Self-Oriented Monetary Policy, Global Financial Markets and Excess Volatility of International Capital Flows

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Abstract

International economists have entered into a new discussion about the volatility of global capital flows, the spillovers of US monetary policy, and the effectiveness of domestic macroeconomic tools for emerging economies. This paper explores the determinants of international capital flows and the spillover effects of monetary and financial shocks in a core-periphery DSGE model where linkages between financial institutions and financial frictions are a central feature of the excess sensitivity of capital flows. In the absence of financial frictions, the spillover effects of centre country shocks are minor, and an inflation targeting rule represents an effective policy for the periphery.

In our baseline model however, financial intermediation is limited by enforcement constraints, both in the centre, and the periphery. Thus there is a 'double agency' problem in international capital flows. In that case, a core country monetary tightening causes an amplified contraction in capital flows to the periphery, resulting in a highly correlated rise in lending spreads and a fall in GDP in both core and periphery. In this model, an inflation targeting rule has little advantage relative to an exchange rate peg; the spillovers are almost the same in the two regimes. We extend the model to allow for credit shocks coming from the core country, and find the same prediction - agency problems cause a magnification in capital flows and large spillover effects that are relatively unaffected by the exchange rate regime.

Despite these results, we cannot draw the conclusion that monetary policy is ineffective in emerging market economies. While a simple inflation targeting rule has poor properties in dealing with spillovers, we find that a global cooperative monetary rule allowing a discretionary response to shocks can effectively negate the negative spillover effects of capital flows. Remarkably, we find further that a very similar outcome can be achieved within a non-cooperative environment, where the core and periphery follow an optimal discretionary monetary policy independently. Thus, we tentatively conclude that, even in an environment with multiple frictions in global financial intermediation, a self-oriented, discretionary monetary policy may be a reasonable arrangement for the international monetary system.

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1. Introduction

In recent years, the global economy has seen dramatic examples of volatility in capital flows to emerging market countries. Following the global financial crisis and the subsequent rapid monetary easing in the US and other advanced economies, there was a period of large capital inflows into many fast growing emerging economies such as China, India and Brazil. Economists have characterized this as an investment sentiment driven by a 'reach for yield', given the persistent low returns in the advanced economies. In 2013, the threat of a US monetary 'taper' led to an abrupt reversal of inflows to most emerging economies. The defining characteristic of these two episodes is that capital flows to emerging economies were driven to a large degree by macroeconomic and financial conditions in the advanced economies, especially those in the US. Although the size of the US economy relative to world GDP has fallen in recent decades, the US still plays an outsized role in the global financial system (e.g. Fischer, 2014), one reason being the overwhelming predominance of the US dollar as a funding currency for global capital flows.

This recent experience is by no means new. There is substantial empirical evidence linking international capital flows to US asset prices and US monetary policy. Rey (2013), Miranda-Agrippino and Rey (2014), and Bruno and Shin (2014a) describe a 'global financial cycle' in which capital flows to many countries are highly positively correlated and closely tied to US monetary policy. In their empirical work, a tightening of US monetary policy leads to a spike in global risk aversion, a fall in cross border lending, and a fall in asset prices at a global level. Miranda-Agrippino and Rey (2014) find that a single global factor can explain a large part of the movement in cross border credit flows, as well as domestic credit growth. Moreover, this factor can be related to changes in US policy interest rates.

A major policy question arising from these events is whether US monetary policy imparts a global 'externality' through spillover effects on world capital flows, credit growth and asset prices. Many policy makers in emerging markets (e.g. Rajan, 2014) have argued that the US Federal Reserve should adjust its monetary policy decisions to take account of the excess sensitivity of international capital flows to US policy. This criticism questions the prevailing view that a 'self-oriented' monetary policy based on inflation targeting principles represents an efficient mechanism for the world monetary system (e.g. Obstfeld and Rogoff, 2002), without the need for any cross-country coordination of policies.

A related question is whether emerging market economies that find themselves excessively affected by capital flow volatility need more policy tools besides interest rate and exchange rate adjustment. Rey (2013) argues that for small open countries in present day global financial markets, the classic policy 'trilemma' which states that independent policy may be followed provided the exchange rate is flexible, in fact collapses to a 'dilemma', since exchange rate adjustment cannot easily insulate against large reversals in capital flows. The 'dilemma' defined by Rey is one where emerging market countries can either maintain an open capital account but remain vulnerable to the global financial cycle, or choose to impose capital controls in order to achieve a greater degree of macro policy independence.

This paper develops a simple core-periphery DSGE model of the global financial cycle which is driven by monetary policy and financial shocks in a large country whose currency dominates the flows of financial capital across borders. We use the model to explore the sources of capital flow volatility and the excess sensitivity of emerging market countries to macro conditions in a centre country. Our model is based on the relationship between financial institutions in a large financial centre (global banks or asset managers) and borrowing banks or financial institutions in an emerging market country. We find that when these financial institutions face agency constraints which restrict the growth of their balance sheets, then monetary policy or financial shocks in the financial centre can produce many of the features of international capital flows described above. A monetary contraction in the core (or financial centre) leads to a sharp decline in lending to the emerging market country, a highly correlated fall in global assets prices, and a rise in leverage and interest rate spreads which precipitates a coordinated downturn in real economic activity.

We find, as in the data, that for the baseline calibration of our model, the response of asset prices and interest rate spreads in emerging economies to a monetary contraction in the centre country can in fact be larger than the direct responses of these variables in the centre country itself. Thus, sudden reversals in the monetary policy stance of the centre country can generate what looks like excessive responses in the financial markets of emerging economies. This is the case even if the emerging economy allows its exchange rate to adjust freely.

The key mechanism in our model is the magnification effect of shocks to the balance sheets of global lenders compounded with those of local emerging market borrowers. A monetary tightening in the centre country raises interest rates and funding costs for global lenders. This erodes their net worth, requiring them to reduce lending to local emerging market borrowers. In addition, emerging market countries experience an immediate real exchange rate depreciation. The combination of increased borrowing costs and unanticipated depreciation, which raises the costs of servicing existing debt, leads a sharp decline in net worth for emerging market borrowing institutions. This leads to a rise in spreads in emerging markets. We find that the spreads rise significantly more in the emerging market country than in the centre country, since they are subject to a 'double agency' effect.

We compare these results to that of a basic core-periphery DSGE model without constrained financial institutions. In that case, our model implies that an endogenous exchange rate response acts very well to prevent international monetary spillovers. The contraction in the centre country has only negligible effects on GDP and investment in the emerging market economy, since a real depreciation allows for substantial expenditure switching, and there is no direct impact on bank lending.

We go on to explore the implications of alternative policy and financial structures on the nature of financial and real spillovers. We ask how the nature of spillovers would differ if the emerging market were able to borrow in its own currency. This would eliminate the direct deterioration of balance sheets coming from exchange rate depreciation. We find in this case that the contraction in lending and the rise in spreads is mitigated somewhat, so that the impact on the real economy is smaller. But despite this, the emerging economy is still highly vulnerable to the cutback in direct capital flows and the increase in funding costs coming from the centre country, so that the overall magnitude of spillovers is still very large.

How would the nature of spillovers change if the emerging economy were to follow a pegged exchange rate? In the absence of agency constraints, our results are very standard - a pegged exchange rate would magnify the response of real variables to the external shock, since it would curtail the required adjustment in the real exchange rate. But when global and local financial firms are subject to agency constraints, the magnitude of spillovers differ little between an exchange rate peg and an inflation targeting monetary policy. To a large extent, our results point to a 'dilemma' rather than a 'trilemma', at least in the response to an external monetary contraction.

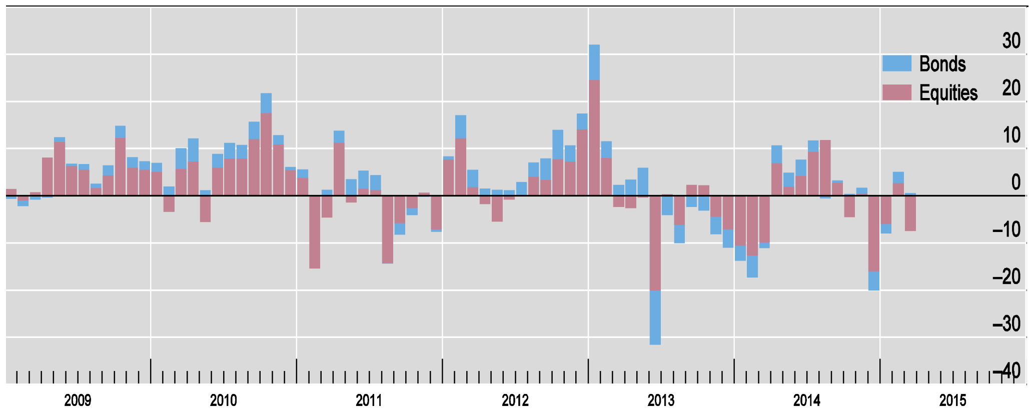
Finally, we investigate the drivers of capital flows from the core country other than monetary policy shocks. Direct shocks to the financial system in the core country triggers many of the same features as those of the monetary shock described above. Again, the spillovers are very similar under a flexible exchange rate inflation-targeting monetary rule and an exchange rate peg. But interestingly, in this case we show that monetary policy can be very effective. A global cooperative monetary response to a financial downturn can largely eliminate the negative impact of the capital flow spillovers. For this response to work however, it is essential that the periphery country exploit the flexibility of its exchange rate. Thus, when a cooperative discretionary monetary rule is considered, the policy 'trilemma' becomes relevant again.

