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COMPOSITION OF INTERNATIONAL CAPITAL FLOWS: A SURVEY

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Composition of International Capital Flows: A Survey*

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Abstract

We survey several mechanisms that explain the composition of international capital flows: foreign direct investment, foreign portfolio investment and debt flows (bank loans and bonds). We focus on information frictions such as adverse selection and moral hazard, and exposure to liquidity shocks, and discuss the following implications for composition of capital flows: (1) home-court information advantage; (2) panic-based capital-flow reversals; (3) information-liquidity trade-off in the presence of source and host country liquidity shocks; (4) moral hazard in international debt contracts; and (5) risk sharing role of domestic bonds in the presence of home bias in goods and equities.

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1. Introduction

Economists tend to favor capital mobility across national borders as it allows capital to seek out the highest rate of return. Unrestricted capital flows further offer several advantages. First, international flows reduce the risk through the diversification of lending and investment. Second, the global integration of capital markets can contribute to the spread of best practices in corporate governance, accounting standards, and legal practices. Third, the global mobility of capital limits the ability of governments to pursue bad policies. In an integrated world capital market with perfect information, all forms of capital flows would be indistinguishable. Information frictions and incomplete risk sharing are important elements needed to differentiate between equity and debt flows, and between different types of equities.

Capital flows can be classified into the following types: foreign direct investment (FDI), foreign portfolio investment (FPI), and debt. Capital flows that have equity-like features (FDI and FPI) are presumed to be more stable and less prone to reversals. Among equity flows, FDI yields more benefits than others because it comes with more direct control of management. In contrast, foreign debt flows, consisting of bank loans and bonds, are regarded as more volatile.

The purpose of this survey is to elucidate some important mechanisms that explain key features of international capital flows:

1. With information asymmetry between foreign and domestic investors, a country which finances its domestic investment through foreign debt or foreign equity portfolio flows, will inefficiently allocate its capital. FDI, however, has the potential to generate an efficient level of domestic investment.

2. Exposure to liquidity shocks makes financial institutions vulnerable to runs by domestic investors and foreign creditors. Maturity mismatch when long-term investments are financed with short-term debt may induce, and exacerbate, a financial crisis and lead to sudden reversals of short-term international capital flows.

3. Foreign direct investment is associated with higher liquidation costs due to the adverse selection. The exposure to liquidity shocks in the source and host countries, affects the volume of foreign direct investment flows relative to portfolio investment flows; based on a trade-off between information and liquidity. This trade-offs helps to explain the composition of equity flows between developed and emerging countries, as well as the patterns of FDI flows during financial crises. In particular, it explains why the developing countries tend to attract a larger share of capital in the form of FDI than the developed countries.

4. The moral hazard problem in conjunction with willingness to repay debt obligations, coupled with limited enforcement, helps explain why countries experience debt outflows in a low income period, in contrast to the predictions of the complete-market paradigm.

5. Bond holdings become a better hedge against real exchange rate risks than equities, in the presence of home bias in goods, which induces home bias in equities. The latter provide the hedge against non-financial income risks.

The organization of the survey is as follows. In section 2, we describe the pecking order between FDI, FPI, and debt in the presence of the home-court information advantage. Section 3 surveys panic-based models of bank loans. Section 4 highlights the distinction between FDI and FPI in the presence of asymmetric information and liquidity risks. Section 5 captures the effect of moral hazard in international debt contracts. Section 6 focuses on models with home bias in goods and services. Section 7 concludes.

2. Home-Court Information Advantage

Strong evidence exists that there is a home-court advantage in international portfolio investment. One explanation is an information asymmetry between domestic and foreign investors about the expected performance of domestic firms. As we demonstrate below, an information asymmetry can cause an aggregate production inefficiency, and lead to foreign under-investment and domestic over-saving. As a result, the marginal productivity of capital at home is high relative to the home country marginal cost of importing capital.

Empirical studies by Portes, Rey and Oh (2001), and Loungani, Mody and Razin (2002) suggest that informational asymmetries significantly contribute to the negative relationship between asset trade and distance. The gravity models predict that bilateral international transactions are positively related to the size of the two economies and negatively to the distance between them. Distance is measured as a proxy for informational frictions, transaction and transportation costs.

In Froot and Stein (1991), Klein and Rosengren (1994), Klein, Peek and Rosengren (2002), the hypothesis is that FDI is information intensive, and thus FDI investors, who know more about their investments than outsiders, face a problem in raising resources for their investments. Gordon and Bovenberg (1996) assume asymmetric information between domestic investors and foreign investors to explain the home bias phenomenon. Razin and Sadka (2003) analyze the gains from FDI when foreign direct investors have superior information on the fundamentals of their investment, relative to foreign portfolio investors.

Razin, Sadka and Yuen (1998) explored a pecking order among the three types of capital flows: debt, equity, and FDI in the context of a model in which domestic savers and FDI investors are endowed with better information than the portfolio foreign investors. The ranking of capital inflows is somewhat similar to the pecking order of the corporate capital structure. Recall that in corporate finance the hypothesis maintains that the firms prefer internal finance (retained earnings, the analogue of FDI in the case of international flows) to external finance. If the latter is required, then firms will issue the safest security (the analogue of debt flows), and they will issue new equity (the analogue of equity portfolio flows) only as a last resort.

2.1 Pecking Order of Capital Flows

Pecking order in corporate finance ranks internal finance at the top, debt finance in the middle, and equity finance at the bottom. A driving force behind the international finance efficiency ranking is that domestic investors are better informed than their domestic counterparts. The pecking order puts FDI first and debt and portfolio equity second. This is because that whereas asymmetric information plagues debt and portfolio equity foreign investment, direct foreign investors, by having control over management, neutralize the information advantage of domestic investors.

Accordingly, Razin, Sadka, and Yuen (1998) consider a small, capital-importing country referred to as a home country. There are N ex-ante risk-neutral identical domestic firms. There are two time periods. Each firm chooses capital input K in the first period. In the second period, the output is equal to $F(K)(1+\varepsilon)$, where $F(\cdot)$ is a production function exhibiting diminishing marginal productivity of capital and ε is a random productivity factor. The productivity factor ε is independent across firms, it has zero mean and is bounded below by -1. The cumulative distribution function of the productivity shock ε is $\Phi(\cdot)$. The domestic interest rate is denoted by r and foreign by r^*.

2.1.1 Foreign Debt Investment

Investment decisions through debt finance are made by firms before ε is observed. Given its investment decision (K) at a stage where uncertainty is unresolved, a firm may choose to default on its debt if $F(K)(1+\varepsilon)$ is smaller than $K(1+r)$. Therefore, firms with productivity $\varepsilon > \varepsilon_0$ will fully repay their non-recourse loans, where ε_0 is a threshold level of ε, such that $F(K)(1+\varepsilon_0) = K(1+r)$. So, the fraction of solvent firms is $N\left(1-\Phi(\varepsilon_0)\right)$.

