies implement controls simultaneously, these could create substantial distortions in other economies and global capital flows, triggering a 'bubble-thy-neighbour' effect that may lead to retaliation and reduce global welfare. This makes a strong case for policy coordination of capital flow policies, with the IMF and the G20 carrying an important responsibility to do so.

References

Bekaert G, M Ehrmann, M Fratzscher and AJ Mehl (2011), 'Global Crises and Equity Market Contagion', NBER Working Paper No 17121.

Bernanke BS (2009), 'The Crisis and the Policy Response', The Stamp Memorial Lecture, London School of Economics, London, 13 January.

Cardarelli R, S Elekdag and MA Kose (2009), 'Capital Inflows: Macroeconomic Implications and Policy Responses', IMF Working Paper No WP/09/40.

Carlson JB, JG Haubrich, K Cherny and S Wakefield (2009), 'Credit Easing: A Policy for a Time of Financial Crisis', Federal Reserve Bank of Cleveland *Economic Trends*, February, pp 7–13.

Chinn MD and H Ito (2008), 'A New Measure of Financial Openness', *Journal of Comparative Policy Analysis: Research and Practice*, 10(3), pp 309–322.

Cline WR (2010), *Financial Globalization, Economic Growth, and the Crisis of 2007–09*, Peterson Institute of International Economics, Washington DC.

Costinot A, G Lorenzoni and I Werning (2011), 'A Theory of Capital Controls as Dynamic Terms-of-Trade Manipulation', NBER Working Paper No 17680.

Federal Reserve (Board of Governors of the Federal Reserve System) (2008), 'Federal Reserve Announces it will Initiate a Program to Purchase the Direct Obligations of Housing-Related Government-Sponsored Enterprises and Mortgage-Backed Securities Backed by Fannie Mae, Freddie Mac, and Ginnie Mae', Press Release, 25 November.

Forbes KJ (2004), 'The Asian Flu and Russian Virus: The International Transmission of Crises in Firm-Level Data', *Journal of International Economics*, 63(1), pp 59–92.

Forbes KJ, M Fratzscher, T Kostka and R Straub (2011), 'Bubble Thy Neighbor: Direct and Spillover Effects of Capital Controls', Paper presented at the 12th Jacques Polak Annual Research Conference, Washington DC, 10–11 November.

Forbes KJ, M Fratzscher and R Straub (2013), 'Capital Controls and Macroprudential Measures: What Are They Good For?', DIW Berlin Discussion Papers No 1343.

Forbes KJ and FE Warnock (2012), 'Capital Flow Waves: Surges, Stops, Flight, and Retrenchment', *Journal of International Economics*, 88(2), pp 235–251.

Fratzscher M (2012), 'Capital Flows, Push Versus Pull Factors and the Global Financial Crisis', *Journal of International Economics*, 88(2), pp 341–356.

Fratzscher M, M Lo Duca and R Straub (2012), 'A Global Monetary Tsunami? On the Spillovers of US Quantitative Easing', Centre for Economic Policy Research Discussion Paper No 9195.

Gagnon J, M Raskin, J Remache and B Sack (2011), 'Large-Scale Asset Purchases by the Federal Reserve: Did They Work?', Federal Reserve Bank of New York Staff Report No 441.

Gelos RG (2011), 'International Mutual Funds, Capital Flow Volatility, and Contagion – A Survey', IMF Working Paper No WP/11/92.

Gelos RG and S-J Wei (2005), 'Transparency and International Portfolio Holdings', *The Journal of Finance*, 60(6), pp 2987–3020.

Hancock D and W Passmore (2011), 'Did the Federal Reserve's MBS Purchase Program Lower Mortgage Rates?', *Journal of Monetary Economics*, 58(5), pp 498–514.

Henry PB (2007), 'Capital Account Liberalization: Theory, Evidence, and Speculation', *Journal of Economic Literature*, 45(4), pp 887–935.

IMF (International Monetary Fund) (2011), 'Recent Experiences in Managing Capital Inflows—Cross-Cutting Themes and Possible Policy Framework', Policy Paper, 14 February.

Jeanne O (2012), 'Who Needs to Open the Capital Account?', unpublished manuscript, Peterson Institute of International Economics.

Jeanne O and A Korinek (2010), 'Managing Credit Booms and Busts: A Pigouvian Taxation Approach', NBER Working Paper No 16377.

Jotikasthira C, CT Lundblad and T Ramadorai (2010), 'Asset Fire Sales and Purchases and the International Transmission of Financial Shocks', Centre for Economic Policy Research Discussion Paper No 7595.

Korinek A (2010), 'Regulating Capital Flows to Emerging Markets: An Externality View', unpublished manuscript, University of Maryland.

Korinek A (2011), 'Capital Controls and Currency Wars', unpublished manuscript, University of Maryland.

Magud NE, CM Reinhart and KS Rogoff (2011), 'Capital Controls: Myth and Reality—A Portfolio Balance Approach', Peterson Institute of International Economics Working Paper WP 11-7.

Miao Y and M Pant (2012), 'Coincident Indicators of Capital Flows', IMF Working Paper No WP/12/55.

Neely CJ (2010), 'The Large-Scale Asset Purchases had Large International Effects', Federal Reserve Bank of St. Louis Working Paper 2010-018C.

Ostry JD, AR Ghosh, K Habermeier, M Chamon, MS Qureshi and DBS Reinhardt (2010), 'Capital Inflows: The Role of Controls', IMF Staff Position Note SPN/10/04.

Ostry JD, AR Ghosh, K Habermeier, L Laeven, M Chamon, MS Qureshi and A Kokenyne (2011), 'Managing Capital Inflows: What Tools to Use?', IMF Staff Discussion Note SDN/11/06.

Prasad ES, KS Rogoff, S-J Wei and MA Kose (2003), *Effects of Financial Globalization on Developing Countries: Some Empirical Evidence*, Occasional Paper No 220, International Monetary Fund, Washington DC.

Rajan R (2010), 'Beggaring the World Economy', Project Syndicate, 7 October, online. Available at <http://www.project-syndicate.org/commentary/beggaring-the-world-economy>.

Stulz R (1981), 'On the Effects of Barriers to International Investment', *The Journal of Finance*, 36(4), pp 923–934.

Wright JH (2011), 'What Does Monetary Policy Do to Long-Term Interest Rates at the Zero Lower Bound?', NBER Working Paper No 17154.