An immediate objection to this conclusion is that global cooperation in monetary policy is infeasible. Practically speaking, monetary policy is set at the national level, and especially for the countries at the financial centre, national considerations alone will dictate all policy responses. How do these results change when we recognize this inability to sustain cooperation? We have already noted that naive inflation targeting monetary rules have poor properties in dealing with international spillovers in the presence of agency distortions in international financial intermediation. But this does not mean that *any* self-oriented monetary policy is ineffective. We go on to model a Nash open-loop discretionary monetary policy game where both core and peripheral countries independently choose an optimal monetary policy. Remarkably, we find that the outcome of this game is very similar to the cooperative discretionary rule. Thus, we may tentatively conclude that, even within an international financial system characterized by substantial financial frictions, independent monetary policy determination at the national level may represent an effective international monetary arrangement.

We develop a centre-periphery model where financial institutions in a centre country make loans to other banks or financial sector borrowers in an emerging market economy, which in turn finances real investment in the emerging economy. Separately, there are international capital markets where households in both countries may trade in nominal bonds. In addition, our baseline case is one where all international capital flows are facilitated through the centre country currency (e.g. US dollars). The conceptual framework is therefore similar to that of Bruno and Shin (2014b), although our structural model and analysis is very different from their paper. In some respects our modelling strategy is close to the works by Devereux and Yetman (2010), Dedola and Lombardo (2012), Dedola et al. (2013), Ueda (2012), Kollmann et al. (2011), Kolasa and Lombardo (2014), Choi and Cook (2004) and Perri and Quadrini (2011). These authors study various positive and normative aspects of international spillovers due to financial frictions. Our paper builds on these ideas to address the specific questions highlighted above.

Figure 2.1: Capital Flows to EMEs

Net flows into emerging market portfolio funds[1] Graph 4



[1] In billions of US dollars, data up to end of 23 March 2015. Sums across major economies in each region. Data cover net portfolio flows (adjusted for exchange rate changes) to dedicated funds for individual EMEs and to EME funds for which country or at least regional decomposition is available.

Source: EPFR.

2. Capital Flows to Emerging Markets: Some recent evidence

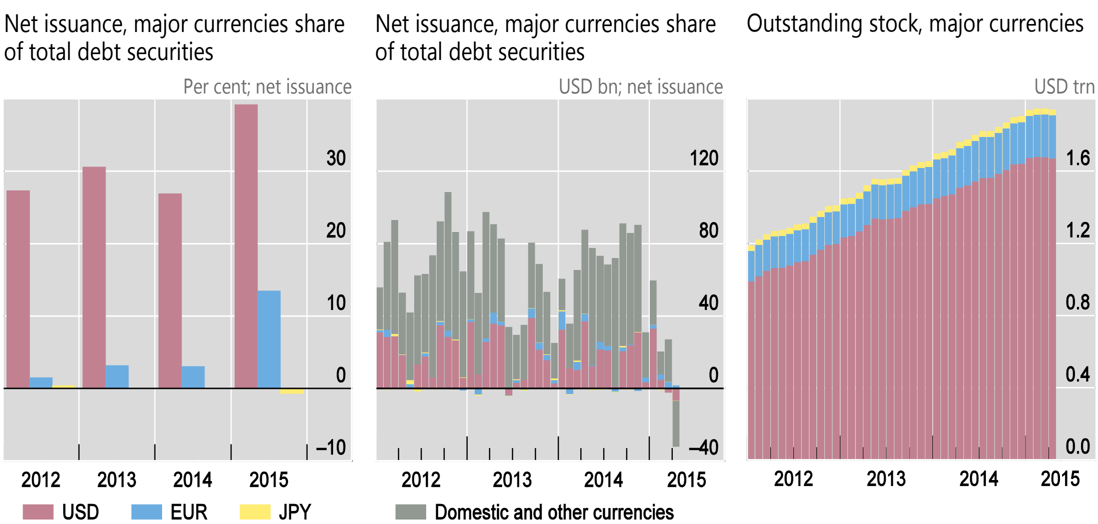
In 2013 and 2014, emerging market economies experienced significant volatility in gross and net capital flows. Observers have attributed much of this to actual or prospective changes in monetary policy in advanced economies. But in fact, as we note above, highly volatile capital flows are a fact of life for emerging market countries. Figure 2.1 illustrates net flows into emerging market portfolio funds for a group of emerging markets since 2009. Following the highly accommodative monetary policies of advanced countries in 2009-2010, there was a significant uptick in net inflows to emerging markets. This continued with some volatility until 2013, when the proximate cause of the US 'taper' announcement led large outflows from EME countries, both in bonds and equity assets.

Figure 2.2 shows the currency composition of emerging economies net issuance debt securities over the past four years. A significant fraction of new issues remain denominated in foreign currencies, with the US dollar still representing the major share of these. The right hand panel of Figure 2.2 shows that the US dollar comprises about 90 percent of the outstanding stock of debt securities for this representative group of EMEs.

Our theoretical analysis of spillovers depends in a central way on the correlation of interest rate spreads across countries. Figure 2.3 illustrates the path of interest rate spreads in the US domestic economy, in Asia, Latin America and Emerging Markets generally (for USD

Figure 2.2: Currency Exposure for EMEs

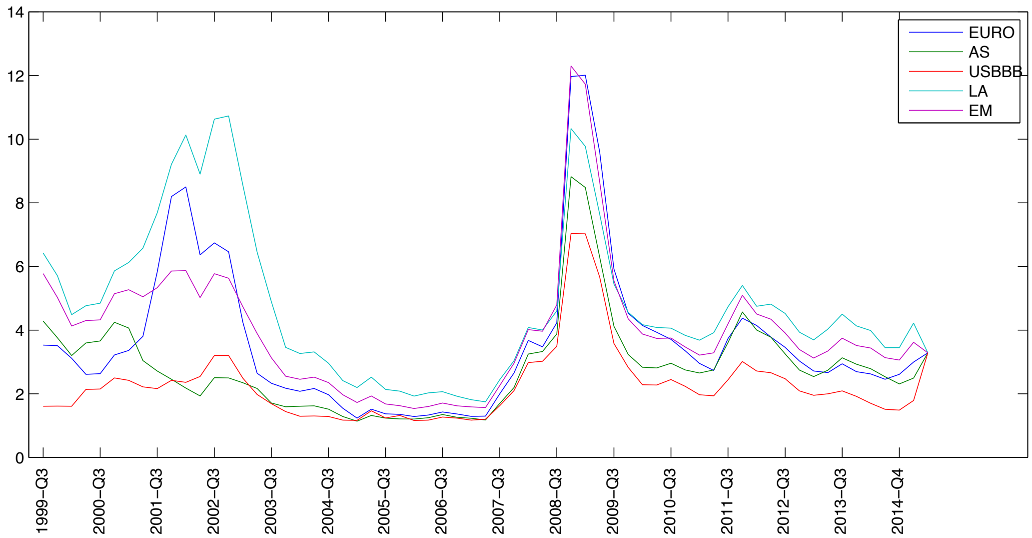
Debt securities in emerging economies[1,2,3] Graph 5



[1] All issuers, all maturities, by nationality of issuer. [2] Argentina, Brazil, Chile, China, Colombia, the Czech Republic, Hong Kong SAR, Hungary, India, Indonesia, Israel, Malaysia, Mexico, Peru, the Philippines, Poland, Russia, Saudi Arabia, Singapore, South Africa, South Korea, Thailand and Turkey. [3] Data up to 13 April 2015.

Sources: Dealogic; BIS calculations.

Figure 2.3: High Correlation of Spreads



issues) as well as Euro denomination issues. The US domestic issue on average has the lowest risk spreads, but clearly there is an extremely high correlation between all the spreads.

3. The Global Model

Our results are structured around a 2 country core-periphery model. The centre/core country is assumed to be large relative to the peripheral country. We now describe in detail the structure of each country's actors and the decisions they face, beginning with the emerging market economy. We denote the emerging economy with the superscript 'e' and the centre country with the superscript 'c'.

The schemata for our model is described in Figure 3.1. In the centre country there are households, global financiers (banks or asset managers[1]), capital goods producers, production

[1]In the remainder of the paper, to simplify the discussion, we will refer to capital goods financiers in both the centre and peripheral countries as banks. It should be noted however that the key thing that

firms, and a monetary authority. There is a global capital market for one-period risk free bonds. In the emerging market country there are also households, local borrowers (banks or financial managers), capital goods producers, production firms, and a monetary authority. The centre country households make deposits with global financiers at the centre country risk free rate, and can hold centre country one-period nominal government debt, which may also be traded on international capital markets. The global banks receive deposits from households in the centre country, and invest in risky centre country technologies, as well as in emerging market banks. Along the lines of Gertler and Karadi (2011), banks in both countries finance purchases of capital from capital goods producers, and rent this capital to goods producers. The borrowing banks in the emerging market economy are funded through loans from global banks/financiers. There are two levels of agency constraints; global banks must satisfy a net worth constraint in order to be funded by their domestic depositors, and local EME banks in turn must have enough capital in order to receive loans from global banks. In both countries, the production goods firms use capital and labour to produce differentiated goods, which are sold to retailers. Retailers are monopolistically competitive and sell to final consuming households, subject to a constraint on their ability to adjust prices.