Assume that domestic firms are better informed than the foreign lenders. They are able to observe productivity ε before making their loan decisions. Thus domestic lenders will extend loans only to firms with productivity $\varepsilon > \varepsilon_0$. In contrast, foreign lenders will advance loans to all firms since they do not observe ε at this stage. Denote the fraction of solvent firms financed by foreign lenders by β. Therefore, the expected payoff of foreign lenders is given by

$$\text{Payoff} \equiv \beta N(1-\Phi(\varepsilon_0))K(1+r) + N\Phi(\varepsilon_0)F(K)(1+e^-), \quad (1)$$

where $e^- \equiv E[\varepsilon \mid \varepsilon \le \varepsilon_0]$. The amount of loans given by foreign lenders is given by $Loan \equiv (\beta N(1-\Phi(\varepsilon_0)) + N\Phi(\varepsilon_0))K$.

The expected value of the representative firm

$$V \equiv F(K) - [(1-\Phi(\varepsilon_0))K(1+r) + \Phi(\varepsilon_0)F(K)(1+e^-)]. \quad (2)$$

Accordingly, the value maximizing level of K is such that

$$F'(K) = \frac{(1-\Phi(\varepsilon_0))K(1+r)}{1-\Phi(\varepsilon_0)(1+e^-)}, \quad (3)$$

which implies that due to the possibility of default,

$$F'(K) < 1+r. \quad (4)$$

This inequality represents an over-saving inefficiency: domestic stock of capital is larger than what domestic savers are willing to pay for in terms of foregone present consumption.

The expected payoff of the foreign lender should be equal to the capital income on loans, which implies that $r^* < r$ and

$$F'(K) > 1+r^*. \quad (5)$$

This means that aggregate production is inefficient and the country can potentially gain from the debt-financed increase in the stock of domestic capital.

Although debt instruments specify that the issuer of these instruments must pay a fixed value, in the case of default the lender becomes an equity holder. Thus inefficient foreign financing also applies to foreign portfolio investment, as we demonstrate in the next subsection.

2.1.2 Foreign Portfolio Investment

As before, all firms choose investment level K in the first period before the random productivity factor ε is observed. All firms are originally owned by domestic investors, who equity finance their capital investment. Foreign investors do not observe the productivity ε when they purchase shares in existing firms. Therefore, they offer to buy at the same price all firms, with low and high productivity. The price therefore reflects the average productivity of the firms foreigners invest in. As a result, there is a threshold level of productivity ε_0 such that initial owners of firms whose productivity above ε_0 will not be willing to sell at that price.

The value of the representative firm is equal to $F(K)(1+\varepsilon)$. Thus the threshold productivity ε_0 is defined by

$$\frac{F(K)(1+e^-)}{(1+r^*)} = \frac{F(K)(1+\varepsilon_0)}{(1+r)}, \tag{6}$$

If foreigners have positive holdings in domestic firms, then it is necessary that $r^* < r$.

Then, the amount of foreign portfolio investment is given by

$$FPI = \frac{N\Phi(\varepsilon_0)F(K)(1+e^-)}{(1+r^*)}. \tag{7}$$

The firm's expected market value net of the original capital investment is

$$V = \Phi(\varepsilon_0)\frac{F(K)(1+e^-)}{(1+r^*)} + (1-\Phi(\varepsilon_0))\frac{F(K)(1+e^+)}{(1+r)} - K. \tag{8}$$

Maximizing this expression with respect to K yields the following condition:

$$\Phi(\varepsilon_0)\frac{F'(K)(1+e^-)}{(1+r^*)} + (1-\Phi(\varepsilon_0))\frac{F'(K)(1+e^+)}{(1+r)} - 1 = 0. \tag{9}$$

Because the firm knows, when making its capital investment decision, that it will be sold at a premium if faced with low-productivity events, it tends to overinvest relative to the rate of return to domestic investors and under-invest relative to the rate of return to foreign investors,

$$\left(1+r^*\right) < F'(K) < \left(1+r\right). \tag{10}$$

As in the case with debt flows, the information asymmetry between domestic and foreign investors creates inefficiencies, such as over-saving by domestic investors and under-investment by foreigners, that reduce the gains from international capital flows.

2.1.3 Foreign Direct Investment

The foreign direct investor buys a domestic firm before the investment decision is made. So, the foreign investors and direct investors are equally informed. The capital K^* is imported from the foreign country, and the output is $F(K^*)(1+\varepsilon)$. J is the number of firms bought by foreign investors. The market value of the firm sold to foreign direct investors is

$$V^* = \frac{F(K^*)}{\left(1+r^*\right)} - K^*. \tag{11}$$

Therefore, the amount of foreign direct investment is given by

$$FDI = J(K^* + V^*). \tag{12}$$

In an equilibrium with positive number of firms owned by both domestic and foreign investors, $V^* = V$, where $V = \frac{F(K)}{\left(1+r\right)} - K.$

The optimal level of capital investment K^* and K should satisfy

$$F'(K^*) = 1 + r^*, \tag{13}$$
$$F'(K) = 1 + r.$$

When FDI investors have access to the domestic debt market then $r = r^*$ and we get $F'(K^*) = (1 + r^*) = F'(K) = 1 + r$. That is, global capital markets are efficient. In the case of FDI, the asymmetric information problems are alleviated due to the actual exercise of management and control.

3. Debt Flows

Debt flows remain the dominant form of flows to developing economies, although their relative importance has declined over time. The empirical literature on financial globalization documents a systematic empirical link between exposure to debt flows and the likelihood and severity of financial crises. Rodrik and Velasco (1999) find that countries with a larger short-term debt stock than reserves are more likely to experience a financial flows reversal. Tong and Wei (2009) find that a large pre-crisis exposure to non-FDI capital inflows tends to be associated with a more severe credit crunch during the crisis. However, debt flows can be beneficial in certain circumstances. A country that has no access to equity or FDI inflows, might still be able to benefit from debt inflows to finance illiquid investments (Diamond and Rajan, 2001).[1]

Wei (2006) argues that sudden reversals of capital flows are more likely to occur among countries that rely relatively more on portfolio debt flows, including bank loans, and less on FDI. Moreover, short-term bank loans to developing countries tend to increase during booms and rapidly decrease during economic slowdowns. Claessens, Dooley and Warner (1995) find that long-term debt flows are often as volatile as short-term flows. The procyclicality and high volatility of debt flows can lead to inefficient capital allocation and generate moral hazard. McKinnon and Pill (1996) show financial liberalization without adequate supervision can result in over-borrowing by banks. Furthermore, banks may expose their balance sheets to currency risk if taking speculative open positions in foreign exchange are permitted.

