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HOME BIAS IN GLOBAL BOND AND EQUITY MARKETS

THE ROLE OF REAL EXCHANGE RATE VOLATILITY

by Michael Fidora,
Marcel Fratzscher
and Christian Thimann

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In 2006 all ECB publications feature a motif taken from the €5 banknote.

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2 European Central Bank, Kaiserstrasse 29, 60311 Frankfurt am Main, Germany. E-mail: michael.fidora@ecb.int, marcel.fratzscher@ecb.int and christian.thimann@ecb.int.

Address
Kaiserstrasse 29
60311 Frankfurt am Main, Germany

Postal address
Postfach 16 03 19
60066 Frankfurt am Main, Germany

Telephone
+49 69 1344 0

Internet
http://www.ecb.int

Fax
+49 69 1344 6000

Telex
411 144 ecb d

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Abstract

This paper focuses on the role of real exchange rate volatility as a driver of portfolio home bias, and in particular as an explanation for differences in home bias *across* financial assets. We present a Markowitz-type portfolio selection model in which real exchange rate volatility induces a bias towards domestic financial assets as well as a stronger home bias for assets with *low* local currency return volatility. We find empirical support in favour of this hypothesis for a broad set of industrialised and emerging market countries. Not only is real exchange rate volatility an important factor behind bilateral portfolio home bias, but we find that a reduction of monthly real exchange rate volatility from its sample mean to zero reduces bond home bias by up to 60 percentage points, while it reduces equity home bias by only 20 percentage points.

JEL No.: F30, F31, G11, G15

Keywords: home bias; exchange rate volatility; risk; portfolio investment; global financial markets; capital flows.

Non-technical summary

Home bias towards holding domestic financial assets continues to be an important phenomenon of global financial markets which is poorly understood. Attempts in the literature to understand and explain portfolio home bias have concentrated on the role of information asymmetries, transaction costs, the role of non-tradables to hedge idiosyncratic risk, the role of institutions and behavioural finance arguments.

The paper focuses on the role of real exchange rate volatility as a key determinant of international portfolio allocation and home bias. Specifically, we analyses the importance of real exchange rate volatility in explaining cross-country differences in home bias, and in particular as an explanation for differences in home bias *across* financial asset classes, i.e. between equities and bonds. We use a Markowitz-type international capital asset pricing model (CAPM) which incorporates real exchange rate volatility as stochastic deviations from PPP. Given a mean-variance optimization which implies risk-aversion of investors, real exchange rate volatility induces a bias towards domestic financial assets because it puts additional risk on holding foreign securities from a domestic (currency) investors' perspective, unless foreign local currency real returns and the real exchange rate are sufficiently negatively correlated.

A second key implication of the model is that home bias in assets with relatively *high* local currency return volatility should respond less to real exchange rate volatility than home bias in assets with *low* local currency return volatility. This result entails that in the presence of real exchange rate volatility home bias is generally higher for assets with lower local currency return volatility. Overall, this implies that home bias should be higher for bonds than for equities as bond returns typically are less volatile than equity returns. It also means that a reduction of exchange rate volatility should have a larger impact on bond home biases than on equity home biases.

We test for the role of real exchange rate volatility as a driver of bilateral equity and bond home biases for 40 investor countries, covering all major industrialized and emerging market economies, and up to 120 destination countries. We find compelling empirical support for both of our main hypotheses. First, real exchange rate volatility is an important explanation for the cross-country differences in bilateral home biases in bonds and in equities. Our benchmark model with real exchange rate volatility can explain around 20 percent of the cross-country variation in equity and bond home biases.

Second, we find that bond home bias is more pronounced than equity home bias, although this stylized fact is not highly robust across country-pairs. This finding is consistent with the hypothesis of our Markowitz-type international CAPM that financial assets with lower underlying volatility should exhibit a larger home bias. More importantly, we show that a reduction of the monthly real exchange rate volatility from its sample mean to zero reduces bond home bias by around 60 percentage points, while it reduces the equity home bias by only 20 percentage points.

The findings of the paper have relevant implications from a number of perspectives. For the evolving literature on home bias, the results underline that exchange rate volatility is a key factor that needs be included and controlled for when modelling portfolio choices and home bias. For economic policy, the findings stress that uncertainty and risk—whether stemming from economic, political or other sources—may explain an important part of the pattern of global financial integration.

1 Introduction

Home bias towards holding domestic financial assets continues to be an important phenomenon of global financial markets which is poorly understood. At least since French and Poterba (1991) the fact that investors reveal a strong preference for their home countries' equity is known as home bias. A steadily growing literature has proposed several partly competing and partly complementary explanations. An important strand of this literature focuses on the effect of transaction and information costs on international portfolio positions, as e.g. in Cai and Warnock (2004), Portes and Rey (2005) and Daude and Fratzscher (2006). Various recent empirical studies have challenged in particular the assumption that international diversification yields higher returns. They indeed find that investors frequently earn significantly higher returns on investments in firms that are located in close geographic proximity, due to information asymmetries and frictions (e.g. Coval and Moskowitz (1999, 2001), Hau (2001), Dvorak (2005), Bae, Stulz and Tan (2005)).

Other studies emphasize the role of policies and of the quality of domestic institutions, such as capital controls or corporate governance, in explaining cross-country differences in financial asset holdings (e.g. Gordon and Bovenberg (1996), Burger and Warnock (2003, 2004), Gelos and Wei (2005)). A more recent strand of the literature has proposed behavioral explanations such as patriotism (Morse and Shrive (2004)) or investors who maximize expected wealth relative to a group of peers (Gómez, Priestley and Zapatero (2002)). Finally, others have argued that the home bias in financial asset holdings is much smaller than often assumed because domestic financial assets may provide a natural hedge against idiosyncratic risk to domestic non-tradables, such as labour income (Engel and Matsumoto (2005), Pesenti and van Wincoop (2002)).

Interestingly, although often mentioned and its relevance being widely acknowledged, the role of exchange rate volatility has received little attention in the empirical literature on home bias and trade in financial assets. To our knowledge, there is only one systematic analysis, by Cooper and Kaplanis (1994), which develops an indirect test of the impact of domestic inflation risk in the absence of purchasing power parity (PPP). While they find that uncertain domestic inflation cannot rationalize the observed home bias, their test is based on an examination of the correlation between domestic equity returns and inflation, rather than an analysis of the impact of real exchange rate volatility on cross-border investment or home bias.

The composition of global bond portfolios has also received much less attention than equity holdings. This is somewhat surprising given the fact that the over USD 50 trillion outstanding global debt securities exceeds by far the around USD 35 trillion of world stock market capitalization.[1] There are two notable exceptions. First, Burger and Warnock (2003, 2004) look from a US perspective at foreign participation in local currency bond markets and the composition of US foreign bond portfolios. They find that sound macroeconomic policies and institutions, such as creditor-friendly laws, attract foreign investment in local bond markets. Second, Lane (2005) shows that individual euro area economies' international bond holdings are biased towards intra-euro area holdings. Moreover, he finds that trade linkages and geographical proximity explain a considerable part of both intra- and extra-euro area bond holdings. These findings are broadly consistent with those of De Santis (2006) and De Santis and Gérard (2006), which confirm that the introduction of the euro affected portfolio allocation within the euro area.

The present paper takes a global perspective and focuses on the role of real exchange rate volatility as a key determinant of international portfolio allocation and home bias. The paper analyses the importance of real exchange rate volatility in explaining cross-country differences in home bias, and in particular as an explanation for differences in home bias *across* financial asset classes, i.e. between equities and bonds. We use a Markowitz-type international capital asset pricing model (CAPM) which incorporates real exchange rate volatility as stochastic deviations from PPP. Given a mean-variance optimization which implies risk-aversion of investors, real exchange rate volatility induces a bias towards domestic financial assets because it puts additional risk on holding foreign securities from a domestic (currency) investors' perspective, unless foreign local currency real returns and the real exchange rate are sufficiently negatively correlated.

A second key implication of the model is that home bias in assets with relatively *high* local currency return volatility should respond less to real exchange rate volatility than home bias in assets with *low* local currency return volatility. This result entails that in the presence of real exchange rate volatility home bias is generally higher for assets with lower local currency return volatility. The rationale is that if return volatility of a foreign asset is low, real exchange rate volatility makes a relatively higher contribution to real return volatility of this asset, when measured in domestic currency, and vice versa. Overall, this implies that home bias should be higher for bonds than for equities as bond returns typically are less volatile than equity returns. It also means that a reduction of exchange rate volatility should have a larger impact on bond home biases than on equity home biases.

[1] Throughout the paper, data on stock market capitalisation are taken from Standard and Poor's (2005). Data on outstanding amounts of debt securities are taken from the Bank for International Settlements International Securities Statistics.

We take these hypotheses to the data and test for the role of real exchange rate volatility as a driver of bilateral equity and bond home biases for 40 investor countries, covering all major industrialized and emerging market economies, and up to 120 destination countries. We find compelling empirical support for both of our main hypotheses. First, real exchange rate volatility is an important explanation for the cross-country differences in bilateral home biases in bonds and in equities. Our benchmark model with real exchange rate volatility can explain around 20 percent of the cross-country variation in equity and bond home biases. The aim of the paper is to motivate and explore specifically the role of exchange rate volatility, rather than to examine the large set of factors that could explain home bias in general. Nevertheless, in testing the impact of real exchange rate volatility, we also control for a set of bilateral factors that are commonly used in the gravity literature on international trade in goods and assets. In addition, the bilateral dimension of our dependent and explanatory variables allows us to control for (investor and target) country fixed effects, i.e. for country-specific determinants when isolating the impact of real exchange rate volatility on home bias.

Second, we find that bond home bias is more pronounced than equity home bias, although this stylized fact is not highly robust across country-pairs. This finding is consistent with the hypothesis of our Markowitz-type international CAPM that financial assets with lower underlying volatility should exhibit a larger home bias. More importantly, we show that a reduction of the monthly real exchange rate volatility from its sample mean to zero reduces bond home bias by around 60 percentage points, while it reduces the equity home bias by only 20 percentage points.

The findings of the paper have relevant implications from a number of perspectives. For the evolving literature on home bias, the results underline that exchange rate volatility is a key factor that needs be included and controlled for when modelling portfolio choices and home bias. For economic policy, the findings stress that uncertainty and risk—whether stemming from economic, political or other sources—may explain an important part of the pattern of global financial integration.

The paper is organized as follows. Section 2 reviews some of the literature on portfolio choice and home bias, drawing in particular on the factors that have been put forward to explain home bias. The data and some key stylized facts are presented in Section 3. Section 4 then develops a simple Markowitz-type international CAPM that links real exchange rate volatility, modelled as stochastic deviations from PPP, and portfolio choice. This model motivates the empirical analysis of Section 5, which outlines the results for explaining home bias and understanding the differences in equity and bond home biases. Section 6 concludes, briefly discussing also possible extensions and implications for policy.