The emerging country is essentially a mirror image of the centre country, except that households in the emerging country do not finance local banks, but instead engage in intertemporal consumption smoothing through the purchase and sale of centre currency denominated nominal bonds[2]. Banks in the emerging market use their own capital and financing from global financiers to make loans to local entrepreneurs. The net worth constraints on banks in both the emerging market and centre countries are motivated along the lines of Gertler and Karadi (2011).

3.1. The Emerging Market Economy (EME)

A fraction n of the world's households live in the emerging economy. Households consume and work, and act separately as bankers. A banker member of a household has probability θ of continuing as a banker, upon which she will accumulate net worth, and a probability $1-\theta$ of exiting, upon which all net worth will be deposited to her household's account. In every period, non-bank households are randomly assigned to be bankers so as to keep the population of bankers constant.

Households in the EME have preferences over (per capita) consumption C_t^e and labor H_t^e supply given by:

$$E_0 \sum_{t=0)}^{\infty} \beta^t \left(\frac{C_t^{e(1-\sigma)}}{1-\sigma} - \frac{H_t^{e(1+\psi)}}{1+\psi} \right)$$

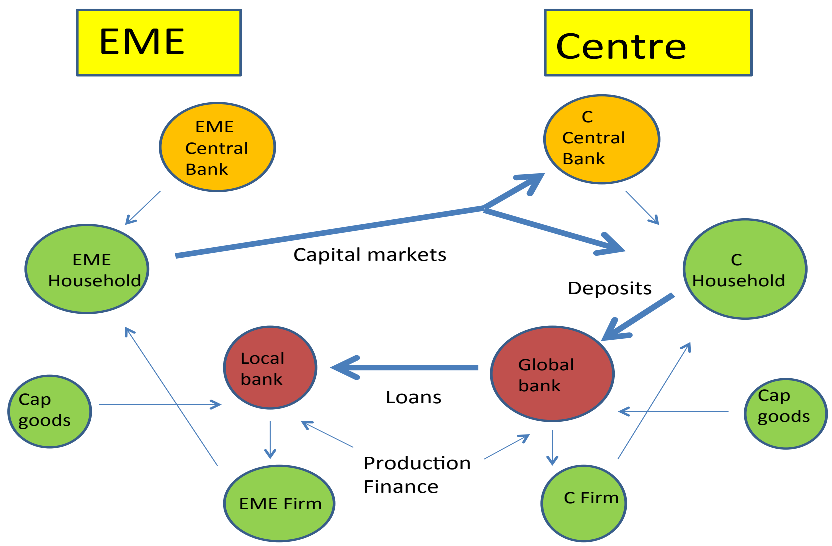
where consumption is broken down further into consumption of home (e) and foreign (c)

distinguishes them is that they make levered investments, and are subject to no-default constraints. In this sense, they need not be literally banks in the strict sense.

[2]We assume that the market for centre country nominal bonds is frictionless. Adding additional frictions that limit the ability of emerging market households to invest in centre country nominal bonds would just exacerbate the impact of financial frictions that are explored below.

Figure 3.1: The world economy

Architecture of model



baskets as

$$C_t^e = \left(v^{e\,\frac{1}{\eta}} C_{et}^{e1-\frac{1}{\eta}} + (1-v^e)^{\frac{1}{\eta}} C_{ct}^{e1-\frac{1}{\eta}} \right)^{\frac{1}{1-\eta}}$$

Here η is the elasticity of substitution between home and foreign goods, $v^e \geq n$ indicates the presence of home bias in preferences,[3] and we assume in addition that within each basket, goods are differentiated and within country elasticities of substitution are $\sigma_p > \eta$.

Given this, the true price index for E country households is

$$P_t^e = \left(v^e P_{et}^{1-\eta} + (1-v^e) P_{ct}^{1-\eta} \right)^{\frac{1}{1-\eta}}$$

Then the household budget constraint is described as follows

$$P_t^e C_t^e + S_t B_t^e = W_t^e H_t^e + \Pi_t^e + R_{t-1}^* S_t B_{t-1}^e$$

Households purchase dollar (centre country) denominated debt. They consume home and foreign goods. S_t is the exchange rate (price of C currency), and B_t^e is the stock of foreign currency bonds held. W_t is the nominal wage, and Π_t^e represents profits earned from banks and firms, net of new capital infusion into banks. R_t^* is the centre country T-bill rate. Households have the standard Euler conditions and labor supply choices described by

$$E_t \Lambda_{t+1}^e \frac{R_t^*}{\pi_{t+1}^e} \frac{S_{t+1}}{S_t} = 1$$

$$\frac{W_t^e}{P_t^e} = C_t^{e\sigma} H_t^{e\psi}$$

where $\Lambda_{t+1}^e \equiv \beta \left(\frac{C_{t+1}^e}{C_t^e} \right)^{-\sigma}$, and $\pi_{t+1}^e \equiv \frac{P_{t+1}^e}{P_t^e}$.

Given two-stage budgeting, it is straightforward (and omitted here) to break down consumption expenditure of households into home and foreign baskets.

3.2. Capital goods producers

Capital producing firms in the EME buy back the old capital from banks at price Q_t^e and produce new capital from the final good in the EME economy subject to the following adjustment cost function:

$$P_t^e \left(I_t^e + I_t^e \zeta \left(\frac{P_t^e I_t}{P_{t-1}^e I_{t-1}} - 1 \right)^2 \right)$$

where I_t^e represents investment in terms of the EME aggregator good.

EME banks then finish the capital goods subject to idiosyncratic risk, and rent it to intermediate goods producers in the EME economy. At that point, the capital also receives

[3] Home bias is adjusted to take into account of country size. In particular, for a given degree of openness x, $v^e = 1 - x(1-n)$, and a similar transformation for the centre country home bias parameter.

an aggregate 'capital quality' shock ξ^e_{t+1}, so that that dynamics of the aggregate capital stock is described by

$$Z^e_{t+1} = I^e_t + (1-\delta)K^e_t$$
$$K^e_{t+1} = \xi^e_{t+1} Z^e_{t+1}$$

where Z^e_t is the capital stock purchased by the EME bank, and K^e_{t+1} is the capital stock in production.

3.3. EME banks

EME banks begin with some bequeathed net worth from their household, and continue to operate with probability θ, and with probability $1-\theta$ revert back to their household as in the model of Gertler and Karadi (2011). We also follow Gertler and Karadi in the nature of the incentive constraint. Ex ante, EME banks have an incentive to abscond with borrowed funds before the investment is made. Consequently, conditional on their net worth, their leverage must be limited by a constraint that ensures that they have no incentive to abscond.

At the end of time t a bank i that survives has net worth given by $N^e_{t,i}$ in terms the EME good. It can use this net worth, in addition to debt raised from the global bank, to invest in physical capital at price Q^e_t in the amount $Z^e_{t+1,i}$. Debt raised from the global bank is denominated in centre country currency. In real terms (in terms of the centre country CPI), we denote this debt as $V^e_{t,i}$. Thus, EME bank $i's$ balance sheet is given by

$$N^e_{t,i} + RER_t V^e_{t,i} = Q^e_t Z_{t+1,i} \tag{3.3.1}$$

where RER_t is the real exchange rate, Q^e_t is the real price of EME capital, and $Z^e_{t+1,i}$ is the investment undertaken by the EME bank at time t.

Bank $i's$ net worth is the difference between the return on previous investment and its debt payments to the global bank.

$$N_{t,i} = R^e_{k,t} Q^e_{t-1} Z^e_{t,i} - RER_t R_{ct-1} V^e_{t-1,i}$$

where R_{ct-1} is the ex-post real interest rate received by the global bank, equal to the predetermined nominal interest rate adjusted by ex-post inflation in the centre country.

Because it has the ability to abscond with the proceeds of the loan and its existing net worth, the loan from the global bank must be structured so that the EME bank's continuation value from making the investment exceeds the value of absconding. Following Gertler and Karadi (2011), we assume that the latter value is κ^e_t times the value of existing capital. Hence denoting the bank's value function by $J^e_{t,i}$, it must be the case that $J^e_{t,i} \geq \kappa^e_t Q^e_t Z^e_{t+1,i}$. Here κ^e_t measures the degree of the agency problem, and is subject to exogenous shocks.

Once the bank has made the investment, at the beginning of period $t+1$ its return is realized.

The problem for an EME bank at time t is described as follows:

$$\text{Max} \;\; J^e_{t,i\;[Z^e_{t+1,i},V^e_{t,i}]} = E_t \Lambda^e_{t+1} \left[(1-\theta)(R^e_{k,t+1} Q^e_t Z^e_{t+1,i} - RER_{t+1} R_{ct} V^e_{t,i}) + \theta J^e_{t+1,i}\right]$$

subject to (3.3.1), and the incentive constraint given

$$J_{t,i}^{e} \geq \kappa_t^e Q_t^e Z_{t+1,i}^e$$

The full set of first order conditions for this problem are set out in the appendix.

The evolution of net worth averaged across all EME banks, taking account that banks exit with probability $1-\theta$, and that new banks receive infusions of cash from households at rate δ_T times the existing value of capital, can be written as:

$$N_{t+1}^{e} = \theta\left((R_{kt+1}^{e} - \frac{RER_{t+1}}{RER_t}R_{c,t})Q_t^e K_{t+1}^e + \frac{RER_{t+1}}{RER_t}R_{c,t}N_t^e\right) + \delta_T Q_t^e K_t^e$$

The first term on the right hand side captures the increase in net worth due to surviving banks, given their average return on investment. The second term represents the 'start-up' financing given to newly created banks by households.