3.1 Bank Loans and Banking Crises

Banks engage in maturity transformation: consumers deposit money in their bank account, and banks invest a part of these deposits in long-term investments. Therefore, there is a mismatch between the maturities of the liquid deposits of the consumers and the illiquid investments of the bank. Such maturity mismatch makes them vulnerable to bank runs. If too many consumers decide to withdraw their funds simultaneously from a bank, the bank may fail. Diamond and Dybvig (1983) demonstrate that (with common knowledge about the fundamentals of investment returns), there is a possibility of self-fulfilling bank run equilibrium.

1 See Kose, Prasad, Rogoff, and Wei (2006) for a survey of the literature on the volatility and risk of debt flows.

In the Diamond and Dybvig (1983) model there are three periods $(0,1,2)$, one good, and a continuum $[0,1]$ of consumers. Each consumer is born in period 0 with an endowment of one unit of the good. Consumption occurs only in periods 1 or 2 (c_1 and c_2 denote corresponding consumption levels). Each consumer can be of two types: with probability λ the consumer is impatient and with probability $(1-\lambda)$ is patient. Consumers privately learn their types at the beginning of period 1, and their types are $i.i.d$.[2] Impatient agents derive utility only from consumption in period 1, $u(c_1)$. Patient agents can consume at either period. The expected utility is given by $\lambda u(c_1)+(1-\lambda)u(c_2)$. There is a productive long-term technology: for each unit of input in period 0, the technology generates 1 unit of output in period 1 or R units of output in period 2 where $R>1$.

A bank offers *demand deposit* contracts to consumers. Each consumer deposits his endowment in the bank in period 0. The contract gives a depositor the right to withdraw his deposit in period 1, and to receive a fixed payment r_1 which is larger than the short-run return of 1. However, if a depositor waits until period 2, he receives a random payoff of r_2 which is the amount of non-liquidated investments divided by the number of remaining depositors. These payments are maintained as long as the bank has enough resources to pay every depositor who withdraws early. If the bank does not have a sufficient amount of resources, it liquidates all the investments and divides them among consumers who demand withdrawal in period 1. In that case, consumers who wait until period 2 receive nothing.

As long as the expected period 2 payment is higher: $u\left(\frac{1-\lambda r_1}{1-\lambda}R\right)>u(r_1)$, all patient consumers would prefer to wait until period 2. This is the first-best equilibrium. There exists also a second equilibrium in which all consumers demand early withdrawal. When they do so, the first period payment is $r_1=1$ and the second period payment is $r_2=0$. In this case, it is indeed optimal for consumers to withdraw their deposits early.

Therefore, if there is common knowledge about the fundamentals, there exist multiple equilibria. This means that at each realization of the fundamental, consumers may coordinate on any one of these multiple equilibria. Bank runs arise because of a coordination failure. When many run on the bank, it can fail due to the illiquidity generated by the run.

2 Since there is no aggregate uncertainty, λ is also a fraction of impatient consumers in the economy.

Figure 1 illustrates the welfare levels for (i) autarky equilibrium(A), (ii) first-best equilibrium, and (iii) bank run equilibrium. There is a clear welfare ranking: first-best equilibrium is superior to an autarky, and an autarky is superior to an equilibrium with bank runs.

Goldstein and Pauzner (2005) assume consumers do not have common knowledge regarding the fundamentals of the economy, but instead receive noisy signals. The model with noisy signals has a unique equilibrium in which the fundamentals determine whether a bank run will occur.

Suppose the long-term technology has a random payoff: R with probability $p(\theta)$ and 0, otherwise. The state θ is random, and it is unknown before period 2. The consumer receives an imperfect private signal θ_i about the true value of θ, before he decides on whether or not to withdraw his deposit. The signal has two effects. First, it provides information about the fundamental (or the probability $p(\theta)$). A larger signal implies a higher forecasted probability, $p(\theta)$. Consequently, the incentive to run on the bank by patient consumers who receive the signal is reduced. Second, the signal provides information about the signals received by others. The higher the signal, the more probable that others receive high signals too. This effect also reduces the incentive of a patient consumer to run on the bank. There is consequently a unique threshold signal, θ^*, in which patient consumers run if they observe a signal below a certain threshold and do not run if above. A patient consumer's action is uniquely determined by his signal: he demands early withdrawal if and only if his signal is below a certain threshold.

Specifically, there are three regions of the fundamental. In the lower region, the bank is insolvent and the run occurs. In the middle region, the bank is solvent, but only a fraction of the late consumers withdraw their deposits. In the high region, a bank run does not occur. As the signals are positively correlated with the fundamental θ, the fraction of consumers who withdraw their deposits in period 1 is decreasing in θ: the higher is θ, the lower is the incentive to run. Therefore, the bank will take this probability into account in designing deposit contracts and depositors will coordinate on θ_i as it provides information about the signals received by others: the higher is θ_i the more likely that others receive high θ_i, hence, less incentive to run.

The following two policy measures are adopted in order to prevent bank runs: suspension of convertibility and deposit insurance. However, there are costs associated with each policy. Suspension of convertibility may deny consumption to agents who face early liquidity needs. By providing deposit insurance the government eliminates runs in the middle region. However, the government creates moral hazard, providing an incentive for the bank to offer an excessively high deposit rate, which increases the region of insolvency. As a result, banks become more vulnerable to runs when they offer more risk sharing.

Therefore, moral hazard creates a systemic risk. The way to avoid this effect is to put restrictions on banks' decisions. In the model, it means limiting the deposit rate.

3.2 Capital Flow Reversals

Banks tend to finance long-term investment with short-term debt. Such debt maturity structure makes financial institutions vulnerable to bank runs. Even a small shock may result in financial distress, leading to costly asset liquidation and a large decline in asset prices. Furthermore, domestic bank runs may interact with panics by foreign creditors.

Chang and Velasco (2001) apply the Diamond-Dybvig model to international capital flows, in order to explain sudden reversals of short-term international capital flows. They show that if the financial system's potential short-term obligations exceed the liquidation value of assets, the domestic financial system may collapse. For example, almost all of the countries that experienced financial crises in the 1990s had the combination of large short-term liabilities[3] and relatively scarce internationally liquid assets (Furman and Stiglitz, 1998). Furthermore, in the economy which has access to the international capital markets, bank runs may be associated with balance-of-payments crises and currency crises.

Chang and Velasco (1998) provides an analysis of how capital mobility can cause a collapse of a fixed exchange rate system. The ability of governments to come to the rescue of domestic banks under attack is severely limited by the availability of international reserves. In the economy with a fixed exchange rate regime, foreign currency outflows put pressures on the currency peg. If the probability that the currency crash increases, bank runs become more likely, which in turn puts even more pressure on the currency. As a result, in emerging economies financial crises are usually accompanied by a currency crisis.