2 Related literature

The work by French and Poterba (1991) shows that compared to simple benchmarks resulting from the capital asset pricing model (CAPM) the fraction of wealth countries invest in foreign securities is too low. In its simplest form the CAPM predicts that all investors hold the same portfolio of risky assets: if investors have identical expectations of the mean and variance of future returns of all securities and apply the same portfolio optimization procedure, all investors will allocate their portfolio in the same way.

It has been argued that the international CAPM as formulated by Solnik (1974) is subject to several assumptions which may not hold in global security markets. For example, the CAPM abstracts from transaction and information costs which may differ among investors and countries. Such costs tend to increase the price of foreign investment relative to domestic investment and thereby lower returns on foreign investment. In their seminal paper, French and Poterba (1991) find that 98 percent of Japanese equity holdings are domestic, while 94 percent of US holdings and 82 percent of UK holdings are domestic. Assuming that investors optimize their portfolios according to Markowitz-type mean-variance portfolio selection, they extract from each country's perspective the expected returns implied by actual portfolio allocation and historical return covariances. The results suggest that investors expect considerably higher returns in their respective domestic markets. They conclude that taxes and transaction costs are unlikely to explain this large differential.

As *transaction costs* are difficult to measure, Tesar and Werner (1995) argue that the cost associated with transactions should be negatively related to the number of transactions undertaken in the market. However their empirical findings interestingly reveal that in the US and Canada the turnover rate on foreign equity is several times higher than on domestic equity. Warnock (2001) re-estimates the turnover rate based on stocks of foreign equity in these countries' portfolios. While the adjusted base of foreign holdings reduces the turnover rate of foreign equity to that of domestic equity, this finding does not alter the conclusion that transaction cost can explain only little of the home bias.

Information costs may also lower returns on foreign investment and increase the ex ante volatility of foreign investment returns. The Introduction mentioned several important papers addressing this issue, while an excellent summary of the arguments is provided by Harris and Raviv (1991), while other important studies are by Ahearne, Griever and Warnock (2004) and Kho, Stulz and Warnock (2006). A related literature analyzes the impact of *information frictions* on international portfolio flows. Portes, Rey and Oh (2001, 2005) find that bilateral portfolio flows of the US depend negatively on distance, while they positively respond to the volume of bilateral telephone traffic. Interestingly, Portes, Rey and Oh (2001) show that more standardized assets like treasury bonds respond less to information frictions than corporate bonds or equity.[2]

The general finding that *transaction costs* are less important than *informational asymmetries* in explaining foreign investment is also underlined by the empirical evidence on broader country samples, as provided by Bertraut and Kole (2004), Chan, Covrig and Ng (2005), Faruqee, Li and Yan (2004) and Lane and Milesi-Ferretti (2005). Most of the explanatory power in these papers comes from gravity-type variables such as distance or language. Finally, Sørensen, Yosha, Wu and Zhu (2005), show how the decline in home bias has resulted in a substantial increase in risk-sharing between countries.

However, to our knowledge there exists no paper that explicitly and systematically analyses real exchange rate volatility as a determinant of bond and equity home bias in a global context. The study by Cooper and Kaplanis (1994) mentioned in the introduction develops an indirect test of whether the home bias in equity portfolios is caused by investors trying to hedge inflation risk. This is found to be the case only if investors have very low risk aversion and equity returns are negatively correlated with domestic inflation. However, their indirect test is based on an examination of the correlation between domestic equity returns and inflation, rather than an analysis of the impact of real exchange rate volatility on cross-border investment or home bias.

3 Data and stylized facts relating to global equity and bond markets

This section first discusses the data and definitions of home bias and presents a number of characteristics and interesting stylized facts about home biases in global equity and bond markets. These are used as motivation for the model and empirical estimation in subsequent sections.

3.1 Data and definitions

Data on global equity and bond holdings are taken from the International Monetary Fund's Coordinated Portfolio Investment Survey (CPIS) for the years 1997, 2001, 2002 and 2003.

[2] Another strand of the literature has focused on how *geographical patterns* impact investor home bias. Coval and Moskowitz (1999, 2001) find that mutual funds earn significantly higher returns on equities of companies' which are headquartered close to the mutual fund. Hau (2001) shows that German speaking investors earn excess returns on German equity, a finding that is confirmed also for other countries (e.g., Choe, Kho and Stulz (2004) for Korea, Dvorak (2005) for Indonesia).

In this survey, the up to 70 reporting countries and regions[3] provide information about their foreign portfolio investment assets. Portfolio investment is broken down by instruments (equity and debt) and residence of issuer, the latter providing information about the destination of portfolio investment. Debt instruments are partly broken down by long-term debt and short-term debt, with the latter being defined as debt securities with an original maturity of up to one year.[4]

While the CPIS provides the most comprehensive survey of international portfolio investment holdings, it is still subject to a number of important caveats. Most importantly, the CPIS is not able to address the issue of third-country holdings and round-tripping. For example, German equity investment alone in Luxembourg was reported to be USD 152 billion in 2003, when Luxembourg's stock market capitalization was less than USD 40 billion. A similar point can be made for Ireland and several smaller financial offshore centres. Moreover, the CPIS data show a very low degree of cross-border holdings by emerging market economies. In the absence of other financial data especially for this country group, it is difficult to check whether this reflects reality or is due to reporting omissions. Finally, the CPIS does not provide a currency breakdown and does not identify domestic security holdings.[5]

Therefore, in order to derive the domestic component of each country's portfolio, we take the aggregate of portfolio investment in that country as reported by the remaining countries as an estimate of the country's liabilities.[6] The difference of reported liabilities and local market capitalization gives an estimate of the domestic component of the countries' portfolios. Stock market capitalization is taken from Standard and Poor's (2004). Bond market capitalization is proxied by the amounts outstanding published in the Bank for International Settlements Security Statistics Tables 14 and 16 containing data on international debt securities by residence of issuer and domestic debt securities by residence of issuer of all maturities and sectors.[7] It has to be noted that due to the above mentioned caveats of the CPIS we exclude some countries from our analysis, in particular financial centres such as Ireland and Luxembourg, for which data seem distorted. The remaining countries in our sample together account for over 90 percent of global equity and bond

[3]In the following we refer to the participating territorial entities as countries throughout, irrespective of whether they constitute sovereign states or not.

[4]Not all countries provide a breakdown of debt securities by maturity. However, they report the total value of debt securities

[5]For a detailed discussion of the CPIS, see International Monetary Fund (2002).

[6]Thus we make the implicit assumption that non-reporting countries do not have any portfolio investment in the reporting countries.

[7]Note that we cannot identify amounts outstanding of debt securities by original maturity, as the BIS only provides a separate breakdown for debt securities with remaining maturity of up to one year.

market capitalization.

In order to derive a measure of home bias we compare actual geographical portfolio allocations to those predicted by a simple benchmark. We follow the literature and take the share of a country's market capitalization in the world market as a benchmark (see e.g. Chan, Covrig and Ng, 2005). In this context, home bias measures the degree to which investors of a given country are overweight in domestic assets and underweight in international assets, as compared to the benchmark portfolio that would weigh home and foreign assets according to the respective shares in the global financial market.

Formally, let w_i^* be the market weight of the rest of the world seen from the viewpoint of a given country i, and w_i be the share of international assets in the country's portfolio, home bias is given by the percent difference between these two weights:

$$HB_i = \frac{w_i^* - w_i}{w_i^*} = 1 - \frac{w_i}{w_i^*} \tag{1}$$

For example, if country i investors allocate $w_i = 25$ percent of their portfolio abroad, whereas $w_i^* = 75$ percent of the world's market capitalization are abroad, they have only exploited international diversification to one-third and thus have a home bias of two-thirds.

More specifically, we can determine a "bilateral" home bias between two countries and gauge how much the actual allocation of financial assets of country i vis-à-vis any given country j differs from the benchmark weight this country should receive:

$$HB_{ij} = \frac{w_j^* - w_{ij}}{w_j^*} = 1 - \frac{w_{ij}}{w_j^*} \tag{2}$$

This measure states how underweight or overweight investors of country i are in a given country j, by providing the percentage deviation of the actual portfolio from the market portfolio. In the market portfolio with full international diversification w_{ij} equals w_j^* and the home bias is zero; at the other extreme, if investors of country i do not hold any securities of country j, they are said to have a home bias of 100 percent against that country. Of course, this measure also allows a country to be overinvested in other countries, as is the case among some euro area countries, in which case the home bias becomes negative.

3.2 Key stylized facts

Global stock and bond markets are heavily concentrated in mature economies that account for 83 percent of world stock market capitalization and 92 percent of the outstanding amount of debt securities (see Table 1). Reporting emerging economies contribute a much smaller share of 6 and 3 percent to the global market capitalization of equities and bonds.[8] It is worth noting that the US plays an even more dominant role in global equity markets than in global bond markets, since for both the euro area and Japan the weight in bond markets is roughly 50 percent higher than in stock markets. Within emerging markets, Asia is relatively more important for stock markets, whereas Latin America plays a larger role in bond markets. All these differences reflect in particular the relative size of public debt in the various areas and regions.

Tables 1-2

The results for the overall measure of home bias, that provides an intuition of the degree to which portfolios are sub-optimally diversified, are summarized in Table 2. First, mature economies have a relatively higher bias towards domestic debt securities than towards domestic equities, of on average 73 and 68 percent, respectively. Second, this finding is particularly strong for the United States, with bond home bias of 91 percent against an equity home bias of 75 percent, while the euro area as an aggregate, as well as individual euro area economies have lower home bias in both markets.

Figure 1

This finding is consistent with the results on bilateral home bias which are not shown here for brevity reasons. Finally, Figure 1 shows how home bias has steadily declined over recent years. In particular, the euro area has—with the implementation of the monetary union—eliminated the gap between bond and equity home bias. While the look at broader patterns confirms the finding that home bias is more pronounced in bond markets, this stylized fact does not hold for emerging economies. However, this could be largely due to measurement problems and the above mentioned caveats of the CPIS.