Firms in the EME hire labour and capital to produce retail goods. Since a central aim of our analysis is to explore the impact of centre country monetary policy on capital flows and EME bank lending, we assume that firms in both countries have Calvo-style sticky prices with Calvo re-set parameter $1-\varsigma$. The representative EME firm has production function given by:

$$Y_t^e = A_t^e H_t^{e(1-\alpha)} K_t^{e(\alpha)}$$

Given this, then we can define the aggregate return on investment for EME banks (averaging across idiosyncratic returns) as

$$R_{kt+1}^{e} = \frac{R_{zt+1}^{e} + (1-\delta)Q_{t+1}^{e}}{Q_t^e}$$

where R_{zt+1} is the rental rate on capital and δ is the depreciation rate on capital.

The representative EME firm chooses labour and capital employment so as to minimize costs. We can then define the EME firm's real marginal cost implicitly by the conditions

$$MC_{et}(1-\alpha)A_t^e H_t^{e(-\alpha)} K_t^{e(\alpha)} = W_{rt}^{e} \tag{3.3.2}$$

$$MC_{et}\alpha H_t^{e(1-\alpha)} K_{t+1}^{e(\alpha-1)} = R_{zt}^{e}$$

In the appendix, we show that the Calvo pricing formulation implies the following specification for the PPI rate of inflation Π_{et} in the EME. Here Π_{et}^{*} denotes the inflation rate of newly adjusted goods prices, F_{et} and G_{et} are implicitly defined, and $\frac{\sigma_p}{\sigma_p-1}$ represents the optimal static markup of price over marginal cost.

$$\Pi_{et}^{*} = \frac{\sigma_p}{\sigma_p-1}\frac{F_{et}}{G_{et}}\Pi_{et} \tag{3.3.3}$$

$$F_{et} = Y_{et}MC_{et} + \mathbb{E}_t\left[\beta\varsigma\Lambda_{t,t+1}^{e}\Pi_{et+1}^{\eta}F_{et+1}\right] \tag{3.3.4}$$

$$G_{et} = Y_{et}P_{et} + \mathbb{E}_t\left[\beta\varsigma\Lambda_{t,t+1}^{e}\Pi_{et+1}^{-(1-\eta)}G_{et+1}\right] \tag{3.3.5}$$

$$\Pi_{et}^{1-\eta} = \varsigma + (1-\varsigma)\left(\Pi_{et}^{*}\right)^{1-\eta} \tag{3.3.6}$$

3.4. Monetary policy

In the baseline specification, the central bank follows a Taylor rule, i.e.

$$\log R_t = \lambda_{r,e} \log R_{t-1} + (1-\lambda_{r,e}) \left(\lambda_{\pi,e} \log \left(\frac{\pi_t^e}{\pi_{ss}^e} \right) + \lambda_{y,e} \log \left(\frac{Y_t^e}{Y_{ss}^e} \right) \right) + \varepsilon_{r,t}^e. \tag{3.4.1}$$

where $\varepsilon_{r,t}^e$ is a monetary policy shock.

In analysis we will also consider the response of the economy under the assumption that the central banks cooperate in order to implement the Ramsey optimal allocation. In this case they choose the allocation that maximizes the size-weighted average of households' welfare across countries, subject to the competitive equilibrium conditions. The details are provided in Appendix XX.

3.5. The centre country

The centre country households have similar preferences to those of the EME, and its production firms sell to the emerging market country households. The centre country's financial institution (the global bank) receives deposits from the households and guarantees them the risk-free interest rate in return. The global bank then invests in the centre country technology as well as the EME bank debt.

Centre country representative household preferences are:

$$E_0 \sum_{t=0)}^{\infty} \beta^t \left(\frac{C_t^{c(1-\sigma)}}{1-\sigma} - \frac{H_t^{c(1+\psi)}}{1+\psi} \right)$$

and their budget constraint is given by:

$$P_t^c C_t^c + B_t^c = W_t^c H_t^c + \Pi_t^c + R_t^* B_t^c + T_t^c$$

Centre country households make deposits in the banking system, and receive returns R_t^*. They receive profits Π_t^c from their own bank, net of capital infusions into the new banks. But as we've noted above, emerging market household do not deposit in their own banking system. Rather they purchase centre country treasury bills. To keep the notation simple, just assume that the EME residents buy treasury bills directly from the centre country government. Any net sale of treasury bills from the centre country government is rebated directly to the centre country households to the amount of T_t^c.

The definition of centre country CPI's, and bond and labour supply choices for the centre country households are exactly analogous to those of the EME country, so we omit them here. Likewise, the specification for capital producing firms and the dynamics of the aggregate capital stock for global banks is identical to that described for the EME economy. The appendix describes the full details of centre country household choices and capital producing firms.

3.6. Centre country banks

A representative global bank j has a balance sheet constraint given by

$$V_{jt}^{e} + Q_{t}^{c} Z_{jt+1}^{c} = N_{jt}^{c} + B_{t}^{c}$$

where V_{jt}^{e} is investment in the EME bank, and $Q_{t}^{c} Z_{jt+1}^{c}$ is investment in the centre country capital stock. N_{jt}^{e} is the bank's net worth, and B_{t}^{c} are deposits received from households. All variables are denominated in real terms, (in terms of the centre country CPI).

The global bank's value function can then be written as:

$$J_{jt}^{c} = E_{t} \max_{Z_{j,t+1}^{c}, V_{jt}^{e}, B_{t}^{c}} \Lambda_{t+1}^{c} \left[(1-\theta)(R_{kt+1}^{c} Q_{t}^{c} Z_{jt+1}^{c} + R_{ct} V_{jt}^{e} - R_{t}^{*} B_{t}^{c}) + \theta J_{jt+1}^{c} \right]$$

Here, Λ_{t+1} is the stochastic discount factor for centre country households, R_{ct} is, as described above, the return on the global bank's loans to the EME bank, and R_{t}^{*} is the risk-free rate paid to domestic depositors.

The bank faces the no-absconding constraint:

$$J_{jt} \geq \kappa_{t}^{c} \left[V_{jt}^{e} + Q_{ct} Z_{jt+1}^{c} \right]$$

where κ_{t}^{c} is a parameter measuring the degree of the agency problem, and which is subject to exogenous shocks.

We describe the first order conditions for the global bank in detail in the appendix. As in the case of the EME banks, we can describe the dynamics of net worth for the global banking system by averaging across surviving banks, and including the 'start-up' funding provided by centre country households. We then get the condition as follows

$$N_{t+1}^{c} = \theta \left(\left(R_{kt+1}^{c} - R_{t}^{*} \right) Q_{t}^{c} Z_{t+1}^{c} + \left(R_{c,t} - R_{t}^{*} \right) V_{t}^{e} + R_{t}^{*} N_{t}^{c} \right) + \delta_{T} Q_{t+1}^{c} K_{t}^{c} \qquad (3.6.1)$$

Again, the details of the production firms and price adjustment in the centre country are identical to those of the EME economy, so we leave the description to the appendix.

3.7. Monetary Policy

The central bank of the centre country, in our baseline specification, follows a Taylor rule of the type described above (see equation 3.4.1).

4. Calibration

Table 1 describes the full calibration for the model. We set the openness parameters ν^{e} and ν^{c} in line with the trade shares of the US with a group of emerging markets, and the trade shares of the same group of EME's with the US using the IMF DOT statistics (average shares since 2000). Given that the two shares are very similar in the data we set both to $\nu^{c} = \nu_{e} = 0.96$. The inter temporal elasticity of substitution is set at approximately unity, so that $\sigma = 1.02$. The Armington elasticity of substitution between home and foreign goods is 1.5, while the micro elasticity of substitution σ_{p} is 6. The discount factor is set at $\beta = 0.99$, while the Frisch elasticity of labour supply $\frac{1}{1+\psi}$ is set at 0.8. The parameter of production

Table 1: Parameter Values

Label	Value	Label	Value
n	0.15	$\nu_{p,c}$	0.96
σ_p	6	σ	1.02
ς	0.8	κ	0.38
$\lambda_{y,c}$	0.2	$\rho_{A,e}$	0.9
$\lambda_{\pi,c}$	1.2	$\rho_{A,c}$	0.9
$\lambda_{r,c}$	0.85	ρ_{ξ}	0
π	3.1416	$\rho_{\kappa,e}$	0.9
β	0.99	$\rho_{\kappa,c}$	0.9
δ	0.025	$\rho_{i,c}$	0.9
δ_T	0.004	σ_{Ae}	0.01
ζ	1.728	σ_{Ac}	0.01
η	1.5	σ_{ξ}	0.01
ψ	0.276	$\sigma_{\kappa,e}$	0.01
θ	0.96	$\sigma_{\kappa,c}$	0.01
α	0.3	$\sigma_{i,c}$	0.01
$\nu_{p,e}$	0.96		

are standard; the elasticity of hours in production, $1-\alpha$ is .7, while the depreciation rate δ is set at 0.025 (at quarterly frequency), and the parameter in the adjustment cost technology is 1.73. From Gertler and Karadi (2011) we take the banking sector parameters so that $\theta = 0.96$, $\kappa = 0.38$, and $\delta_T = 0.004$. On the basis of these parameter values we obtain steady state spreads of lending to borrowing rates and leverage ratios as described in Table 2.

We will focus on shocks to monetary policy and to 'financial shocks', represented by shocks to the parameter κ_t^c, the fraction of investment that can be obtained by an absconding global bank. We assume that monetary policy shocks are *i.i.d.* with a 1 percent standard deviation. Shocks to κ_t^c are AR(1) processes with persistent 0.9 and standard deviation of 1 percent also. The Taylor rule coefficients are chosen at standard levels.