Moreover, foreign creditors in emerging economies may have better access to the world capital markets than domestic investors. Therefore, foreign creditors may be more likely to run on the bank than domestic creditors. With a high fraction of foreign credits, bank failures may coincide with capital flow reversals, thereby creating a balance of payments crisis. Krugman (2000) develops a general equilibrium model where the endogenously determined real exchange rate interacts with the balance sheet of domestic investors, because their borrowings are financed by foreigners. A depreciation of the real exchange rate negatively affects investors' balance sheets, causing a sharp fall in investment spending. Self-fulfilling multiple equilibria ensue.

Real exchange depreciation may cause bank runs as well as aggravate their impact on the economy. Since assets are typically denominated in the domestic currency while debt is denominated in a foreign

[3] In Mexico in 1995, Russia in 1998, and Brazil in 1999, the debt was mostly owned by government; in Indonesia, Korea, and Thailand in 1997, it was primarily owned by private banks and firms.

currency, an unanticipated depreciation or devaluation increases the value of debt. For example, a substantial amount of debt denominated in a foreign currency was a prominent feature of financial markets in Latin America in the 1990s. (Mishkin, 1996)

4. Equity Flows and Liquidity Shocks

An empirical regularity is that the share of FDI in total foreign equity flows is larger for developing countries than for developed countries. Regarding the second moments of foreign equity flows, it is known that the volatility of FDI net inflows is, in general, much smaller than that of FPI net inflows. Moreover, empirical analysis has established that the differences in volatility between FPI and FDI flows are much smaller for developed economies than for developing economies.

Rossi and Volpin (2004) find that the volume of M&A activity is significantly larger in countries with better corporate governance standards and stronger investor protection. Albuquerque (2003) argues that financially constrained countries borrow more through FDI because FDI is harder to expropriate. Albuquerque, Loayza, and Serven (2005) analyze the dynamics of FDI in response to increased integration of capital markets. They find that financial integration increases the relative importance of global factors as drivers of foreign investment. Furthermore, developing countries' exposure to global factors has increased faster than that of developed countries.

Goldstein and Razin (2006) focus on the information-liquidity trade-off of FDI relative to FPI. FDI investors are in effect the managers of the firms under their control, whereas FPI investors effectively delegate decisions to managers. Consequently, direct investors are more informed than portfolio investors regarding the prospects of their projects. This information enables direct investors to manage their projects more efficiently.[4] This informational advantage, however, comes at a cost. If investors need to sell their investments before maturity because of liquidity shocks, the price they can get will be typically lower when buyers know that they have more information on the fundamentals of the investment project. A key implication of the model is that the choice between FDI and FPI will be linked to the likelihood with which investors expect to get a liquidity shock.

4.1 Information-Liquidity Trade-off between FDI and FPI

Information advantage in the case of FDI can turn into a disadvantage due to an adverse selection problem when assets must be liquidated prematurely when a source-country liquidity shock occurs.

[4] The idea that control increases efficiency and value of the firm is supported empirically by recent papers in the international finance literature (Perez-Gonzalez, 2005 and Chari *et al*., 2005).

Accordingly, Goldstein and Razin (2006) consider a small economy faced by a continuum $[0,1]$ of foreign investors. Each foreign investor has an opportunity to invest in one investment project. Foreign investment can occur in one of two forms: either as a direct investment or as a portfolio investment. A direct investor effectively acts like a manager, whereas in the case of a portfolio investment, the project is managed by an outsider.

There are three periods of time: 0, 1, and 2. In period 0, each investor decides whether to make a direct investment or a portfolio investment. In period 2, the project matures. The net cash flow from the project is given by

$$R(K,\varepsilon) = (1+\varepsilon)K - \frac{1}{2}AK^2, \tag{14}$$

where ε is an idiosyncratic random productivity factor, which is independently realized for each project in period 1, and K is the level of capital input invested in the project in period 1, after the realization of ε. The parameter A reflects production costs. The productivity shock ε is distributed between -1 and 1 with mean 0 with the cumulative distribution function $\Phi(\cdot)$, and the density function is $f(\cdot) = \Phi'(\cdot)$. Investors choose the form of investment that maximizes (ex-ante) expected payoff.

In period 1, after the realization of the productivity shock, the manager of the project observes ε. Thus, if the investor owns the project as a direct investment, she observes ε, and chooses K, so as to maximize the net cash flow: $K^d(\varepsilon) = \dfrac{1+\varepsilon}{A}$.

Therefore, the ex-ante expected net cash flow from a direct investment, if held until maturity, is:

$$EV_D = \frac{E\left((1+\varepsilon)^2\right)}{2A}. \tag{15}$$

In the case of a portfolio investment, the owner has an arms length relationship with the manager, and thus she cannot observe ε. In this case, the owner maximizes the expected return absent any information on the realization of ε; and decisions are based on the ex-ante 0 mean. Thus, the manager will be instructed to choose $K^p = K^d(0) = \dfrac{1}{A}$. Then, the ex-ante expected payoff from a portfolio investment, if held until maturity, is:

$$EV_P = \frac{1}{2A}. \tag{16}$$

Comparing (15) with (16), we see that if the project is held until maturity, it yields a higher payoff as a direct investment than as a portfolio investment. This reflects the efficiency that results from a hands-on management style in the case of a direct investment.

There are also costs for FDI investment, however. First, an FDI investor has to incur a fixed cost in order to acquire the expertise to manage the project directly. We denote this cost, which is exogenously given in the model, by C. Second, there is an endogenous cost arising from the possibility of liquidity shocks occurring in period 1. There is a discount when selling a project managed as direct investment due to information asymmetries, as demonstrated below.

In period 1, before the value of ε is observed, the owner of the project might get a liquidity shock. With the realization of a liquidity shock, the investor is forced to sell the project in period 1. This feature of the model is similar to the preference-shock assumption made by Diamond and Dybvig (1983): an investor who is subject to a liquidity shock derives her utility only from period-one consumption. If, however, she is not subject to a liquidity shock, she derives her utility from period-two consumption. We denote by λ the probability of a liquidity shock. We assume that there are two types of foreign investors. In particular, half of the investors will need to sell with probability λ_H and half with probability λ_L such that $1 > \lambda_H > \frac{1}{2} > \lambda_L > 0$, and $\lambda_H + \lambda_L = 1$. Investors know ex ante whether they are of a λ_H type or a λ_L type and this is their private information. In addition to liquidity-based sales, there is a possibility that an investor will liquidate a project in period 1 if she observes a low realization of ε. Then the price that buyers are willing to pay for a direct investment that is being sold in period 1 is:

$$P_D = \frac{1}{2A} \frac{(1-\lambda_D)\int_{-1}^{\underline{\varepsilon}_D}(1+\varepsilon)^2 f(\varepsilon)d\varepsilon + \lambda_D}{(1-\lambda_D)\Phi(\underline{\varepsilon}_D) + \lambda_D}. \tag{17}$$