4 Theoretical framework: equity and bond home bias and real exchange rate volatility

4.1 The model

This section presents a simple theoretical framework that links stochastic deviations from PPP, or real exchange rate volatility, with home bias. In addition to the well-known result that exchange rate risk tends to reduce the optimal weight of foreign securities in investors'

[8] Note that for the descriptive analysis we group those countries that do not report to the CPIS as "Rest of the world". This group includes both mature and emerging economies.

portfolios, we show that this effect decreases in the domestic currency return volatility of assets. In order to keep the model manageable we impose a simple stochastic structure for asset returns. We assume that the nominal (local currency) rate of return i_k^D and real (local currency) rate of return r_k^D of a domestic asset k are given by the following equations, where μ_k is a constant (which is equal to the expected real rate of return) and ϵ_k^D is an error term with $E(\epsilon_k^D) = 0$ and $Var(\epsilon_k^D) = \sigma_k^2$.

$$i_k^D = \mu_k + \pi^D + \epsilon_k^D \tag{3}$$

$$r_k^D = i_k^D - \pi^D = \mu_k + \epsilon_k^D \tag{4}$$

Note that this specification implies that domestic assets are a perfect hedge against inflation, as long as inflation and the random shock to the return are uncorrelated. However, this assumption is only made for notational convenience, since dropping π^D from (3) and (4) would not alter the general findings.[9]

In order to express returns earned on foreign securities in real local currency terms, we assume a stochastic relative purchasing power parity, where $\Delta \ln e$ stands for a variation (where an increase corresponds to a depreciation) of the domestic currency, π^D and π^F are the domestic and foreign inflation rate and η is an error term with $E(\eta) = 0$ and $Var(\eta) = \sigma_\eta^2$

$$\Delta \ln e = \pi^D - \pi^F + \eta \tag{5}$$

Note that if relative purchasing power parity were to hold perfectly ($Var(\eta) = 0$), the inflation differential alone would determine the path of the nominal exchange rate, with higher domestic inflation deterministically resulting in a depreciation, as predicted by purchasing power parity.

Foreign currency nominal returns of foreign securities are given by equation (6) below. Correspondingly—using equation (3), (4) and (6)—domestic currency real returns of foreign securities are given by equation (7). Superscripts D and F denote domestic and foreign variables, respectively:

$$i_k^F = \mu_k + \pi^F + \epsilon_k^F \tag{6}$$

[9] It has to be noted that while for equities the assumption of inflation hedged real returns may hold, this assumption is particularly unrealistic for bonds. However, our results do not change substantially if this assumption is relaxed for bonds while being maintained for equities or vice versa.

$$r_k^F = i_k^F + \Delta \ln e - \pi^D = \mu_k + \epsilon_k^F + \eta \tag{7}$$

Equation (7) is a key equation in this context. It shows that in our specification, the real return of foreign securities expressed in domestic currency depends not only on the shock to the return of the foreign security, but also on a shock measuring the deviation of the exchange rate from relative PPP, η. This implies that any deviation of the exchange rate from purchasing power parity drives a wedge between real returns on domestic and foreign investment.

To further simplify the analysis, we assume that the global capital market consist of two countries, each of which offers one equity and one bond, denoted by the subscripts e and b. Then, according to equations (4) and (7), expected real returns in domestic currency are given by:

$$\mathbf{R} = \begin{pmatrix} E(r_e^D) = \mu_e \\ E(r_b^D) = \mu_b \\ E(r_e^F) = \mu_e \\ E(r_b^F) = \mu_b \end{pmatrix} \tag{8}$$

Note that from equations (3) and (4) we have restricted expected local currency real returns to be identical within asset classes, irrespective of whether they are domestic or foreign securities. We also assume for simplicity that variances of nominal returns are identical within asset classes. Furthermore all errors are assumed to be uncorrelated.[10] In this case, the variance-covariance matrix of domestic currency real returns is given by:

$$\mathbf{\Sigma} = \begin{pmatrix} Var(r_e^D) = \sigma_e^2 & 0 & 0 & 0 \\ 0 & Var(r_b^D) = \sigma_b^2 & 0 & 0 \\ 0 & 0 & Var(r_e^F) = \sigma_e^2 + \sigma_\eta^2 & 0 \\ 0 & 0 & 0 & Var(r_b^F) = \sigma_b^2 + \sigma_\eta^2 \end{pmatrix} \tag{9}$$

Given these assumptions on returns and volatilities of the four securities, we can use simple portfolio selection to derive optimal portfolio weights and eventually a measure of home bias. In this respect, we follow Adler and Dumas (1985) and Cooper and Kaplanis (1994) taking a standard Markowitz mean-variance investor who maximizes a quadratic utility function, where $E(R^{PF})$ is the expected real return on a portfolio of risky assets,

[10] In fact, Cappiello and De Santis (2005) and Peltonen (2005) find a negative correlation between equity and exchange rate returns, suggesting that equities hedge the exchange rate risk. However, estimated correlations are rather low and differ substantially across country pairs and exchange rate regimes.

$Var(R^{PF})$ is the squared standard deviation of returns and λ is the coefficient of risk aversion or relative weight attached to the volatility of the return:[11]

$$\max U = E(R^{PF}) - \frac{\lambda}{2} Var(R^{PF}) \tag{10}$$

The investor chooses the optimal portfolio weights $\mathbf{w}$ for all individual assets in the portfolio, with respect to a vector of expected real returns $E(\mathbf{R})$ of the individual assets, the variance-covariance matrix $\mathbf{\Sigma}$ of real returns, which is assumed to be known, and a unity investment restriction. The resulting optimization problem is given by the following Lagrangian, with μ being a Lagrange multiplier:

$$\max L = \mathbf{w}' E(\mathbf{R}) - \frac{\lambda}{2} \mathbf{w}' \mathbf{\Sigma} \mathbf{w} - \mu(\mathbf{w}'\mathbf{I} - 1) \tag{11}$$

Derivation of equation (11) with respect to $\mathbf{w}$ yields the optimal portfolio weights:

$$\mathbf{w} = \frac{\mathbf{\Sigma^{-1}}}{\lambda}\left(E(\mathbf{R}) - \frac{\mathbf{I}'\mathbf{\Sigma^{-1}} E(\mathbf{R}) - \lambda}{\mathbf{I}'\mathbf{\Sigma^{-1}}\mathbf{I}} \mathbf{I}\right) \tag{12}$$

For notational convenience we define the following portfolio constant:

$$A = \frac{\mathbf{I}'\mathbf{\Sigma^{-1}}\mathbf{E}(\mathbf{R}) - \lambda}{\mathbf{I}'\mathbf{\Sigma^{-1}}} = \frac{-\lambda + \frac{\mu_e}{\sigma_e^2} + \frac{\mu_b}{\sigma_b^2} + \frac{\mu_e}{\sigma_e^2+\sigma_\eta^2} + \frac{\mu_b}{\sigma_b^2+\sigma_\eta^2}}{\frac{1}{\sigma_e^2} + \frac{1}{\sigma_b^2} + \frac{1}{\sigma_e^2+\sigma_\eta^2} + \frac{1}{\sigma_b^2+\sigma_\eta^2}} \tag{13}$$

Substituting (8), (9) and (13) into (12) yields the portfolio weights of domestic equity and bonds, as well as foreign equity and bonds, as follows:

$$\mathbf{w} = \begin{pmatrix} w_e^D = \frac{\mu_e - A}{\lambda\sigma_e^2} \\ w_b^D = \frac{\mu_b - A}{\lambda\sigma_b^2} \\ w_e^F = \frac{\mu_e - A}{\lambda(\sigma_e^2+\sigma_\eta^2)} \\ w_b^F = \frac{\mu_b - A}{\lambda(\sigma_b^2+\sigma_\eta^2)} \end{pmatrix} \tag{14}$$

Defining P^D as the domestic fraction of world portfolio wealth, market clearing requires the world market portfolio $\mathbf{w}^*$ to be:

$$\mathbf{w}^* = \begin{pmatrix} w_e^{D*} = P^D w_e^D + P^F w_e^F \\ w_b^{D*} = P^D w_b^D + P^F w_b^F \\ w_e^{F*} = P^D w_e^F + P^F w_e^D \\ w_b^{F*} = P^D w_b^F + P^F w_b^D \end{pmatrix} \tag{15}$$

[11] Note that division of the coefficient of risk aversion λ by 2 does not change the results as it only rescales risk aversion for notational convenience.

Using the identity $P^F = 1 - P^D$ substitution of equation (14) into equation (15) yields an expression for equity home bias, HB_e, and bond home bias, HB_b , defined as the deviation of the weight of foreign equities (bonds) in the domestic portfolio from the weight the foreign equity (bond) market has in the world market.

$$HB_e = \frac{w_e^{F*} - w_e^F}{w_e^{F*}} = \frac{(1-P^D)\sigma_\eta^2}{\sigma_e^2 + (1-P^D)\sigma_\eta^2} \tag{16}$$

$$HB_b = \frac{w_b^{F*} - w_b^F}{w_b^{F*}} = \frac{(1-P^D)\sigma_\eta^2}{\sigma_b^2 + (1-P^D)\sigma_\eta^2} \tag{17}$$

Note, that the advantage of these expressions derived from our model is that they exactly match the definition of home bias employed in the empirical literature. The model gives rise to several postulates that can be tested empirically:

First, equations (16) and (17) state that home bias increases in real exchange rate volatility, which measures the degree to which relative PPP is violated. If the change in the real exchange rate equals the inflation differential, i.e. relative PPP perfectly holds, home bias is zero. Conversely, as real exchange rate risk increases to infinity, home bias converges to unity, which implies the absence of foreign investment.

Second, home bias decreases in the relative value of a country's portfolio, P^D. This reflects the intuitive feature that large global players can "afford" a relatively large home weight without necessarily showing a home "bias".

Third, home bias decreases in the (common) local currency variance of the equity or bond. This means that the higher is the volatility of the local currency return, the less important will be the impact of exchange rate volatility on volatility expressed in domestic currency and the less the risk-return profile of a foreign security will be affected by real exchange rate risk. If exchange rate volatility converges to zero, the risk-return profile of a foreign security is dominated by its idiosyncratic risk component. The latter postulate implies that as long the local currency volatility of bond returns is smaller than that of equity returns, home bias is higher in global bond markets than in global stock markets. These postulates are tested below.

4.2 Simulations

Before turning to the analysis of the *statistical* significance we assess whether the model implies any *economically* significant effect of exchange rate volatility on home bias. In order to do so, we simulate values for home bias based on the theoretical framework's prediction as expressed in equations (16) and (17). These simulated values provide an indication of the expected effect of exchange rate volatility on home bias. Furthermore, they serve as a benchmark for assessing the goodness-of-fit of our empirical model by comparing them to the estimated values.

As the theoretical framework is built on the assumption of equal returns and variances within asset classes, the equity and bond volatility terms σ_e and σ_b in equations (16) and (17) refer to volatility parameters that are assumed to be equal across countries. Point estimates for these parameters as given by the standard deviation of equity return series will, however, typically not be equal across countries, and the assumption of equality of the true parameters may not hold in reality.