5. Results

6. The impact of monetary policy on capital flows and international transmission

We first explore the impact of centre country monetary shocks on global GDP, capital flows, asset prices leverage, and interest rate spreads. The main set of questions we are interested in is how is the global impact of monetary tightening in the centre country affected by the presence of financial frictions. In addition, how does the relationship between global banks and local banks affect the spillover effects of monetary policy shocks, and how do these spillovers compare to the effect of a monetary policy shock in a standard multi country DSGE model without banks and financial frictions.

In addition, we wish to go beyond the question of transmission with financial frictions to address the question of how important is the monetary policy response in the EME country. Does the exchange rate policy followed by the EME significantly affect the international transmission mechanism in the presence of financial frictions? In other words, do financial frictions affect the 'insulation' properties of flexible exchange rates for an EME economy? A closely related question is to what extent does the currency of denomination of nominal liabilities affect the transmission properties of the model in response to centre country monetary tightening. Does 'liability dollarization' significantly exacerbate the cross country transmission of monetary shocks?

Figure 6.1 illustrates the first set of results for a monetary policy tightening in the centre country. The monetary shock is scaled to represent a 1% innovation to the policy rule. In the absence of financial frictions (where neither global nor the local banks incentive constraints are binding), and under a flexible exchange rate (plain line) the shock is almost wholly absorbed within the centre country. The EME country's real economy is well insulated from the monetary policy shock. The EME policy rate rises only slightly, and there is a sharp real depreciation of the EME currency, but almost no effect on EME GDP, investment, or asset prices. In the centre country itself, there is a sharp fall in GDP, investment and asset prices. We note also that, in the absence of financial frictions, the monetary policy tightening leads to an *increase* in bank lending to the EME. This result goes against the empirical evidence described above.

This small degree of international transmission of monetary policy in the absence of financial frictions is in line with existing models, and supports the theoretical presumption of an important role for flexible exchange rates in the response to external shocks. The Figure also illustrates the effect of the same shock, but assuming that the EME central bank chooses an exchange rate peg (but again without financial frictions, crossed line). In this case, the real exchange rate depreciation is dampened significantly, the EME short term policy rate rises sharply, and there is a significant fall in real GDP and investment in the EME. Interestingly however, in this case, bank lending to the EME still rises, relative to the initial steady state.

When we introduce financial frictions in the form described in our model however, the results are dramatically different. Figure 6.2 shows that in the baseline case, with financial frictions (solid-plain line), the monetary tightening in the centre country precipitates a large and persistent fall in capital inflows to the EME. The fall in bank loans causes a sharp fall in asset prices, an increase in bank leverage, and a rise in interest rate spreads in the EME. There is a general fall in investment and GDP of similar orders of magnitude in both the centre country and the EME. The contrast in these results with those in the economy without financial frictions is highlighted even more when we look at the comparison of the quantitative effects on leverage, asset prices and spreads across the two countries. Even though the monetary tightening is precipitated by the shock in the centre country, the rise the response of spreads, leverage and asset prices is greater in the EME. This is associated with a much greater fall in investment spending in the EME than in the centre country itself. These results are consistent with the observation that emerging markets are highly sensitive to sudden reversals of capital flows, especially those associated with monetary tightening in advanced economy markets. Moreover, the capital flows cause a financial accelerator response which amplifies the effects of the initial shock on the emerging market economy. The international transmission in this model is critically tied to the financial amplification mechanism coming from the linkage between bank's net worth and their asset valuation. A monetary tightening reduces aggregate demand and investment, which leads to a fall in the

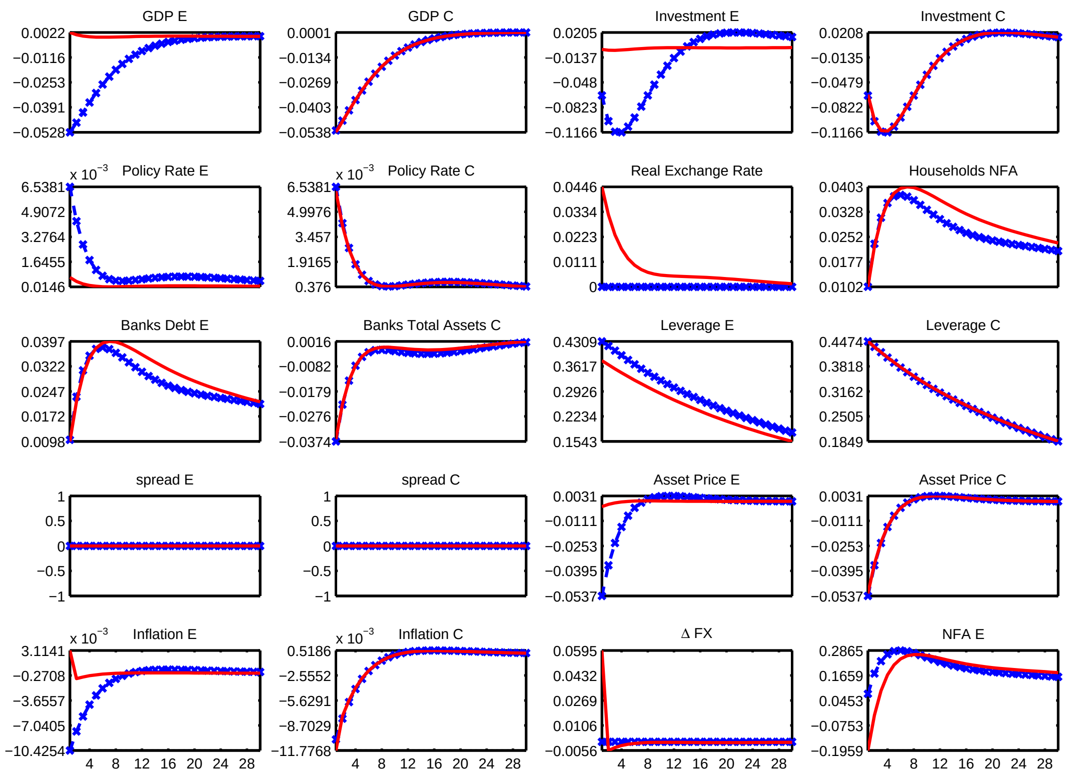


Figure 6.1: Monetary Policy Shock C. Plain line=Flexible exchange rate; Crossed line=Peg.

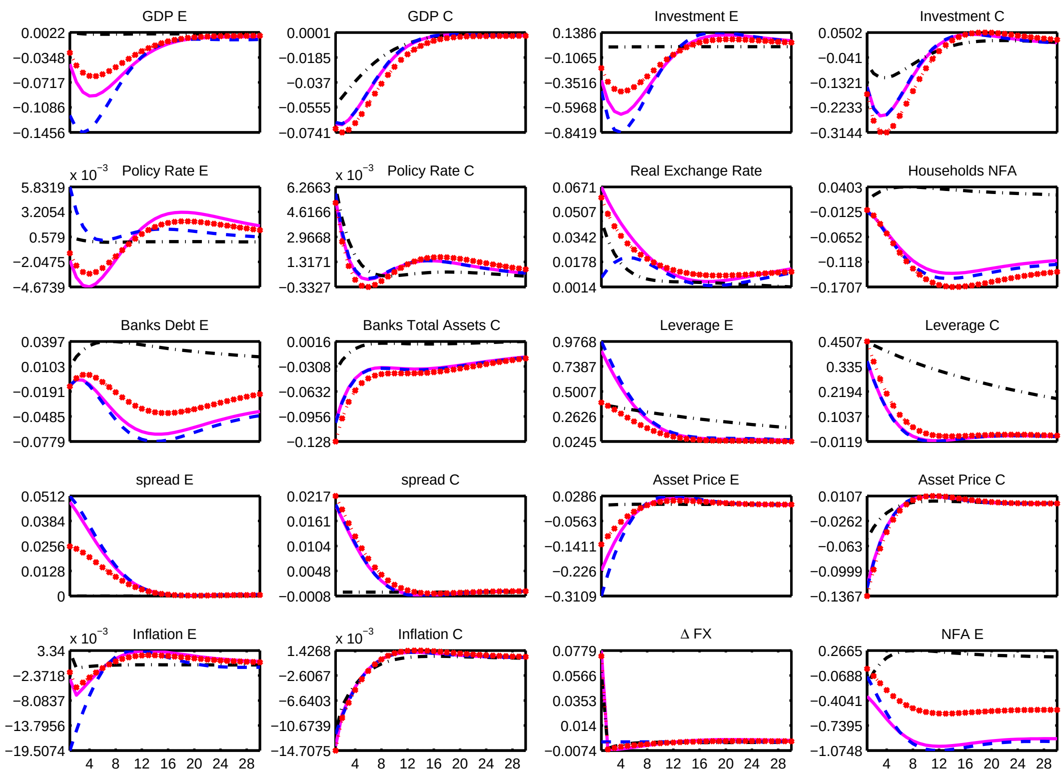


Figure 6.2: Monetary Policy Shock C. Solid=baseline; Dot-dashed=no. fin. frictions; Dashed=peg; Dots=local currency debt.

price of capital. This leads to a fall in bankers net worth in the centre country, amplifying the fall in investment. At the same time, the fall in centre country bank net worth leads to fall in capital flows to the EME, reducing investment and asset prices in the EME, generating a further fall in EME net worth. As a result interest rate spreads rise in both countries. In contrast to the case without financial frictions, we see that monetary tightening in the centre country leads to a substantial and persistence fall in global bank lending to the EME. And because of the 'double' spread affect - the balance sheet deterioration increases the spread of the global bank lending rate over the centre country risk-free rate, and also an increase in the EME bank's return on capital over its borrowing rates, we tend to get amplified responses of spreads, leverage and asset prices in the EME.