Here, $\underline{\varepsilon}_D$ is a threshold level of ε, set by the direct investor, below which the direct investor is selling the project without being forced to do so by a liquidity shock; λ_D is the probability, as perceived by the market, that an FDI investor gets a liquidity shock. In (17), it is assumed that if the project is sold due to a liquidity shock, that is, before the initial owner observes ε, the value of ε is not recorded in the firms before the sale. Therefore, the buyer does not know the value of ε. However, if the project is sold for low-profitability reasons, the owner will know the value of ε after the sale. The threshold $\underline{\varepsilon}_D$ is determined in equilibrium. The initial owner sets the threshold level $\underline{\varepsilon}_D$, such that given P_D, when observing $\underline{\varepsilon}_D$, an investor is indifferent between selling and not selling the project in the absence of a liquidity shock. Thus:

$$P_D = \frac{\left(1+\underline{\varepsilon}_D\right)^2}{2A}. \tag{18}$$

Equations (17) and (18) together determine P_D and $\underline{\varepsilon}_D$ as functions of the market-perceived probability of sale due to the liquidity shock (λ_D). We denote these functions as: $\underline{\varepsilon}_D(\lambda_D)$ and $P_D(\lambda_D)$.

When a portfolio investor sells the projects in period 1, everybody knows she does it because of a liquidity shock. Thus, the price of the project is given by

$$P_P = \frac{1}{2A}. \tag{19}$$

Comparing the price of FDI, which is determined by (17) and (18), with the price of FPI, which is determined by (19), we see that the resale price of a direct investment in period 1 is always lower than the resale price of a portfolio investment in that period. The intuition is that if a direct investor prematurely sells the investment project, the market price must reflect the possibility that the sale originates from inside information on low prospects of this investment project. This constitutes the second (liquidity) cost of FDI.

Based on this analysis, we can write the ex-ante expected net cash flow from FDI:

$$EV_D\left(\lambda_i, \lambda_D, A, C\right) = \left[(1-\lambda_i)\left(\begin{array}{l} \frac{\left(1+\underline{\varepsilon}_D\left(\lambda_D\right)\right)^2}{2A}\Phi\left(\underline{\varepsilon}_D\left(\lambda_D\right)\right) \\ +\int_{\underline{\varepsilon}_D\left(\lambda_D\right)}^{1} \frac{\left(1+\varepsilon\right)^2}{2A} f(\varepsilon)d\varepsilon \end{array} \right) + \lambda_i \frac{\left(1+\underline{\varepsilon}_D\left(\lambda_D\right)\right)^2}{2A} \right] - C. \tag{20}$$

The ex-ante expected net cash flow from FPI is simply:

$$EV_P(A) = \frac{1}{2A}. \tag{21}$$

Then, the difference between the expected value of FDI and the expected value of FPI is:

$$Diff(\lambda_i, \lambda_D, A, C) \equiv EV_D(\lambda_i, \lambda_D, A, C) - EV_P(A). \tag{22}$$

Clearly, investors will choose FDI (FPI) when $Diff(\lambda_i, \lambda_D, A, C) > 0 \quad (< 0)$ and will be indifferent between the two (that is, may choose either FDI or FPI) when $Diff(\lambda_i, \lambda_D, A, C) = 0$.

To complete the description of the equilibrium, it remains to specify λ_D, the market perceived probability that an FDI investor will get a liquidity shock. Assuming that rational expectations hold in equilibrium, λ_D has to be consistent with the equilibrium choice of the two types of investors between FDI and FPI, such that

$$\lambda_D = \frac{\lambda_H \lambda_{H,FDI} + \lambda_L \lambda_{L,FDI}}{\lambda_{H,FDI} + \lambda_{L,FDI}}, \tag{23}$$

where $\lambda_{H,FDI}$ is the proportion of λ_H investors who choose FDI in equilibrium and $\lambda_{L,FDI}$ is the proportion of λ_L investors who choose FDI in equilibrium.

There are five possible cases that can potentially be observed in equilibrium. Case 1: All investors choose FDI. Case 2: λ_L investors choose FDI; λ_H investors split between FDI and FPI. Case 3: λ_L investors choose FDI; λ_H investors choose FPI. Case 4: λ_L investors split between FDI and FPI; λ_H investors choose FPI. Case 5: All investors choose FPI. Equilibrium outcomes depend on production cost A, and liquidity preferences (λ_L, λ_H). As the production cost A increases, we are more likely to observe FPI and less likely to observe FDI in equilibrium. As the difference in liquidity needs between the two types of investors increases, we are more likely to see a separating equilibrium, where different types of investors choose different forms of investment.

Suppose now that an aggregate liquidity shock occurs in period 1 with probability q. Conditional on the realization of the aggregate liquidity shock, individual investors have to sell their investment at period 1 with probabilities λ_L and λ_H. This implies that as the probability of an aggregate liquidity shock q increases, there will be more FPI and less FDI in equilibrium. Thus, the ratio of FPI to FDI will increase. The intuition is that as the probability of an aggregate liquidity shock increases, agents know that they are more likely to sell the investment early, in which case they will get a low price since buyers do not know whether they sell because of an individual liquidity need or because of adverse information on the productivity of the investment. As a result, the attractiveness of FDI decreases.

The empirical prediction is that countries with a higher tendency for liquidity problems will be the source of a higher ratio of FPI to FDI. Goldstein, Razin, and Tong (2008) find empirical evidence that a higher probability of a liquidity crisis in the source country has a significant positive effect on the ratio between FPI and FDI.

4.2 Composition of Equity Flows and Financial Crises

Emerging economies have counter-cyclical current accounts and experience large capital outflows during crises. The theoretical literature argues that financial crises lead to an exit of foreign investors even if there are no shocks to fundamentals. The following papers link financial crises and liquidity through models of self-fulfilling investor runs. Chang and Velasco (2001) place international illiquidity at the center of financial crises. They argue that a small shock may result in financial distress, leading to costly asset liquidation, a liquidity crunch, and a large drop in asset prices. Caballero and Krishnamurthy (2001) argue that during a crisis self-fulfilling fears of insufficient collateral may trigger a capital outflow.

However, financial crises may be associated with an outflow of FPI and a simultaneous inflow of FDI. This behavior reflects the *fire-sale FDI* phenomenon when domestic companies and assets are acquired by foreign investors at fire-sale prices. Krugman (2000) notes that the Asian financial crisis was accompanied by a wave of inward direct investment. Furthermore, Aguiar and Gopinath (2005) analyze data on mergers and acquisitions in East Asia between 1996 and 1998 and find that the liquidity crisis is associated with an inflow of FDI. Moreover, Acharya, Shin, and Yorulmazer (2007) observe that FDI inflows during financial crises are associated with acquisitions of controlling stakes. Baker, Foley, and Wurgler (2008) argue that FDI flows may also reflect arbitrage activity by multinationals as well as the purchase of undervalued host country assets.