Therefore, we test these assumptions on all country pairs for which data on real local currency equity and bond returns are available.[12] Results are reported in Tables 3. For nearly all country pairs in our sample, the hypothesis of equal expected real returns within asset classes cannot be rejected, thus lending support to our assumption. Results on the hypothesis of variance equality are somewhat more mixed. Brown and Forsythe (or modified Levene) tests cannot reject the hypothesis of equal variance in only 57% of the cases for bonds and 29% of the cases for equities. Therefore we perform additional Wilcoxon signed rank sum tests which can be interpreted as tests on the equality of distributions. As this hypothesis cannot be rejected in 91% of the cases for bonds, and 98% of the cases for equities we proceed under the assumption of equal returns and volatilities within asset classes.

Table 3

Since equations (16) and (17) require the domestic and foreign local currency return volatility to be identical for both countries, we estimate the volatility parameters for each country pair as the arithmetic average of the two standard deviations of the domestic and foreign real local currency return series. Data on real exchange rate volatility are computed as the standard deviation of the real bilateral exchange rate between each country pair.[13] The share of each country's portfolio in the world portfolio P^D is proxied by the country's equity and bond market capitalization plus the difference between its foreign portfolio investment assets and its portfolio investment liabilities taken from the CPIS.

The results of the simulation exercise are reported in Table 4. Most importantly, our simulations yield an economically significant impact of exchange rate volatility on home bias. The sample averages of the simulated home biases are around 19% for equity markets

[12] Local currency return indices are from Datastream for equities and JP Morgan GBI for bonds.

[13] For the simulation exercise we use the standard deviation of monthly bilateral real exchange rate changes over the period 1998–2005.

and 39% for bond markets. Secondly, the simulated effect of exchange rate volatility is twice as big in the case of bonds when compared to equities. Overall, these results suggest that exchange rate volatility may account for a sizeable part of the empirically observed home bias as well as the differences in the degree of home bias between asset classes.

Table 4

5 Empirical results

We now turn to the empirical framework and results. Section 5.1 formulates equations (16)–(17) in a structural form, which can be tested empirically for our broad cross-section of countries. Extension and robustness tests of these benchmark results follow in Section 5.2. Finally, Section 5.3 presents and discusses in detail the marginal effects of real exchange rate volatility for equity and bond home biases, illustrating the empirical relevance of real exchange rate volatility for explaining today's existing portfolio home bias.

5.1 Benchmark model and results

The main objective is to estimate the effect of real exchange rate volatility on cross-country differences in bilateral home bias. Moreover, we want to understand the differential effects of exchange rate volatility on bilateral home bias *across* financial assets, i.e. between equities and bonds.

Recall from Section 3 the definition of the bilateral home bias of an investor country i vis-à-vis the destination country j:

$$HB_{ij} = \frac{w_j^* - w_{ij}}{w_j^*} \forall w_j^* \geq w_{ij} \tag{18}$$

with w_j^* as the world market share of country j and w_{ij} as the share of country i's portfolio held in country j securities. One potential complication is that in the case of $w_j^* < w_{ij}$, which implies an overinvestment of country i in country j, the measure of home bias can take large negative values if w_j^* is small. Thus we re-define the home bias measure for these cases as:[14]

$$HB_{ij} = \frac{w_j^* - w_{ij}}{w_{ij}} \forall w_j^* < w_{ij} \tag{19}$$

[14] It is important to note that there are only very few cases in which countries are overweight internationally in their investment, and that such overinvestment is generally small so that definitions (18) and (19) are roughly equal as both are approximately: $HB_{ij} \approx \ln w_j^* - \ln w_{ij}$. The empirical findings below do not change in a meaningful manner when using equation (18) throughout.

Since the dependent variable for home bias is restricted to lie between -1 and 1 we use a tobit estimator for censored variables. As tobit estimation requires a linear representation of the latent variable, we modify equations (16) and (17) in the following way:

$$HB_{ij} = \ln w_j^* - \ln w_{ij} = \alpha + \beta \ln \sigma_{\eta ij} + \gamma \ln P_i^D + \epsilon_{ij} \tag{20}$$

with $\sigma_{\eta ij}$ being the natural logarithm of the standard deviation of monthly bilateral real exchange rate changes over the period 1998–2005 and $\ln P^D$ the logarithm of the proportion of country i's wealth in world wealth.[15] We chose and tested various different proxies for real exchange rate volatility. Ideally one would like to have a proxy that is forward-looking and reflects the expectations of investors concerning this source of uncertainty. In the absence of such a forward-looking measure, we take the standard deviation of monthly real exchange rate changes over the period 1998–2005 as our preferred measure of volatility. However, we have tested various alternative measures of real exchange rate volatility using a broad range of different historical periods. Since the estimated standard deviations do not vary significantly over the different periods, our empirical results are robust to using such alternative proxies.

Since the time dimension of the data is limited and, moreover, changes over time are very small and mainly reflect valuation changes rather than cross-border investment flows we use averaged data over the period 2001–2003 and thus estimate a pure cross-section.

Most importantly, we use a fixed effects estimator. Although non-linear models with fixed effects tend to yield biased estimators, Greene (2001) shows that this bias in practice is negligibly small in practice and is outweighed by the advantage of more precise estimates for the standard errors. Our preferred estimator is therefore one that includes source and host country fixed effects, as these are able to control for virtually all country specific determinants of home bias, e.g. the existence of capital controls, macroeconomic stability, or institutional quality in both source and host countries. However, as a robustness check we also present results for pooled and random effects estimators.

Table 5 provides the results for the benchmark model, using a source and host country-fixed effects estimator, separately for equity and for bond home bias. This estimator also corrects for a potential correlation of the residuals across observations by estimating cluster-corrected standard errors. A key result is that real exchange rate volatility has a sizeable and highly significant effect on home bias. Moreover, the effect of real exchange rate volatility is much larger on home bias in bonds than equity home bias. In fact the point estimate for the former is in some specifications more than twice as large as the

[15] For a detailed description of variable definitions and sources, see Appendix B.

latter, which is broadly in line with the results from the simulation exercise presented in Section 4.2. However, as the tobit estimator does not allow us to interpret the coefficients in a straightforward way, we will return to this specific issue in Section 5.3.

Table 5

More specifically, Table 5 shows the empirical findings for seven alternative model specifications. In these various specifications we attempt to control for different potential sources of home bias, other than real exchange rate volatility, that have been stressed in the literature—namely related to information costs and asymmetries (model II), hedging against terms of trade shocks (model III), non-linear effects of exchange rate volatility (model IV), portfolio diversification opportunities (model V) and risk-sharing (models VI and VII). The key objective of these alternative specifications is to test whether real exchange rate volatility continues to be a significant determinant of home bias even when controlling for these alternative hypotheses.

Model I includes only real exchange rate volatility while model II adds gravity variables as controls. As we know from the literature on gravity models, distance and other familiarity variables are often found to be good proxies for transaction and information costs and asymmetries. Indeed, the size of the point estimate for the real exchange rate volatility variable falls when controlling for gravity factors. The fact that the real exchange rate volatility coefficient for equity home bias declines relatively more strongly suggests that such information costs may play a larger role for equities than for bonds.

As a next step, model (III) adds bilateral imports of country i from country j to the specification. The rationale for including trade follows the argument by Obstfeld and Rogoff (2001)—tested thoroughly in Lane and Milesi-Ferretti (2004) and Lane (2005)—that bilateral financial asset holdings may function as a hedging device against terms of trade shocks in partner countries. For instance, country i can insure itself against price changes in imports from country j by purchasing financial assets in country j. A rise in import prices and a corresponding increase in earnings, and thus higher equity returns, in country j should therefore have offsetting effects for the wealth of country i.

In our case this means that more imports from country j should lower the home bias country i has vis-à-vis country j. We find that while this trade variable has the correct negative sign, it is not statistically significant in the fixed effects estimation, though it is in some specifications for the pooled estimator (Table 6). Moreover, the finding that higher bilateral import intensity is significantly negatively related to home bias in equities but not in bonds for these latter two estimators is also sensible because it suggests that equity securities provide a better hedge against such terms of trade shocks than bonds, which usually pay a fixed coupon.

Model IV tests for non-linearities in the effects of real exchange rate volatility on home bias. One hypothesis is that changes in real exchange rate volatility may have e.g. a more important effect on financial asset holdings and home bias when such volatility is very low. For instance, De Santis (2005) and De Santis and Gérard (2006) argue that the creation of Economic and Monetary Union (EMU) in Europe may have affected the size of cross-border financial investment.

We tested various specifications for non-linearities in real exchange rate volatility, and show in model IV of Table 5 the one with the strongest results, namely when including a currency union dummy if both countries i and j share a common currency. This specification suggests that there are indeed non-linear effects in that currency unions reduce the home biases in bonds and in equities substantially, in addition to the effect that currency unions have on real exchange rate volatility. Nevertheless, even when controlling for currency unions the effect of real exchange rate volatility on bond home bias remains substantially larger than that for equities. Moreover, as there is a strong correlation between real exchange rate volatility and the currency union dummy, our preferred model specification is to continue focusing on the real exchange rate volatility variable.

Models V and VI attempt to control for diversification opportunities and risk-sharing. As discussed in Section 3 above, in a mean-variance portfolio choice model, there is no rationale for an investor to invest in foreign assets in countries where their returns are strongly positively correlated with domestic financial assets as this does not allow the investor to diversify her risk. Hence home bias in bilateral asset holdings should be larger across those country pairs where asset returns are strongly positively correlated.

We test this hypothesis in two different ways, one by including monthly bilateral stock correlations (model V) and another one by including quarterly GDP correlations (model VI). One of these variables is found to be significant for the fixed effects estimator of Table 5, although they become partly significant when using a pooled estimator as shown in Table 6. Overall, we find that the results are robust to alternative econometric estimators, i.e. to using a pooled estimator (Table 6) but also for a random effects estimator. In addition, the McKelvey-Zavoina-Pseudo-R^2 of the pooled model gives an indication of the goodness of fit of the model and the overall impact of real exchange rate volatility and shows that a sizeable 20 percent of the cross-country variation in home biases can be explained by the benchmark model with real exchange rate volatility alone.[16]

Table 6

[16] Veall and Zimmermann (1994) show that in tobit regressions the McKelvey-Zavoina-Pseudo-R^2 is superior to a wide range of alternative goodness-of-fit measures.

In summary, we find compelling evidence that real exchange rate volatility has a sizeable and highly significant effect on bilateral home bias both in bonds and in equities. More importantly, the results provide strong support for our hypothesis formulated through the portfolio selection model specification of Section 4 in that bilateral home biases in bonds are significantly more sensitive to real exchange rate volatility than those in equity securities. This holds across all the various economic model specifications as well as the different econometric estimators. In fact, the difference in the effect of real exchange rate volatility on home bias in bonds versus home bias in equities becomes in most instances even stronger when controlling for various other determinants, such as information asymmetries, trade and risk-sharing.