We can again ask how the exchange rate regime affects the international transmission linkages in the case of financial frictions. Here the results are very different from the conventional DSGE model. With financial frictions and bank-balance sheet linkages, there is relatively little difference between the baseline case and the EME monetary policy with pegged exchange rates (dashed line). The exchange rate peg does limit the EME real depreciation. This magnifies the fall in real GDP, since there is less compensating expenditure switching towards EME goods. But the fall in bank lending, the rise in leverage and spreads, the fall in asset prices, and the fall in EME investment is almost identical to that in the baseline case with flexible exchange rates. Thus, these results tend to support that argument that in the presence of financial friction both on the lending and borrowing side for the EME, there is only a limited role for nominal exchange rate adjustment in insulating the economy from external shocks. We will see this even more clearly in the case of a financial shock in the analysis below.

How do the results depend on the denomination of bank lending? The baseline case assumes that all borrowing is done in centre country currency (e.g. US dollars). Hence, the centre country monetary shocks precipitates an unanticipated depreciation in the EME currency that has a direct negative impact on the EME bank's net worth. This negative effect of 'liability dollarization' on balance sheets has been much discussed in the literature on emerging market crises and exchange rate adjustment (Bruno and Shin, 2014). Figure 6.2 illustrates the effect of this mechanism by contrasting it with the case where debt is denominated in domestic currency (dotted line). In that alternative specification, an unanticipated centre country monetary shock still generates a real exchange rate depreciation for the EME country, but there is no direct negative valuation effect on the EME banks balance sheet. The impulse responses show that under local currency denomination of liabilities the transmission effect of the centre country monetary contraction is lessened. The smaller impact on EME bank net worth leads to a smaller spike in the EME spread relative to the baseline case. EME leverage rises by less, and the asset price falls by less. Consequently the fall in investment and GDP is reduced by about 30% at their trough. But even without the direct valuation effect of the exchange rate change, the direct effect of the fall in centre country capital flows still leads to a large balance sheet deterioration and a fall in real activity. Relative to the case without financial frictions, there is still a large negative impact on EME investment and real GDP. Thus, quantitatively, the spillover effects of capital flows is magnified by US dollar funding, but this feature is only a part of the overall mechanism.

These results seem to underscore the message of Rey (2013) and others, suggesting that despite having flexible exchange rates, emerging market countries are extremely vulnerable to volatile capital flows related to US monetary policy shocks. Our model implies that this is true, in the presence of financially constrained bank lending and US dollar funding of loans. Exchange rate adjustment can then only play a limited role in mitigating the impact of shocks, and it suggests the need for other direct forms of capital restrictions or macro-prudential policies that directly target the balance sheets of banks. We address these questions more fully in the analysis below.

Absent financial constraints, however, we find that the exchange rate plays a major role in cushioning capital flow volatility. Without the endogenous response to balance sheets in our model, an inflation targeting monetary rule is highly successful in insulating the EME from centre country monetary shocks, while an exchange rate peg would lead exacerbate the response of capital inflows and the real economy to these shocks.

We should note of course that the monetary rule described above is an ad-hoc specification. An optimal monetary policy response can be designed that will do much better in response to the centre country monetary shock. In the case of an optimal cooperative monetary rule, this statement becomes trivial, because then it is always optimal to directly offset the monetary shock itself, and the impact of the monetary shock is entirely eliminated. But a more interesting question arises when the EME must response unilaterally. We explore this response in the section on non-cooperative monetary policy below.

Finally, we note that the impact of shocks in our model is extremely asymmetric. Figure 6.3 reports the effect on both the EME and the centre country of a monetary policy contraction of similar magnitude to that of Figure 6.2 but now coming from the EME country. First, we note that the impact on the C country real activity is negligible. This is to be expected, since the EME is small relative to the world economy. There is a fall in GDP in the EME, since the monetary contraction leads to an immediate real exchange rate depreciation. But remarkably, we find that the contraction in real activity in the EME is now smaller than in the response to the centre country shock. The critical feature is that the monetary shock in the EME does not directly impact on the EME banks balance sheet. In fact, there is a small boost to the bank's net worth, coming from the unanticipated real appreciation. But the effects on spreads, leverage and asset prices is small, and as a consequence, investment falls by substantially less than in response to an external monetary tightening.

7. Financial Shocks

The 2008-2009 financial crisis has motivated considerable research on the role of credit shocks. Jermann and Quadrini (2012) show, in a model with financial constraints, that financial shocks can explain the 2008-2009 US recession as well as other previous episodes. Helbling et al. (2011) provide empirical evidence on the role of financial shocks in driving global recessions. Boivin et al. (2013) shed light on the macroeconomic consequences of financial shocks for the US economy using a large set of macro and financial variables. Christiano et al. (2014) estimate a DSGE model with financial frictions à la Bernanke et al. (1999) and show that financial shocks (the idiosyncratic shock to financially constrained borrowers) are the most important shock driving the business cycle.

In this section we discuss the spillover effects of financial shocks originating in the centre country. Figure 7.1 shows impulse responses for a 1% increase in the incentive compatibility constraint parameter κ_t^c. The first noticeable effect of this shock is the relatively strong

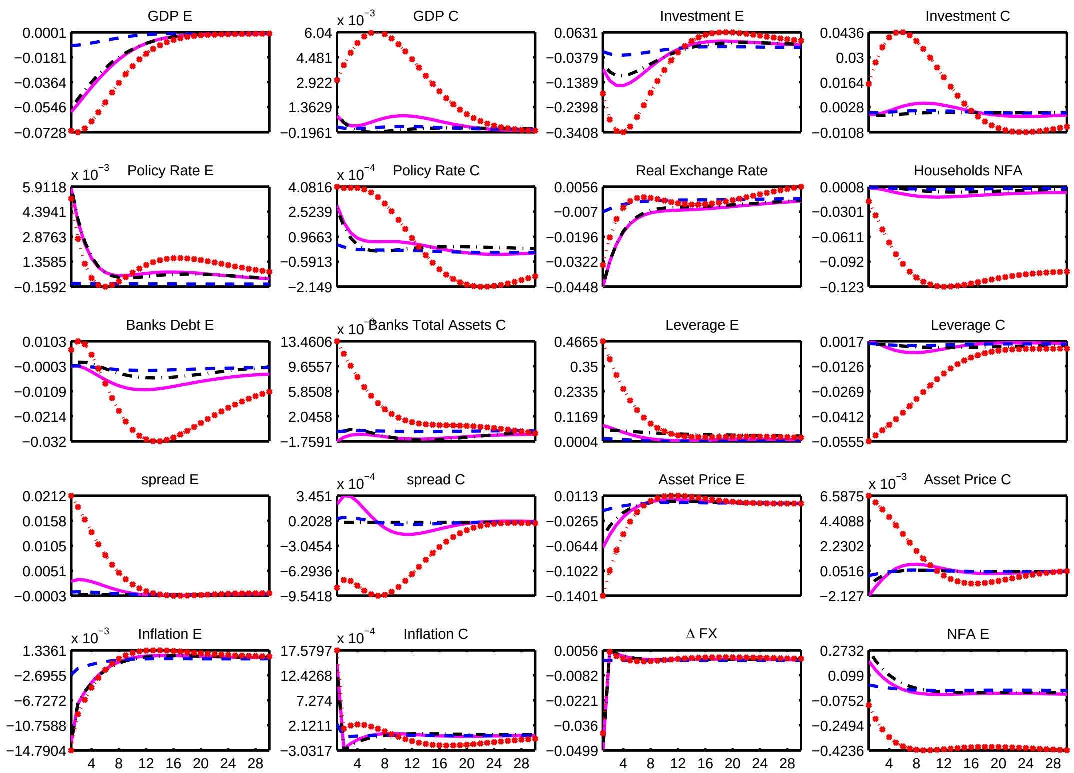


Figure 6.3: Monetary Policy Shock E. Solid=baseline; Dot-dashed=no. fin. frictions; Dashed=peg; Dots=local currency debt.

comovement across countries. As discussed by Devereux and Yetman (2010) and Dedola and Lombardo (2012), financial shocks in one single economy, in a world characterized by financial integration and financial frictions, can generate highly synchronized responses across countries. Another feature of our impulse responses is that they are rather invariant to the exchange rate regime or the currency denomination of liabilities. The synchronization of credit spreads (measured as wedges between the return on capital and the domestic policy rate) is the dominant factor in generating business cycle movements. The contraction in the emerging economy is markedly larger than that in the centre country (the epicentre of the shock), mainly due to the asymmetric size of the two economic regions.[4] In terms of capital flows the consequence of the centre-country financial shock is a "retrenchment" of international capital. Gross inflows into EME banks fall as do EME outflows from households. This adjustment is reminiscent of the capital flows observed during the 2008-2009 financial crisis (e.g. Broner et al., 2013).