Kirabaeva (2009) developed a model to analyze the composition of investment (direct vs portfolio) across two countries in the presence of heterogeneity in liquidity risk and asymmetric information about the investment productivity. During liquidity crises (an increase in liquidity preferences) the level of FDI may increase or decrease depending on the equilibrium. The dual effect of an increase in the liquidity risk on the capital flows corresponds to the empirically observed pattern of FDI during liquidity crises.[5] The model offers an alternative explanation of the fire-sale FDI phenomenon based on adverse selection. At the same time, it provides the possibility of a decrease in FDI through self-fulfilling expectations.

The characteristic features of direct investment are higher profitability and access to private information about investment productivity. Portfolio investment represents holdings of assets which allow for risk diversification (investing into multiple projects) and greater liquidity. Taking advantage of the inside

[5] Financial crises may be associated with an outflow of FPI and a simultaneous inflow of FDI, e.g., the 1994 crisis in Mexico and the late 1990s crisis in South Korea. However, there is also evidence that some crises have been accompanied by an outflow foreign investment, including FDI, e.g., the 2001 crisis in Argentina and 1990s crisis in Indonesia.

information, direct investors may sell low-productive investments and keep the high-productive ones under their ownership. This generates a "lemons"[6] problem: the buyers do not know whether the investment is being sold because of its low productivity or due to an exogenous liquidity shock. Therefore, due to this information asymmetry, there is a discount on the prematurely sold direct investment (relative to the prematurely sold portfolio investment).

There are two types of equilibria. In the first type, only investors from the country with a lower liquidity risk choose to hold direct investments. In the second type, investors from both countries hold direct investments. In this case, there is strategic complementarity in choosing direct investment. This generates a possibility of multiple equilibria through the self-fulfilling expectations. If countries have the same fundamentals, the country with a higher liquidity risk attracts less inward foreign investment, but a larger share of it is in the form of FDI. Also, the country with a higher level of asymmetric information about investment productivity attracts more FDI relative to FPI since the marginal benefits from private information are larger.

These results are consistent with the empirical findings that countries that are less financially developed and have weaker financial institutions tend to attract more capital in the form of FDI. Furthermore, it can explain the phenomenon of bilateral FDI flows among developed countries, and one-way FDI flows from developed to emerging countries.

A crisis is associated with an increase in the liquidity risk. Such an increase results in the drying up of market liquidity as more investors have to sell their risky asset holdings. At the same time, it becomes more likely that if a direct investment is sold before maturity, it is sold due to exogenous liquidity needs rather than adverse information about investment productivity. This reduces the adverse selection problem and therefore results in a smaller discount on prematurely sold direct investments. This effect captures the phenomenon of fire-sale FDI during liquidity crises. If an economy is in the unique equilibrium then higher liquidity risk leads to a higher level of FDI. However, if there are multiple equilibria then FDI may decline as the liquidity risk becomes higher. In this case, an outflow of FDI is induced by self-fulfilling expectations.

5. Moral Hazard in Debt Contracts under Limited Enforcement

With access to complete international credit markets, an economy would be able to borrow to finance a stable level of consumption and investment. However, empirical findings suggest that countries often experience capital outflows in very low income periods.

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6 Akerlof (1970).

Eaton and Gersovitz (1981) analyze a model with incomplete international credit market and risk of repudiation. The level of debt is the minimum of the credit demands of the economy and the credit constraints by lenders. Borrowing occurs in periods of relatively low income and must be fully repaid in the following period. Failure to repay prevents borrowing in the subsequent period. Atkeson (1991) studies a model of lending that contains both a moral hazard problem and an enforcement problem. The introduction of moral hazard due to asymmetric information between borrower and lender, explains why the occurrence of especially low output realizations prompt international lenders to ask these countries for repayments. Tsyrennikov (2007) shows that the capital outflows in the lowest output state in a model with only moral hazard can be quantitatively significant and larger than in a model which also includes limited enforcement.

The Atkeson (1991) model features moral hazard associated with willingness to repay debt obligations under limited enforcement. A risk-averse borrower lives for $t = 0,1,2,...$. At period 0, he is endowed with Q_o units of the good, and in each period the borrower has access to the investment technology: $Y_{t+1} = f(I_t, \varepsilon_{t+1})$ where I_t are units of goods invested and ε_{t+1} is an i.i.d. random variable. The probability density of Y_{t+1} conditioned on I_t is $g(Y_{t+1}, I_t)$.[7] The borrowers' preferences are represented by $(1-\delta)E_o\sum_{t=0}^{\infty}\delta^t u(c_t)$ where $\beta \in (0,1), u^{'}(c) > 0, u^{''}(c) < 0$.

In the autarky environment with no access to the international credit market, the optimal value function $V_{aut}(Q)$ satisfies the following Bellman equation:

$$V_{aut}(Q) = \max_{I\in[0,Q]}\{(1-\delta)u(Q-I) + \delta\sum_{Q^{'}} V_{aut}(Q^{'})g(Q^{'}, I)\}. \quad (24)$$

The risk-neutral lender can observe the borrower's investment choice, and there is complete enforcement. The borrower can issue Arrow securities that pay out d_i in state i and $q(Y_i, I)$ is the price of such security given last period investment I. Since the lender is risk-neutral, the Arrow securities are priced such that $q(Y_i, I) = \delta g(Y_i, I)$.

The optimal value function $V_{compl}(Q)$ satisfies the Bellman equation:

7 Several assumptions are imposed on g(Y,I) to make the model tractable.

$$V_{compl}(Q) = \max_{I\in[0,Q]}\left\{\begin{array}{l}(1-\delta)u(c)+\delta\sum_{Y'}V_{AD}(Y'-d(Y'))g(Y',I^*) \\ +\mu\left(Q-c+\sum_{Y'}q(Y',I^*)d(Y')-I^*\right)\end{array}\right\}, \quad (25)$$

where I^* is the optimal investment level such that it maximizes the project present value evaluated at the Arrow securities prices $\max_{I\geq 0}\{-I+\delta\sum_{Y'}Y'g(Y',I)\}$.

The borrower borrows a constant amount $\sum_{Y'}q(Y',I^*)d(Y')$ and invests I^* each period, and makes high repayment when Y' is high and low repayment when Y' is low. This is a full-insurance solution.

Next consider the environment with *moral hazard*: the lender cannot observe the investment choice I_t which affects the probability distribution of returns Y; and *limited enforcement*: the borrower can default on the promised repayment.