5.2 Extensions and robustness

There are several important caveats and issues that need close scrutiny. A first potential caveat of the analysis is the issue whether and to what extent exchange rate volatility may be endogenous, i.e. that capital flows over the years have influenced the degree of exchange rate volatility, and hence that the size of bilateral capital stocks—our dependent variable—may to some extent have indirectly affected exchange rate volatility. A first reply is that endogeneity should be less of a problem for capital stocks as compared to capital flows. A second and more important point is that most likely the effect of exchange rate volatility on home bias would be stronger—and thus our results be strengthened—if we could adequately control for this endogeneity. We would expect this to be so because countries with higher bilateral exchange rate volatility are most likely also those with relatively large bilateral capital flows. Hence if capital flows induce more exchange rate volatility, then also country-pairs with large bilateral capital stocks should have higher exchange rate volatility. But this is exactly the opposite of what our theoretical model implies and what we find empirically, namely that more exchange rate volatility leads to lower bilateral investment and thus higher home bias.

Table 7

To investigate this potential issue of endogeneity, we instrument exchange rate volatility through exchange rate regimes and various indicators of the quality of domestic institutions of countries. The intuition is that the choice of the de jure exchange rate regime as well as the quality of domestic institutions should be largely exogenous to bilateral capital stocks and flows. Table 7 shows the results of this IV estimation. The important finding is that the two key results of the paper remain unchanged: exchange rate volatility has a significant effect on home bias, and a larger effect on bonds than on equities. In fact, the point estimates of exchange rate volatility increases somewhat as compared to when using the non-instrumented variable in Table 5.

Table 8

Second, a further note refers to the formal test of equality of the effects of the independent variables on bond home bias versus equity home bias. As this test cannot easily be conducted in our preferred fixed effects tobit model, we estimate a fixed effects seemingly unrelated regression (SUR) for bond home bias and equity home bias simultaneously. Table 8 shows that the coefficients (which are in fact ordinary least square estimators) and standard errors are very similar to those of the tobit estimator. The tests of equality indeed confirm that in particular the effect of real exchange rate volatility is statistically significantly larger on home bias than on home bias in equity securities.[17]

Third, there are many additional factors that are likely to affect home bias and cross-border investment. While we have tried to control for a broad set of determinants in Section 5.1, there are two more specific points that we are trying to tackle in this subsection to further buttress the robustness of our findings. The first relates to the potential caveat that it could be a broader notion of uncertainty, and not only the exchange rate uncertainty alone, that causes portfolio home bias and drives a wedge between home bias in equities and in bonds. The second relates to the potential caveat that the country selection could matter, in particular the joint assessment of developed and developing countries. We tackle these points in turn.

To assess the first potential caveat that other factors, which make financial returns on foreign asset uncertain, could be equally important as the exchange rate, we analyze whether various other forms of risk, such as related to political and institutional factors in host countries, affect home bias. For this purpose, we take our benchmark model III and add various institutional and political variables that have been stressed in the literature as relevant factors in influencing cross-border investment (see Appendix B), always also controlling for real exchange rate volatility. One caveat is that we cannot use our otherwise preferred fixed effects estimator, as this would not allow us to include variables that are specific to the host country. Hence we use here the pooled estimator of Table 6.

Table 9

Table 9 shows the empirical findings when adding various political, institutional and other controls to the benchmark model III. All of these variables are scaled so that a *higher*

[17] An alternative test is to use a type of difference-in-difference estimator, with the dependent variable being the difference between the bilateral home bias in equities and the home bias in bond holdings. Such an exercise, which is not shown here for brevity, confirms the findings of the SUR estimator.

value implies *better* institutions. As one would expect, countries have a lower home bias vis-à-vis countries that have better institutions. This is in particular the case for bond home bias for which all seven institutional variables are statistically significant. Equally importantly, in most cases the impact of the proxies is substantially larger on bond home bias than on equity home bias.

These results confirm the implications of our portfolio selection model in demonstrating that uncertainty has a larger impact on international bond investment than on equity investment. They also confirm that real exchange rate volatility remains relevant and significant, with its effect on equity and bond home bias being largely unchanged.

Fourth, to assess the second potential caveat regarding country selection, we check whether the findings of Section 5.1 are robust to using alternative country samples, as it could be that exchange rate uncertainty plays a role only for those countries where hedging is not possible or highly costly. We therefore in particular make a distinction between industrialized countries and developing economies.

Table 10

Table 10 shows the results for three alternative groupings using a fixed effects estimator as in Section 5.1. The key finding is that real exchange rate volatility is a significant determinant of equity and bond home bias for *all* country groupings, including when only looking at mature economies as source *and* host countries. The coefficient for exchange rate volatility is somewhat higher when estimating a sample with only developing economies as host countries. Also the results for the gravity variables are comparable across samples.

In summary, this subsection confirms the robustness and the significant role of real exchange rate volatility as a determinant of portfolio home bias. It also holds when extending the model to control for various other types of uncertainties and institutional variables, and when looking at alternative country samples.

5.3 Marginal effect of real exchange rate volatility

As the final step of our analysis, we now turn to discussing the overall role of real exchange rate volatility for home bias in equities and bonds. How much of the existing home bias across a country pair can be accounted for by this variable? And what would a change in exchange rate volatility imply for home bias in equities and in bonds?

Two difficulties have to be addressed when assessing the marginal effect of real exchange rate volatility on home bias. First, our preferred tobit estimator is non-linear implying non-constant marginal effects of the independent variables. However, the relatively low degree of censoring in our sample would in practice allow for a direct interpretation of the estimated coefficients as marginal effects. This is also confirmed by a comparison of the coefficients from the tobit model with those of the (linear) SUR model which are strikingly similar. A second difficulty arises from the fact that the independent variable of interest itself, real exchange rate volatility, enters the model in a non-linear form as we use the natural logarithm of this variable.

Therefore and in order to allow for a more intuitive assessment, we compute predicted values for equity and bond home bias for different values of real exchange rate volatility holding all other variables constant at their sample mean. Figure 2 plots the percentage point change in home bias in response to a departure of real exchange rate volatility from its sample mean holding all other variables constant at their respective mean values.

Figure 2

The figure shows that in model III (which controls for imports and gravity) a reduction of real exchange rate volatility from its sample mean to close to zero implies a reduction of bond home bias by 60 percentage points, while it reduces equity home bias by only 20 percentage points.

The second plot of Figure 2 shows the marginal effects for model VII, which controls not only for imports and gravity, but also for real integration (proxied by GDP correlation) and diversification opportunities (proxied via past stock market correlations). The figure shows that the marginal effects of real exchange rate volatility are hardly changed in this model compared to our preferred benchmark model III: the elimination of real exchange rate volatility, as compared to the mean, still reduces bond home bias by 50 percent and equity home bias by about 20 percent. These results also broadly concur with those from the simulation exercise in Section 4.2 that yields an average effect of exchange rate volatility on home bias of around 20 percent in the case of equities and around 40 percent in the case of bonds.

In summary, the key point of this analysis of the marginal effects is that exchange rate volatility is an overall large and significant driver of home bias. This is in particular the case for bond home bias, and to a lesser extent for home bias in equity securities.

6 Conclusions

Much work has been done in recent years on understanding cross-border capital flows and explaining home bias. The primary focus in this literature has been on the importance of information frictions, transaction costs, corporate governance and institutions as well as the role of non-tradables for portfolio choices. Much less systematic attention has been given to the importance of exchange rate volatility and uncertainty.

The paper has analyzed the role of real exchange rate volatility as a driver of home bias. Its key insight is that the home bias in those assets with relatively *high* local currency return volatility responds less to real exchange rate volatility than home bias in assets with relatively *low* local currency return volatility. This result implies that in the presence of real exchange rate volatility home bias is generally higher for assets with lower local currency return volatility. The rationale is that if return volatility of a foreign asset is low, real exchange rate volatility makes a relatively higher contribution to real return volatility of this asset, when measured in domestic currency, and vice versa. Overall, this entails that home bias should be higher for bonds than for equities as bond returns typically are less volatile than equity returns. It also means that a *change* of real exchange rate volatility should have a larger impact on bond home biases than on equity home biases.

The paper has tested these hypotheses empirically for 40 investor countries, covering all major industrialized and emerging market economies, and up to 120 destination countries. Overall, we find strong empirical support for both of our hypotheses. First, real exchange rate volatility is an important explanation for the cross-country differences in bilateral home biases in bonds and in equities. Our benchmark model with real exchange rate volatility can explain about 20 percent of the cross-country variation in equity and bond home biases. Second, we find that bond home bias is somewhat more pronounced than equity home bias. More importantly, we show that a reduction of the monthly real exchange rate volatility from its sample mean to zero reduces bond home bias by up to 60 percentage points, while it reduces the equity home bias by only 20 percentage points. These findings underline the overall importance of real exchange rate volatility as a driver of portfolio home bias.

The findings of the paper have relevant implications from a number of perspectives. For the evolving literature on home bias, the results underline that exchange rate volatility is an important factor that needs be included and controlled for when modelling portfolio choices and home bias. For economic policy, the role of exchange rate volatility in explaining portfolio home bias is important, as it introduces a macroeconomic policy dimension into the considerations of international financial integration. This extends the findings of the literature that have so far mostly focused on issues such as information costs, transaction costs and governance. The importance of the exchange rate underscores the rationale for overall macroeconomic and monetary stability. This would be consistent with the general finding of the paper that uncertainty and risk—whether stemming from economic, political or other sources—may explain continued elevated levels of home bias in global financial integration. Likewise, the progress towards global monetary stability made in recent years may well be an important factor in understanding the gradual increase in the internationalization of portfolios currently observed.

However, the role of the exchange rate in this context also shows that financial integration in today's world of flexible exchange rates among major currencies may be more challenging for financial actors than during the so-called golden era of globalization in the early 20^{th} century that was characterized by the gold standard. An interesting issue is to explore whether the move towards inflation targeting—and hence, floating exchange rates—in many industrial economies and increasingly also emerging market economies indeed entails a potential costs for financial integration, at least insofar as it may have raised exchange rate volatility in the short term. Likewise, an interesting policy angle is to ask whether exchange rate stability is an important consideration underlying the still not well-understood net capital flows from emerging market economies to some industrialized countries, especially the United States, and whether the dollar-orientation of many exchange rate policies of such countries plays an important role.