8. Optimal cooperative monetary policy

So far we have documented that financial market integration can generate disproportional effects on EME of shocks originating in the centre country, quite independently of the exchange rate regime. These results, therefore, seem to provide theoretical support to Rey's description of the changed nature of the monetary policy problem in a world characterized by financial market integration: even under flexible exchange rates, free capital mobility is incompatible with an independent domestic monetary policy (Rey, 2013) . Nevertheless, in this section we show that a more appropriate description of the effects of financial integration on the policy problem is that capital flows exacerbate the policy trade-offs and, thus, require different policy strategies. It is well known that openness, in general, affects the optimal monetary policy response to shocks (e.g. Corsetti et al., 2010, Faia and Monacelli, 2008, Devereux and Sutherland, 2007, Devereux and Engel, 2003 Lombardo and Ravenna, 2014 and Kolasa and Lombardo (2014)). In particular a monetary policy strategy that seems appropriate under a particular mix of shocks ceases to be attractive under a different mix of shocks. Financial integration not only changes the trade-offs faced by central banks, it also changes the type of shocks that the economy is likely to experience. To illustrate this point, Figure 8.1 compares the baseline case with the optimal response under the Ramsey cooperative optimal policy.

The optimal policy is able to reduce considerably the effect of financial shocks on both economies. In particular the EME spread increases only modestly and less than the spread in the centre country. This is reflected in a considerably smaller asset-price decline and, thus, in a smaller fall in investment. Leverage and spreads co-move much less across countries than under the Taylor rule. In order to achieve this allocation, the Ramsey policy-maker needs to depart from the interest rate adjustment observed under the Taylor rule. In particular nominal interest rates fall markedly in both countries and inflation is allowed to increase, albeit only temporarily. The real exchange rate in the EME appreciates on impact, providing extra relief to the balance sheet of EME banks. The optimal policy strongly mitigates capital

[4]Note that the "financial wedges" move almost identically. The double layer of financial frictions de facto faced by the EME bank does not generate larger spreads than in the centre country.

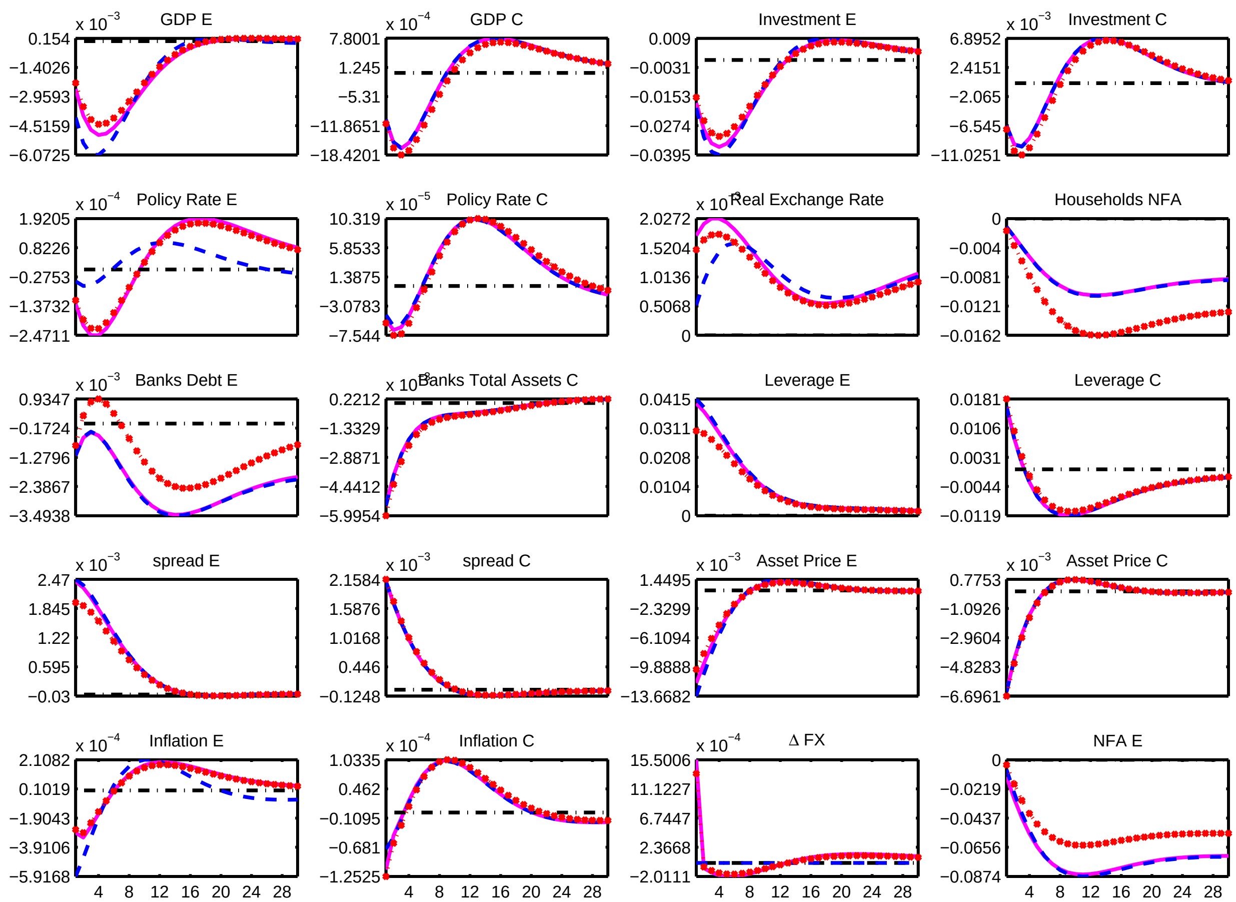


Figure 7.1: Financial shock in C. Solid=baseline; Dot-dashed=no. fin. frictions; Dashed=peg; Dots=local currency debt.

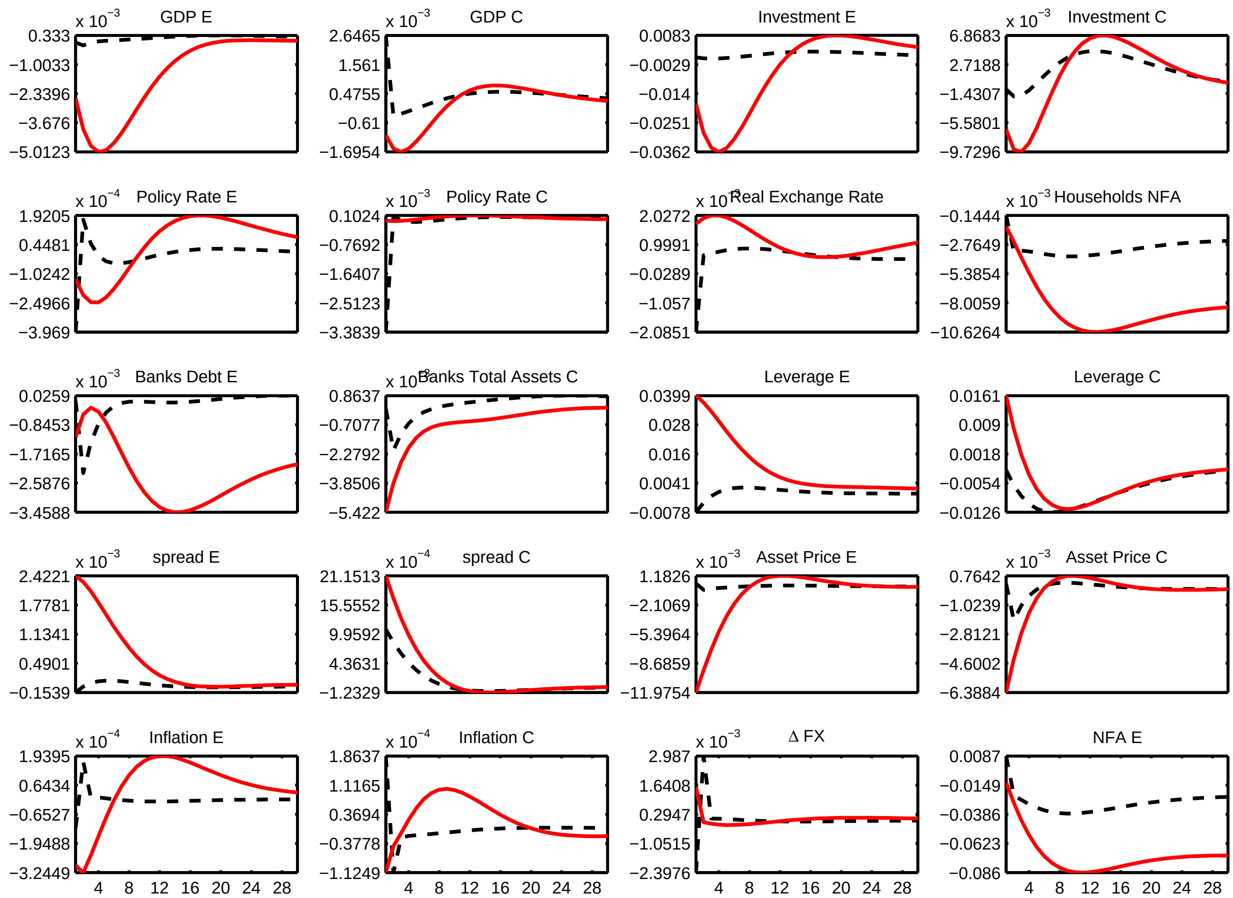


Figure 8.1: Financial shock in C. Solid=baseline; Dashed=Ramsey

"retrenchment", thus preventing the strong credit contraction that the Taylor rule brings about.