The risk-neutral lender lives for two periods and is endowed with M units of the good in each period. He is willing to lend or borrow at the risk-free rate $1/\delta$. The lender observes Q but does not observe I or c. The optimal recursive contract takes the following form:

$$\begin{aligned} d_{t+1} &= d(Y_{t+1}, Q_t) \\ Q_{t+1} &= Y_{t+1} - d_{t+1} \\ b_t &= b(Q_{t+1}) \\ c_t + I_t - b_t &= Q_t. \end{aligned} \quad (26)$$

The value function $V_{Atk}(Q)$ satisfies the following Bellman equation:

$$\begin{array}{lll} V_{Atk}(Q) & = & \max_A\{(1-\delta)u(c)+\delta\sum_{Y'}V_{Atk}(Y'-d(Y',Q))g(Y',I)\} \\ s.t & (i) & c+I-b\leq Q, b\leq M, -d(Y',Q)\leq M, c\geq 0, I\geq 0 \\ & (ii) & b\leq\delta\sum_{Y'}d(Y',Q)g(Y',I) \\ & (iii) & V_{Atk}\left[Y'-d(Y')\right]\geq U(Y') \\ & (iv) & I = \text{argmax}\{(1-\delta)u(Q+b-I)+\delta\sum_{Y'}V_{Atk}(Y'-d(Y',Q))g(Y',I)\} \end{array} \quad (27)$$

The optimal contract can be constructed by iterating to convergence on constraint conditions.

The capital outflow in states with low output is characterized by the following conditions: the optimality condition

$$V_{Atk}(Q) = \max_{I \in [0, Q+b]} \{u(Q+b-I) + \delta \sum_{Y'} V_{Atk}(Y' - d(Y', Q)) g(Y', I)\} \tag{28}$$

and the participation constraint

$$V_{Atk}(Q) \geq V_{aut}(Q+b). \tag{29}$$

Therefore, in the states with low output Y_i, we have $b \leq d(Y_i)$, i.e., there are no capital inflows for these states.

Capital outflows in bad times provide good incentives because they occur only at output realizations so low that they are more likely to occur when the borrower has undertaken too little investment. Their role is to provide incentives for the borrower to invest enough to make it unlikely that those low-output states will occur.

6. Role of Bonds in the Presence of Home Bias in Goods and Equities

Despite the increased cross-border financial transactions, international portfolios remain heavily tilted toward domestic assets.[8] The literature on international portfolios emphasizes the link between home equity bias and home consumption bias (Obstfeld and Rogoff, 2000; Coeurdacier, 2009; Obstfeld, 2009; Engel and Matsumoto, 2008).

Coeurdacier (2009) characterizes the constant equity portfolio that reproduces the locally complete market allocation through trades in claims to domestic and foreign equities. The structure of these optimal portfolios reflects the hedging properties of relative equity returns against real exchange rate fluctuations. With CRRA preferences, the optimal equity position is related to the covariance between the excess return on domestic equity (relative to foreign equity), and the rate of change of the real exchange rate. When the CRRA coefficient exceeds unity, home equity bias arises when excess domestic equity returns are positively correlated with an appreciation of the real exchange rate. In that case, efficient risk sharing requires that domestic consumption expenditures increase as the real exchange rate appreciates. If

8 See French and Poterba (1991), Tesar and Werner (1995), and Ahearne, Griever and Warnock (2004).

domestic equity returns are high precisely at that time, domestic equity provides the appropriate hedge against real exchange rate risk, and investors will tilt their portfolio towards domestic equity.

Coeurdacier and Gourinchas (2009) introduce an additional source of risk, so that the optimal portfolio allocation will typically require simultaneous holdings of equities and bonds. Since relative bond returns are strongly positively correlated with the real exchange rate, it is optimal for investors to use bond positions to hedge real exchange rate risks while equities are left to hedge the impact of additional sources of risk on investors' total wealth. This is consistent with the empirical finding that correlation between excess equity returns and the real exchange rate is too low to explain observed equity home bias (van Wincoop and Warnock, 2006).

Furthermore, they show that home equity bias arises if the correlation between the return on non-financial wealth and the return on equity, conditional on bond returns, is negative (a generalization of both Baxter and Jermann (1997), and Heathcote and Perri (2007)).The reason is that an increase in domestic equity holdings increases its implicit domestic currency exposure. Investors optimally undo this exposure by shorting the domestic currency bond. The overall domestic bond position reflects the balance of these two effects, so it is possible for a country to have short or long domestic currency debt positions. This is in line with recent empirical evidence (Lane and Shambaugh (2007) and Lane and Shambaugh (2009)) that suggests large heterogeneity across countries in the currency denomination of external bond holdings. On average, advanced countries hold long (but small) domestic currency debt positions but some large countries, most notably the US, are short in their own currency debt.

6.1 Home Bias in Goods and Equities

To understand the relationship between home bias in goods and equities consider a two-good world economy[9] where output of the domestic and foreign goods are

$$x_H(\alpha) = \theta_H(\alpha)\bar{x}_{H,}$$
$$x_F(\alpha) = \theta_F(\alpha)\bar{x}_F,$$

where α denotes the state of the world, θ is a random productivity factor, $\bar{x}_H$ and $\bar{x}_F$ denote output endowments of the domestic and foreign good, H and F , respectively. Domestic consumers' utility function is given by $u(c_H(\alpha), c_F(\alpha))$, where $c_j(\alpha)$ denotes state α consumption of good $j, j = H, F$. Thus the goods-indifference curve is given by $u(c_H(\alpha), c_F(\alpha)) = constant$. A unit of domestic equity is a promise to give $\theta_H(\alpha)$ units of the good in state of the world α. Let

[9] The benchmark model without home bias in the equity portfolio is in Helpman and Razin (1978).

$v(p(\alpha);\theta_H(\alpha)z_{H,} + p(\alpha)\theta_F(\alpha)z_F)$ denote the indirect utility function, which is derived from $u(c_H(\alpha), c_F(\alpha))$, where z_j is holdings of equity $j, j = H, F$ in the portfolio. The equity-indifference curve is given by $Ev(p(\alpha);\theta_H(\alpha)z_{H,} + p(\alpha)\theta_F(\alpha)z_F) = constant$. Now assume that the domestic consumer is biased towards the domestically produced good, which is the basis for returns $\theta_H(\alpha)$, accruing to the domestic equity. Induced preference over equities are then biased towards the home equity. In the diagram in Figure 2a we show a good-indifference curve which is tilted towards the domestic good. The induced equity-indifference curve, skewed towards the domestic equity, is shown in Figure 2b. Figures 2a and 2b demonstrate the proposition that equity home bias is derived from good home bias.

6.2 Real Exchange Risks and Financial Risks: Bonds vs Equities

Coeurdacier and Gourinchas (2009) consider a two-period endowment economy model. There are two symmetric countries, Home (H) and Foreign (F), each with a representative household. Each country specializes in the production of one tradable good. Agents consume both goods with a preference towards the local good. In period 0, no output is produced and no consumption takes place, but agents trade financial claims. In period 1, country i receives an exogenous endowment y_i of good i. Countries are symmetric and $E_0(y_i) = 1$ for both countries, where E_0 is the conditional expectations' operator, given date $t = 0$ information. Once stochastic endowments are realized at period 1, households consume using the revenues from their portfolio chosen in period 0 and their endowment received in period 1. Country i household has the standard CRRA preferences.