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Appendix A

Country coverage

Argentina	Denmark	Kazakhstan[1]	Romania[1]
Aruba[1]	Egypt[1]	Korea	Russia[1]
Australia	Estonia[1]	Lebanon[1]	Singapore
Austria	Finland	Luxembourg[1]	Slovak Republic[1]
Bahamas[1]	France	Macao[1]	South Africa[1]
Bahrain[1]	Germany[1]	Malaysia	Spain
Barbados[3]	Greece[1]	Malta[1]	Sweden
Belgium	Guernsey[1]	Mauritius[1]	Switzerland[1]
Bermuda	Hong Kong[1]	Mexico[3]	Thailand
Brazil[1]	Hungary[1]	Netherlands	Turkey[1]
Bulgaria[1]	Iceland	Netherlands Antilles[1]	Ukraine[1]
Canada	Indonesia	New Zealand	United Kingdom
Cayman Islands[1]	Ireland	Norway	United States
Chile	Isle of Man[1]	Pakistan[2]	Uruguay[1]
Colombia[1]	Israel	Panama[1]	Vanuatu[1]
Costa Rica[1]	Italy	Philippines[1]	Venezuela
Cyprus[1]	Japan	Poland[1]	
Czech Republic[1]	Jersey[1]	Portugal	

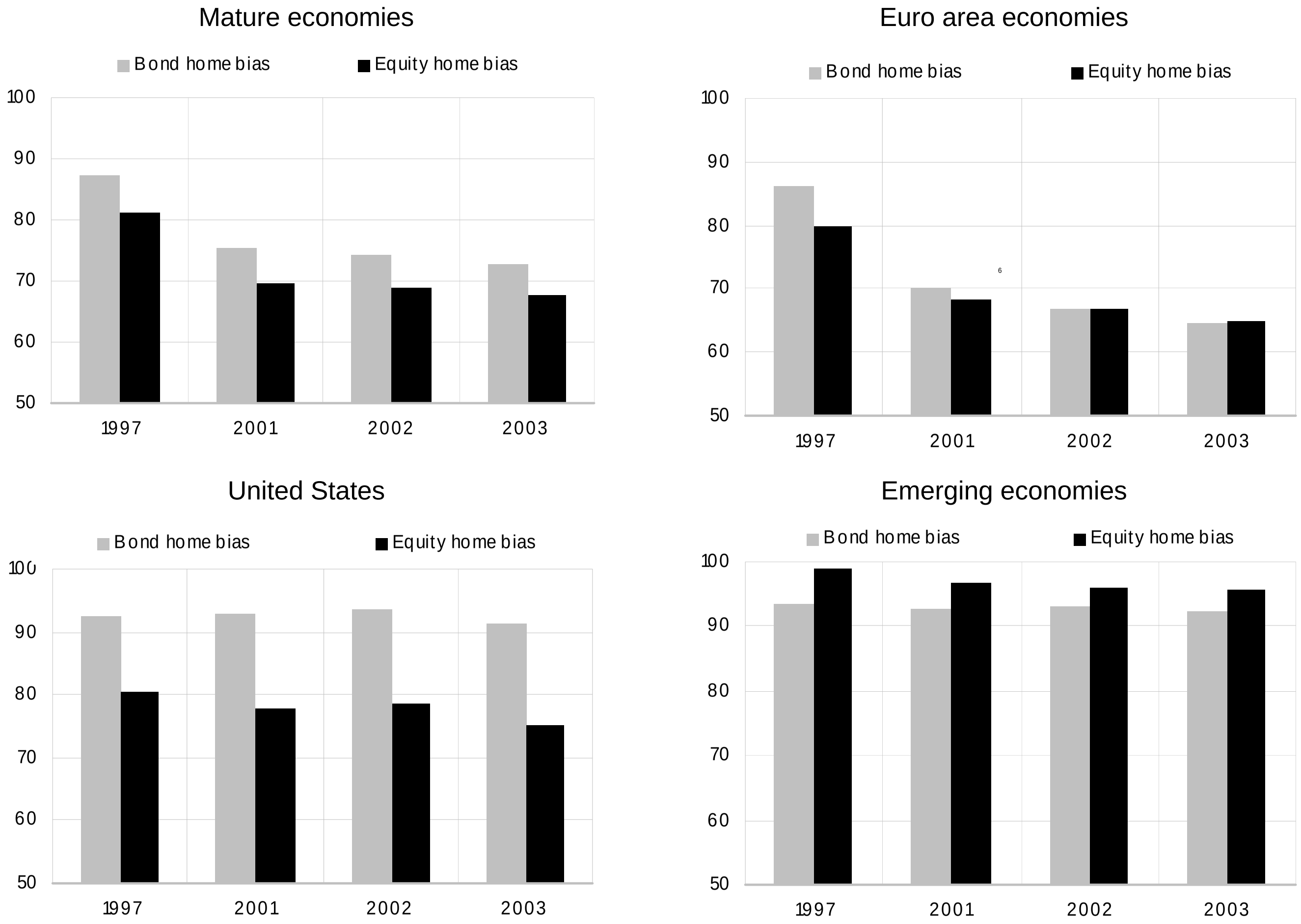
Notes: Countries and regions with superscript 1 (2) (3) only participate since 2001 (2002) (2003). The number of participating countries is 27, 67, 68 and 70 for the years 1997 and 2001 to 2003, respectively. Countries and regions report foreign portfolio investment assets in 235 destination countries or regions.

Appendix B

Data

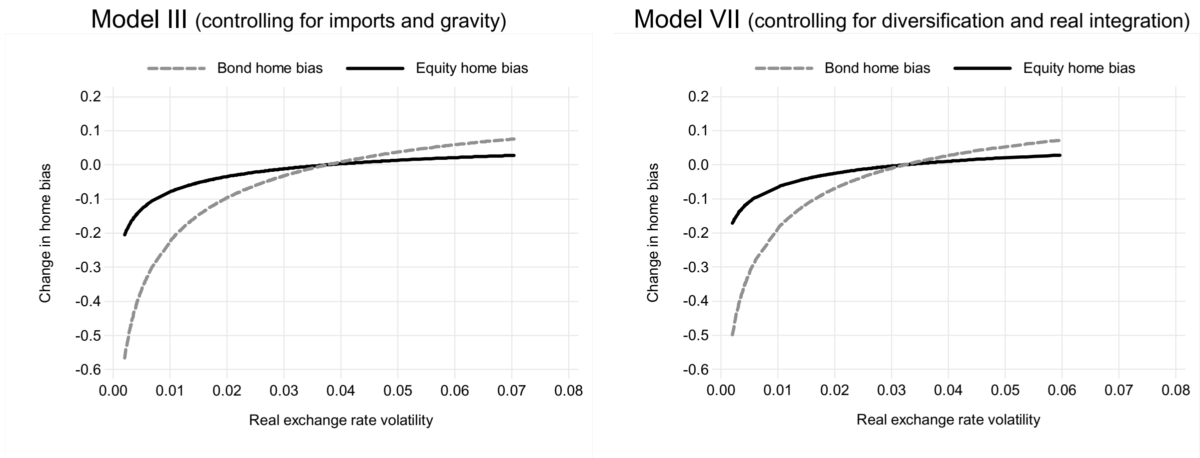
Variable	Definition	Source
Bilateral portfolio investment, equity	Equity portfolio investment of country i in country j	International Monetary Fund, Corrdinated Portfolio Investment Survey
Bilateral portfolio investment, long-term debt	Long-term debt investment (original maturity > 1 year) of country i in country j	International Monetary Fund, Corrdinated Portfolio Investment Survey
Bilateral portfolio investment, short-term debt	Short-term debt investment (original maturity up to 1 year) of country i in country j	International Monetary Fund, Corrdinated Portfolio Investment Survey
Bilateral real exchange rate volatility	Standard deviation of monthly change of the difference of bilateral nominal exchaneg rate and bilateral inflation differential, 1998-2005	Globa Insight, World Market Monitor
Relative wealth	Natural logarithm of the ratio of equity and bond holdings of country i to world equity and bond market capitalisation	Rose (2005)
Distance	Distance between capitals in miles	Rose (2005)
Imports	Ratio of imports from country j to country i's GDP	Rose (2005)
Common language	Dummy which takes the value 1 if countries share at least 1 common language, 0 otherwise	Rose (2005)
Colonial relationship	Dummy which takes the value 1 if countries directly or inidirectly ever had a colonial relationship, 0 otherwise	Rose (2005)
Common border	Dummy which takes the value 1 if countries share a common border, 0 otherwise	Rose (2005)
Number of landlocked countries	Dummy which is equal to the number of landlocked countries	Rose (2005)
Number of islands	Dummy which is equal to the number of island countries	Rose (2005)
Land area product	Mathematical product of the countries land area in square miles	Rose (2005)
Common legal origin	Dummy which takes the value 1 if countries share a common legal origin, 0 otherwise	Rose (2005)
Regional trade agreement	Dummy which takes the value 1 if countries have a multilatetral trade agreement, 0 otherwise	Rose (2005)
Stock market correlation	Correlation coefficient of monthly real US dollar stock market return, 1998-2005	Rose (2005)
GDP correlation	Correlation coefficient of quarterly GDP, 1960-2005	Rose (2005)
Currency union	Dummy which takes the value 1 if countries share a common currency, 0 otherwise	
Investment risk	Rating from 0 to 12, where a higher rating indicates lower risk	International Country Risk Guide
Political risk	Rating from 0 to 100, where a higher rating indicates lower risk	International Country Risk Guide
External conflict	Rating from 0 to 12, where a higher rating indicates lower risk	International Country Risk Guide
Efficiency of judiciary system	Rating from 0 to 8, where a higher rating indicates more efficient judiciary system	World Bank, Doing Business Database
Inflation	Rating from 0 to 10, where a higher rating indicates lower risk	International Country Risk Guide
Corruption	Rating from 0 to 6, where a higher rating indicates lower risk	International Country Risk Guide
Quality of information disclosure	Rating from 0 to 7, where a higher rating indicates more information disclosure	World Bank, Doing Business Database

Figure 1: Equity and bond home bias over time



Notes: Arithmetic average of home bias of the country groups. For details on the country sample see appendix A.

Figure 2: Marginal effects



Notes: The underlying model is that of equation (21), including fixed effects for both countries *i* and *j*: $HB_{ij} = \ln w_j^* - \ln w_{ij} = \alpha_i + \alpha_j + \beta \ln \sigma_{\eta\, ij} + \varepsilon_{ij}$, adding the vectors of controls from models III, IV, and VII. Lines cross at the sample mean of real exchange rate volatility and indicate by how many percentage points home bias changes in response to a change of real exchange rate volatility with respect to its sample mean, holding all other variables constant at their respective sample mean values.