This section shows that domestic monetary policy matters, in a non-trivial way, even under financial integration. Nevertheless, it also shows that financial integration, and the spillovers of foreign financial shocks that come with openness, do exacerbate the trade-offs faced by central banks. The objective of inflation stabilization cannot be achieved to the same extent under financial integration. Stabilization of financial market variables becomes an important objective of policy, suggesting room for macro-prudential interventions (e.g. Farhi and Werning, 2013).

9. Non-cooperative monetary policy

The previous sections showed that while a naive Taylor rule has little advantage over an exchange rate peg, an optimal cooperative discretionary monetary policy could play an effective role in dealing with spillovers in international financial markets. But an obvious objection to this is that cooperative monetary policy is an unrealistic ideal. Practically speaking, monetary policy is set at the national level based on domestic objectives. How would our results differ if we allow for optimal monetary policy, but recognizing that policy is set by each country separately? In this section we analyse the effects of non-cooperative, self-oriented monetary policies. In particular we solve our model for the open-loop, Nash equilibrium and compare it with the baseline Taylor-type rule and the globally optimal Ramsey policy.

As it is well known, there is no single non-cooperative optimal policy, as the solution depends on the strategy space underlying the game. It is also known that defining the strategy space in terms of policy rates does not yield a saddle-path equilibrium. Alternatively one could choose to solve for the non-cooperative equilibrium in terms of explicit instrument rules (closed-loop Nash equilibrium). Nevertheless, in this case too there is some degree of arbitrariness both in the choice of the instrument and in the choice of the feedback variables and lags. Mindful of these issues, we proceed by providing results for a baseline case where the strategy space is defined in terms of PPI inflation. In the Appendix [to be written] we provide some robustness checks.

9.1. The non-cooperative policy problem

Each central bank chooses the allocation that maximizes the intertemporal welfare of the households living in its jurisdiction, i.e.

$$\max_{Y_t^E} \sum_{\infty}^{i=0} E_0 \beta^C BU\left(C_{t+i}, L_{t+i}\right) \tag{9.1.1}$$

subject to all the equations characterizing the decentralized equilibrium (i.e. FOC of the private agents and resource constraints, see Appendix for details), where β^{CB} is the discount factor of the central bank (which we take to be identical to the discount factor of the households) and Y_t^E is the vector containing all the endogenous variables of the model *except* the foreign variable that co-defines the strategy space.[5] A similar problem is solved by the center-country central bank.

The set of first order conditions of the two monetary authorities jointly defines the set of best-responses and, thus, the implicit policy rules followed by the central banks.

Like in the Ramsey case, we follow the "timeless" perspective advocated by Woodford (2003).

[5]Thus, if the PPI inflation rates $\pi_{GDP,t}^E$ and $\pi_{GDP,t}^C$ define the strategy space, Y_t^E excludes $\pi_{GDP,t}^C$ and Y_t^C excludes $\pi_{GDP,t}^E$. The policymakers recognize that the counterpart can freely choose one variable: it has one degree of freedom.

10. Comparison

Figure 10.1 compares the (cooperative) Ramsey policy with the Taylor-type rule used in our baseline specification as well as with the non-cooperative policy described above, under the assumption that the strategy space is defined in terms of domestic PPI inflation rates.

Under this strategy the non-cooperative policy generates dynamics in the main macro variables that are essentially identical to the fully cooperative one.

The lessons that we can draw from this results are the following. First, monetary policy is crucial in determining the response of the economy to shocks (compare the arbitrary Taylor-type rule with the two optimal rules). Second, an appropriately chosen monetary policy can considerably mitigate the spillovers from foreign shocks. Third, a self-oriented monetary policy response can achieve the same outcome of the fully cooperative policy.

So, while financial frictions and financial globalization could generate scope for cooperation in other policy dimensions (e.g. regulation), our analysis suggests that the gains from coordinating standard monetary policy are negligible. Furthermore, we are not considering exceptionally large shocks leading to a liquidity-trap equilibrium. Looking at the coordination gains of unconventional policies when policy rates hit the zero lower bound is beyond the scope of the present analysis.

11. Data, stylized facts and calibration [To be completed]

The set of facts that we could match include

1. Volatility
   - GDP, Investment, REER, Spreads, Capital flows
2. Correlations
   - Within country
     - GDP,Investment
     - Spreads, Investment
     - REER, Spreads
     - Policy rate, spreads
     - Policy rate, Investment
     - Investment, capital flows
     - Capital flows, spreads
   - Across countries
     - GDP,GDP
     - Investment, Investment
     - Policy rate,Policy rate
     - spreads,spreads
3. Impulse responses
4. Variance decomposition

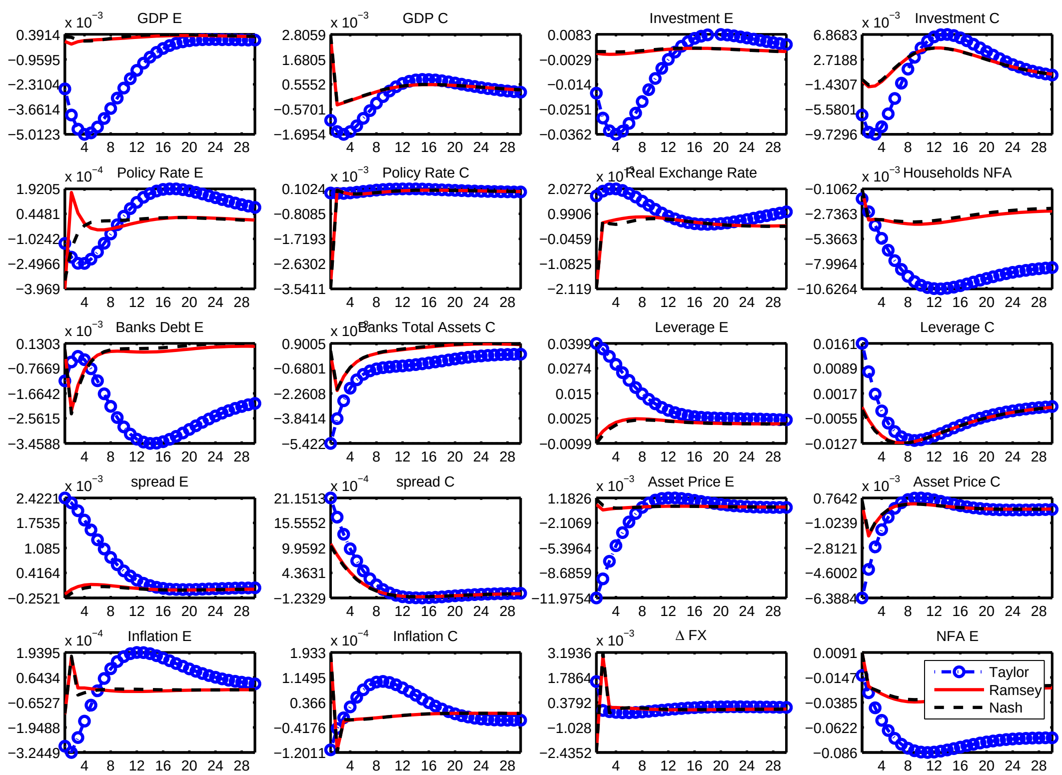


Figure 10.1: Policy responses to a financial shock in C; Nash under GDP-deflator-inflation strategy; Taylor=circled, Nash=dashed, Ramsey=solid.

Table 2: Steady state ratios

Spread C (annual bp)	149.3768
Spread E (annual bp)	253.4488
Leverage C	4.4687
Leverage E	4.0814
$\frac{GDP\ C}{GDP\ E}^{\dagger}$	2.8004

† Ratio of GDP levels.

Standard deviations	
DGDP_e	0.085
DGDP_c	0.071
DI_e	0.48
DI_c	0.195
I_GDP_e	1.474
I_GDP_c	0.451
pi_e	0.023
pi_c	0.019
R_e	0.018
R_c	0.009
spread_xp_e	0.096
spread_xp_c	0.034
Ve	0.78
RER	0.764
HNFA_E	3.252
NFA_E	3.252
Ve_GDP	0.36
NX_GDP	0.169
Correlations	
DGDP_e – vs –DGDP_c	0.546
DGDP_e – vs –DI_e	0.804
DGDP_c – vs –DI_c	0.851
I_GDP_e – vs –NX_GDP	-0.191
I_GDP_c – vs –NX_GDP	-0.094
spread_xp_e– vs –Ve_GDP	0.771
spread_xp_e– vs –spread_xp_c	0.948
DGDP_e – vs –spread_xp_e	-0.432
DGDP_c – vs –spread_xp_c	-0.445
spread_xp_e– vs –RER	0.165

12. Conclusions

The post crisis years have exposed substantial strains in the workings of the international financial system. Excessive volatility in international capital flows have raised questions about the efficacy of self-oriented monetary policies and the benefits of flexible exchange rates under inflation targeting. This paper develops a simple template which allows both for an understanding of the sources of excess volatility of capital flows to emerging markets, as well as an evaluation of policy responses to capital flows. Our results so far indicate that the simple prescriptions about the benefits of flexible exchange rates and inflation targeting are very unlikely to hold in a global financial environment dominated by the currency and policy of a large financial centre, such as the current situation with the US dollar and US monetary policy. Our preliminary analysis does suggest however that an optimal discretionary monetary policy can substantially improve the workings of the international system, even in the absence of direct intervention in capital markets through macro-prudential policies or capital controls. Moreover this can still be consistent with national independence in policy, or in other words, a system of 'self-oriented' monetary policy making.

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