The Home terms of trade, the relative price of the Home tradable good in terms of the Foreign tradable good, is denoted by $q \equiv p_H/p_F$. Trade in stocks and bonds occurs in period 0. In each country there is one Lucas-style stock, a share δ of the endowment in country i is distributed to stockholders as dividends, while a share $(1-\delta)$ is not capitalizable (labor income) and is distributed to households of country i. The supply of each type of share is normalized at unity. Agents can trade a bond in each country denominated in the composite good of country i. Buying one unit of the Home (Foreign) bond in period 0 gives one unit of the Home composite (Foreign) good at $t = 1$. Both bonds are in zero net supply. Initially, each household fully owns the local stock equity, and has zero initial foreign assets.

Denote a country's holdings of local stock by S , and its holdings of bonds denominated in its local composite good by b . The vector $(S;b)$ thus describes international portfolios. Symmetry of preferences and distributions of shocks implies that equilibrium portfolios are symmetric. $S > 1/2$ means that there is equity home bias on stocks, while $b < 0$ means that a country issues bonds denominated in its local good, and simultaneously lends in units of the foreign good. The equilibrium equity portfolio position (in the symmetric steady-state where $y = 1$ and $b = 0$) is given by

$$S^* = \frac{1}{2}\left(\frac{2\delta - 1}{\delta} + \frac{(1 - 1/\sigma)(2a - 1)}{\delta(1 - \lambda)} \right) \tag{30}$$

where $\lambda \equiv \phi\left(1 - (2a-1)^2\right) + (2a-1)^2/\sigma$ represents the equilibrium terms of trade elasticity of relative output.

When $\delta < 1$, the optimal equity portfolio has two components. The first term inside the brackets represents the position of a log-investor ($\sigma = 1$). The domestic investor is already endowed with an implicit equity position equal to $(1-\delta)/\delta$ through non-financial income. Offsetting this implicit equity holding and diversifying optimally implies a position $S = (2\delta - 1)/2\delta < 1/2$ for $\delta < 1$. The second component of the optimal equity portfolio represents a hedge against real exchange rate fluctuations. It only applies when $\sigma \neq 1$, i.e., when total consumption expenditures fluctuate with the real exchange rate. This hedging demand is a complex and non-linear function of the structure of preferences summarized by the parameters σ, ϕ and a. For reasonable parameter values, this hedging demand can contribute to home equity bias only when $\lambda < 1$, i.e. when the terms of trade impact of relative supply shocks is large. Also, this hedge component can be rewritten as a function of the covariance-variance ratio between excess equity returns and the real exchange rate.

Now consider the settings with bonds and an additional independent risk factor $\hat{\varepsilon}$. The model can be summarized by the (log-linearized) inter-temporal allocation across goods and the budget constraint. Relative returns on equities $(\hat{R}_e)$, non-financial wealth $(\hat{R}_n)$ and bonds $(\hat{R}_b)$ are represented by

$$\begin{aligned} \hat{R}_e &= \hat{q} + \hat{y} + \gamma_e^{'}\hat{\varepsilon}, \\ \hat{R}_b &= (2a-1)\hat{q} + \hat{y} + \gamma_b^{'}\hat{\varepsilon}, \\ \hat{R}_n &= \hat{q} + \hat{y} + \gamma_n^{'}\hat{\varepsilon}. \end{aligned} \tag{31}$$

The solution for the optimal portfolio is given by

$$S^* = \frac{1}{2}\left(1 - \frac{1-\delta}{\delta}\beta_{n,e} + \frac{(1 - 1/\sigma)}{\delta}\beta_{RER,e} \right) \tag{32}$$

$$b^{*} = \frac{1}{2}\left(1 - \frac{1-\delta}{\delta}\beta_{n,b} + \frac{(1-1/\sigma)}{\delta}\beta_{RER,b}\right),$$

where $\beta_{.,.}$ are asset returns loadings on the real exchange rate and on non-financial income such that

$$\begin{aligned} \hat{RER} &= \beta_{RER,b}\hat{R}_b + \beta_{RER,e}\hat{R}_e + u_{RER} \\ \hat{R}_n &= \beta_{n,b}\hat{R}_b + \beta_{n,e}\hat{R}_e + u_n. \end{aligned} \tag{33}$$

The intuition is that the equilibrium bond and equity positions will hedge optimally the components of real exchange rate and non-financial income fluctuations with which they are correlated. Because bond returns offer a better hedge against real exchange rate risk than equities, holdings of equities take care of the exposure to other sources of risk, conditional on bond returns. Home equity bias will arise when $Cov(R_e, R_n/R_b) < 0$.

7. Conclusion

This survey focuses on key mechanisms through which market frictions such as information imperfections and liquidity shocks affect composition of international capital flows. To offer a self-contained presentation, we selected only a few stylized models (a small subset of the wide range of models in the literature). Selection of models is guided by the unique and empirically-relevant features they convey, so that they help the reader distinguish the major types of capital flows.

In the international finance context information asymmetries are the rule rather than the exception. So are contract enforcement problems and political risks (Kesternich and Schnitzer, 2010). These topics, as well as global imbalances, which may trigger reversals of net capital flows, remains outside the focus of our survey.

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Figure 1. Equilibrium Types

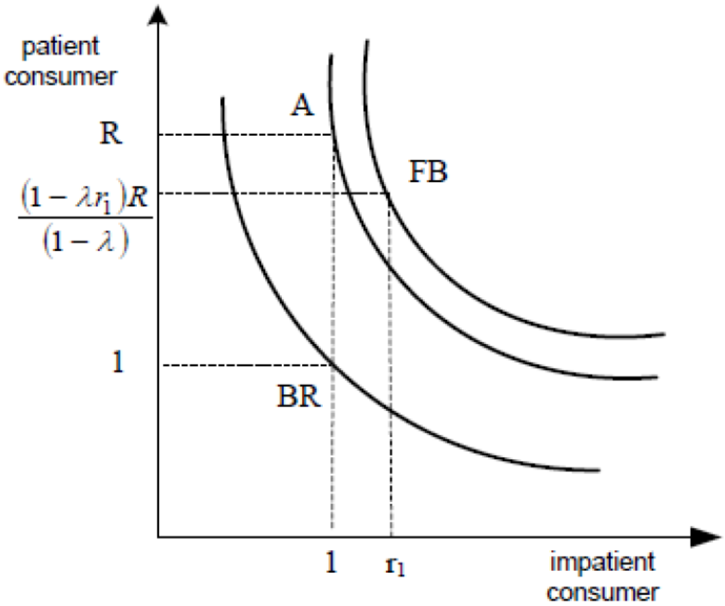

Figure 2.