Table 1: Global stock and debt market capitalization in 2003

	Stock market capitalisation		Debt securities outstanding	
	in USD billion	world share (%)	in USD billion	world share (%)
Mature economies	23,090	83.1	39,520	91.9
United States	12,360	44.5	17,930	41.7
United Kingdom	2,140	7.7	1,850	4.3
Euro area	4,200	15.1	10,710	24.9
France	1,170	4.2	2,240	5.2
Germany	940	3.4	2,920	6.8
Italy	530	1.9	2,110	4.9
Other euro area	1,560	5.6	3,400	7.9
Japan	2,640	9.5	6,840	15.9
Other mature	1,750	6.3	2,240	5.2
Emerging economies	1,720	6.2	1,380	3.2
Asia	610	2.2	300	0.7
Latin America	440	1.6	690	1.6
Other emerging	670	2.4	430	1.0
ROW	2,970	10.7	2,110	4.9

Notes: Stock market capitalization is taken from Standard and Poor's, data on outstanding amounts of debt securities are taken from the Bank of International Settlements International Securities Statistics Tables 14 and 16. Countries and regions include all CPIS reporting economies. Non-reporting economies are grouped in ROW. For details on the country sample see appendix A.

Table 2: Global equity and bond home bias

in%	Equity			Debt securities		
	home weight (actual portfolio share of domestic securities)	market weight (equivalent to share in benchmark portfolio)	home bias ('excessive' home weight/market share abroad)	home weight (actual portfolio share of domestic securities)	market weight (equivalent to share in benchmark portfolio)	home bias ('excessive' home weight/market share abroad)
Mature economies	68.7	…	67.6	73.5	…	72.6
United States	86.2	44.5	75.1	94.8	41.7	91.2
United Kingdom	69.7	7.7	67.1	59.7	4.3	57.9
Euro area	65.4	…	64.9	65.4	…	64.6
France	73.6	4.2	72.4	65.2	5.2	63.3
Germany	62.9	3.4	61.6	74.3	6.8	72.4
Italy	58.2	1.9	57.3	80.0	4.9	78.9
Other euro area	65.6	…	65.3	62.1	…	61.7
Japan	90.3	9.5	89.3	85.4	15.9	82.6
Other mature	67.6	…	67.4	82.2	…	82.1
Emerging economies	95.7	…	95.7	85.3	…	92.2
Asia	96.5	2.2	96.5	80.5	0.7	96.3
Latin America	93.9	1.6	93.9	94.7	1.6	94.7
Other emerging	96.2	…	96.2	81.7	…	88.3

Notes: Data for country groupings (mature economies, euro area, emerging economies) are simple averages of the constituent countries, therefore no market weights are shown. Countries and regions include all CPIS reporting economies. Data are annual averages over the period 2001–2003. For details on the country sample see appendix A.

Table 3: Distribution tests for equity and bond returns

3.A Equity returns

H_0	Equality of mean $\mu_i = \mu_j$	Equality of variance $\sigma^2_i = \sigma^2_j$	Equality of distribution $R_i \sim R_j$
No. not rejected	380	218	347
No. observations	380	380	380
Ratio of not rejected	1.00	0.57	0.91

Notes: Equality of mean, variance and distribution are tested using two-sample t-tests, Brown and Forsythe (modified Levene) tests and Wilcoxon signed rank sum tests, respectively. Rejection refers to the 5 percent critical value.

3.B Bond returns

	Equality of mean H_0: $\mu_i = \mu_j$	Equality of variance H_0: $\sigma^2_i = \sigma^2_j$	Equality of distribution H_0: $R_i \sim R_j$
No. not rejected	1619	481	1612
No. observations	1646	1646	1646
Ratio of not rejected	0.98	0.29	0.98

Notes: Equality of mean, variance and distribution are tested using two-sample t-tests, Brown and Forsythe (modified Levene) tests and Wilcoxon signed rank sum tests, respectively. Rejection refers to the 5 percent critical value.

Table 4: Simulated values for equity and bond home bias

	Equity home bias	Bond home bias
Mean	18.8	39.1
Standard deviation	14.1	23.3
Minimum	0.1	0.5
Maximum	86.1	81.7
No. observations	2600	506

Notes: Home bias simulated using equations (16) and (17).

Table 5: Determinants of home bias – Fixed effects tobit model

	I		II		III		IV		V		VI		VII	
	Equity	Bonds	Equity	Bonds	Equity	Bonds	Equity	Bonds	Equity	Bonds	Equity	Bonds	Equity	Bonds
ln(real exchange rate volatility)	0.210 ***	0.298 ***	0.089 ***	0.236 ***	0.094 ***	0.230 ***	0.066 *	0.127 *	0.086 ***	0.223 ***	0.089 ***	0.218 ***	0.077 **	0.205 ***
	(0.021)	(0.06)	(0.023)	(0.056)	(0.024)	(0.059)	(0.039)	(0.071)	(0.026)	(0.063)	(0.027)	(0.063)	(0.03)	(0.066)
currency union							-0.085	-0.330 *						
							(0.086)	(0.174)						
imports/GDP					-0.001	0.000	-0.001	0.000	-0.001	0.000	-0.001	0.000	-0.001	0.000
					(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ln(distance)			0.171 ***	0.168 ***	0.156 ***	0.164 **	0.162 ***	0.185 ***	0.165 ***	0.134 **	0.142 ***	0.163 **	0.161 ***	0.132 **
			(0.035)	(0.055)	(0.032)	(0.065)	(0.033)	(0.062)	(0.035)	(0.054)	(0.03)	(0.07)	(0.031)	(0.054)
common language			-0.010	0.073	0.006	0.058	0.008	0.053	-0.003	0.023	0.015	0.075	-0.004	0.039
			(0.026)	(0.061)	(0.026)	(0.064)	(0.026)	(0.066)	(0.03)	(0.057)	(0.024)	(0.061)	(0.028)	(0.046)
colonial relationship			-0.093	0.072	-0.093	0.099	-0.092	0.101	-0.095	0.049	-0.082	0.067	-0.082	0.007
			(0.07)	(0.077)	(0.082)	(0.086)	(0.081)	(0.086)	(0.093)	(0.081)	(0.087)	(0.085)	(0.096)	(0.071)
regional trade agreement			0.111	0.093	0.100	0.079	0.112	0.129	0.100	0.011	0.077	0.003	0.060	0.068
			(0.072)	(0.127)	(0.071)	(0.138)	(0.071)	(0.133)	(0.071)	(0.162)	(0.075)	(0.139)	(0.076)	(0.154)
on border			-0.145 ***	-0.155 *	-0.152 ***	0.144	-0.149 **	0.156	-0.148 **	0.086	-0.190 ***	0.127	-0.172 **	0.069
			(0.044)	(0.088)	(0.055)	(0.093)	(0.057)	(0.098)	(0.058)	(0.083)	(0.071)	(0.082)	(0.072)	(0.064)
r of landlocked			-0.050	0.088	-0.054	0.132	-0.053	0.139	-0.078	0.105	-0.101	0.113	-0.114	0.073
			(0.146)	(0.18)	(0.141)	(0.177)	(0.145)	(0.167)	(0.142)	(0.177)	(0.155)	(0.162)	(0.165)	(0.156)
number of islands			-0.131 *	0.155	-0.109	0.208	-0.105	0.194	-0.132 *	0.114	-0.141	0.530 ***	-0.172 *	0.467 ***
			(0.067)	(0.18)	(0.073)	(0.185)	(0.069)	(0.182)	(0.074)	(0.172)	(0.09)	(0.173)	(0.091)	(0.145)
ln($area_i area_j$)			-0.023	0.041 *	-0.025	-0.039	-0.026	0.040 *	-0.028	0.018	-0.025	-0.051	-0.030	-0.024
			(0.017)	(0.024)	(0.018)	(0.025)	(0.018)	(0.024)	(0.018)	(0.021)	(0.019)	(0.033)	(0.018)	(0.021)
common legal origin			-0.135 ***	-0.220 ***	-0.155 ***	-0.240 ***	-0.152 ***	-0.232 ***	-0.173 ***	-0.226 ***	-0.158 ***	-0.214 ***	-0.175 ***	-0.193 ***
			(0.031)	(0.049)	(0.034)	(0.049)	(0.034)	(0.049)	(0.039)	(0.049)	(0.035)	(0.05)	(0.041)	(0.049)
stock market correlation									0.072	0.449			0.245 **	0.474 **
									(0.097)	(0.278)			(0.104)	(0.198)
GDP correlation											-0.004	0.018	-0.014	0.000
											(0.029)	(0.059)	(0.027)	(0.067)
R^2_{MZ}	0.319	0.308	0.502	0.423	0.517	0.421	0.519	0.429	0.542	0.431	0.571	0.5	0.595	0.526
No. observations	2046	2046	1388	1388	1203	1203	1203	1203	1041	1041	940	940	804	804
No. right censored	1035	923	451	367	382	311	382	311	287	250	271	219	195	175

Notes: The estimated model is that of equation (21), including fixed effects for both countries *i* and *j*: $HB_{ij} = \ln w_j^* - \ln w_{ij} = \alpha_i + \alpha_j + \beta \ln \sigma_{\eta_{ij}} + \varepsilon_{ij}$, which implies that $\ln P_i$ cannot be included in this model specification, adding a vector of controls X_{ij}. R^2_{MZ} is the McKelvey-Zavoina Pseudo-R^2. Standard errors are given in parentheses. Significance at the 99%, 95% and 90% level is denoted by ***, **, * respectively.

Table 6: Determinants of home bias – Pooled tobit model

	I		II		III		IV		V		VI		VII	
	Equity	Bonds	Equity	Bonds	Equity	Bonds	Equity	Bonds	Equity	Bonds	Equity	Bonds	Equity	Bonds
ln(real exchange rate volatility)	0.239 ***	0.357 ***	0.083 ***	0.160 ***	0.082 ***	0.161 ***	0.082 ***	0.116 **	0.094 ***	0.171 ***	0.037	0.093 *	0.047	0.105 *
	(0.025)	(0.036)	(0.024)	(0.045)	(0.023)	(0.046)	(0.025)	(0.051)	(0.025)	(0.051)	(0.027)	(0.053)	(0.03)	(0.063)
ln(wealth$_i$/world market cap)	-0.060 ***	-0.107 ***	-0.039 ***	-0.090 ***	-0.043 ***	-0.086 ***	-0.043 ***	-0.087 ***	-0.044 ***	-0.104 ***	-0.045 ***	-0.062 ***	-0.045 ***	-0.075 ***
	(0.012)	(0.022)	(0.008)	(0.019)	(0.009)	(0.018)	(0.009)	(0.018)	(0.008)	(0.021)	(0.01)	(0.018)	(0.01)	(0.02)
currency union							0.003	-0.274 **						
							(0.087)	(0.109)						
imports/GDP					-0.002 **	0.000	-0.002 **	0.000	-0.001	-0.001	-0.001	0.000	-0.001	0.000
					(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
ln(distance)			0.136 ***	0.182 ***	0.132 ***	0.179 ***	0.132 ***	0.192 ***	0.113 ***	0.140 ***	0.147 ***	0.190 ***	0.125 ***	0.138 ***
			(0.034)	(0.036)	(0.033)	(0.04)	(0.032)	(0.041)	(0.032)	(0.035)	(0.037)	(0.047)	(0.037)	(0.038)
common language			0.019	-0.006	0.022	-0.009	0.022	-0.029	-0.021	0.051	0.017	-0.012	-0.025	0.036
			(0.047)	(0.074)	(0.047)	(0.077)	(0.045)	(0.076)	(0.039)	(0.062)	(0.052)	(0.067)	(0.046)	(0.045)
colonial relationship			-0.155 **	-0.043	-0.128 *	-0.005	-0.128 *	0.004	-0.108	-0.072	-0.126	-0.063	-0.101	-0.153 **
			(0.071)	(0.075)	(0.075)	(0.085)	(0.073)	(0.085)	(0.08)	(0.071)	(0.078)	(0.085)	(0.086)	(0.059)
al trade agreement			-0.147 **	-0.073	-0.096	-0.059	-0.097	0.029	0.054	-0.102	-0.053	-0.131	0.035	-0.163
			(0.062)	(0.094)	(0.063)	(0.1)	(0.066)	(0.088)	(0.074)	(0.125)	(0.083)	(0.104)	(0.09)	(0.127)
on border			-0.104 *	0.116	-0.112 *	0.101	-0.112 *	0.119	-0.143 **	0.039	-0.148 *	0.119	-0.160 *	0.054
			(0.056)	(0.078)	(0.058)	(0.089)	(0.059)	(0.096)	(0.059)	(0.082)	(0.081)	(0.086)	(0.085)	(0.079)
number of landlocked			-0.024	-0.110	-0.025	-0.063	-0.025	-0.053	-0.046	-0.121	-0.039	-0.064	-0.046	-0.067
			(0.055)	(0.113)	(0.059)	(0.118)	(0.058)	(0.117)	(0.07)	(0.104)	(0.056)	(0.129)	(0.072)	(0.11)
number of islands			0.021	0.060	0.038	0.057	0.038	0.057	0.037	0.141 **	0.042	0.021	0.029	0.084
			(0.032)	(0.052)	(0.036)	(0.054)	(0.036)	(0.056)	(0.03)	(0.064)	(0.038)	(0.045)	(0.033)	(0.057)
ln(area$_i$area$_j$)			-0.016 **	0.003	-0.011	0.005	-0.011	0.006	0.006	0.005	-0.007	0.000	0.010	0.008
			(0.008)	(0.01)	(0.008)	(0.011)	(0.008)	(0.011)	(0.008)	(0.009)	(0.01)	(0.011)	(0.01)	(0.01)
common legal origin			-0.044 **	-0.169 ***	-0.047 **	-0.162 ***	-0.047 **	-0.142 **	-0.075 ***	-0.141 ***	-0.047 **	-0.174 ***	-0.085 ***	-0.154 ***
			(0.018)	(0.052)	(0.021)	(0.053)	(0.024)	(0.055)	(0.024)	(0.046)	(0.023)	(0.051)	(0.026)	(0.048)
stock market correlation									-0.459 ***	0.166			-0.398 ***	0.013
									(0.088)	(0.166)			(0.085)	(0.16)
GDP correlation											-0.156 ***	-0.126	-0.102 **	-0.118
											(0.048)	(0.097)	(0.048)	(0.102)
R^2_{MZ}	0.183	0.194	0.302	0.272	0.318	0.274	0.318	0.283	0.379	0.31	0.367	0.332	0.414	0.375
No. observations	2046	2046	1388	1388	1203	1203	1203	1203	1041	1041	940	940	804	804
No. right censored	1035	923	451	367	382	311	382	311	287	250	271	219	195	175

Notes: The estimated model is that of equation (21), pooling across all country pairs: $HB_{ij} = \ln w_j^* - \ln w_{ij} = \alpha + \beta \ln \sigma_{\eta_{ij}} + \gamma \ln P_i^D + \varepsilon_{ij}$, adding a vector of controls X_{ij}. R^2_{MZ} is the McKelvey-Zavoina Pseudo-R^2. Standard errors are given in parentheses. Significance at the 99%, 95% and 90% level is denoted by ***, **, * respectively.

Table 7: Determinants of home bias – Instrumented variable model

	I		II		III		IV		V		VI		VII	
	Equity	Bonds	Equity	Bonds	Equity	Bonds	Equity	Bonds	Equity	Bonds	Equity	Bonds	Equity	Bonds
IV of real exchange rate volatility	0.381 ***	0.550 ***	0.223 ***	0.309 ***	0.203 ***	0.307 ***	0.199 ***	0.269 ***	0.195 ***	0.339 ***	0.169 ***	0.224 ***	0.200 ***	0.233 ***
	(0.021)	(0.032)	(0.025)	(0.041)	(0.026)	(0.042)	(0.026)	(0.043)	(0.029)	(0.048)	(0.029)	(0.042)	(0.035)	(0.048)
ln(wealth$_i$)	-0.053 ***	-0.081 ***	-0.036 ***	-0.077 ***	-0.039 ***	-0.074 ***	-0.038 ***	-0.072 ***	-0.038 ***	-0.088 ***	-0.039 ***	-0.046 ***	-0.038 ***	-0.054 ***
	(0.005)	(0.007)	(0.005)	(0.008)	(0.005)	(0.008)	(0.005)	(0.008)	(0.005)	(0.009)	(0.005)	(0.008)	(0.006)	(0.009)
currency union							-0.036	-0.353 ***						
							(0.048)	(0.079)						
imports/GDP					-0.002 ***	0.000	-0.002 **	0.000	-0.001	-0.001	-0.001 **	0.000	-0.001	0.000
					(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
ln(distance)			0.137 ***	0.182 ***	0.126 ***	0.184 ***	0.127 ***	0.187 ***	0.110 ***	0.145 ***	0.137 ***	0.185 ***	0.126 ***	0.143 ***
			(0.013)	(0.021)	(0.014)	(0.023)	(0.014)	(0.023)	(0.015)	(0.025)	(0.016)	(0.023)	(0.018)	(0.025)
common language			0.004	-0.081	0.015	-0.088	0.013	-0.103 *	-0.033	0.002	0.007	-0.054	-0.036	0.026
			(0.033)	(0.053)	(0.034)	(0.054)	(0.034)	(0.053)	(0.034)	(0.055)	(0.036)	(0.052)	(0.038)	(0.052)
colonial relationship			-0.177 ***	-0.026	-0.143 **	-0.002	-0.141 **	0.015	-0.164 ***	-0.137	-0.101	-0.006	-0.125 *	-0.152
			(0.057)	(0.091)	(0.058)	(0.094)	(0.058)	(0.093)	(0.062)	(0.102)	(0.062)	(0.089)	(0.069)	(0.096)
al trade agreement			-0.136 ***	-0.177 ***	-0.109 ***	-0.159 ***	-0.090 **	0.023	0.027	-0.199 ***	-0.016	-0.182 ***	0.068 *	-0.211 ***
			(0.030)	(0.049)	(0.031)	(0.052)	(0.040)	(0.066)	(0.034)	(0.056)	(0.036)	(0.052)	(0.039)	(0.054)
on border			-0.165 ***	0.088	-0.183 ***	0.075	-0.182 ***	0.081	-0.205 ***	-0.017	-0.197 ***	0.092	-0.194 ***	0.022
			(0.046)	(0.074)	(0.048)	(0.079)	(0.048)	(0.078)	(0.048)	(0.080)	(0.054)	(0.079)	(0.056)	(0.079)
r of landlocked			-0.061 **	-0.149 ***	-0.068 **	-0.094 **	-0.067 **	-0.080 *	-0.067 **	-0.103 **	-0.043	-0.076 *	-0.045	-0.073 *
			(0.027)	(0.043)	(0.027)	(0.044)	(0.027)	(0.044)	(0.027)	(0.044)	(0.030)	(0.043)	(0.031)	(0.043)
number of islands			-0.040	-0.058	-0.021	-0.058	-0.021	-0.057	-0.039	-0.002	0.000	-0.049	-0.045	-0.002
			(0.026)	(0.041)	(0.027)	(0.043)	(0.027)	(0.042)	(0.032)	(0.052)	(0.029)	(0.041)	(0.036)	(0.049)
ln(area$_i$area$_j$)			-0.027 ***	-0.005	-0.022 ***	-0.002	-0.022 ***	-0.003	0.002	0.002	-0.014 **	-0.013	0.002	-0.007
			(0.005)	(0.008)	(0.005)	(0.008)	(0.005)	(0.008)	(0.006)	(0.009)	(0.006)	(0.008)	(0.007)	(0.009)
common legal origin			-0.060 ***	-0.202 ***	-0.065 ***	-0.185 ***	-0.063 ***	-0.166 ***	-0.108 ***	-0.164 ***	-0.065 **	-0.215 ***	-0.112 ***	-0.191 ***
			(0.021)	(0.034)	(0.022)	(0.036)	(0.023)	(0.036)	(0.023)	(0.038)	(0.025)	(0.035)	(0.027)	(0.037)
stock market correlation									-0.472 ***	0.226 ***			-0.327 ***	0.111
									(0.049)	(0.077)			(0.058)	(0.080)
GDP correlation											-0.157 ***	-0.129 **	-0.104 **	-0.158 ***
											(0.039)	(0.057)	(0.042)	(0.058)
No. obs	1550	1550	1137	1137	983	983	983	983	864	864	804	804	690	690
No. right censored	687	614	337	279	283	230	283	230	216	190	209	165	146	129

Notes: The estimated model is that of equation (21), pooling across all country pairs: $HB_{ij} = \ln w_j^* - \ln w_{ij} = \alpha + \beta \ln \sigma_{\eta_{ij}} + \gamma \ln P_i^D + \varepsilon_{ij}$, adding a vector of controls X_{ij} and instrumenting HB_{ij} with exchange rate regime, law and order, and corruption indicators for both source and host countries. Standard errors are given in parentheses. Significance at the 99%, 95% and 90% level is denoted by ***, **, * respectively.

Table 8: Determinants of home bias – Seemingly unrelated regressions (SUR) model

	I			II			III			IV			V			VI			VII		
	Equity	Bonds	$\chi2$ [p-value]	Equity	Bonds	$\chi2$ [p-value]	Equity	Bonds	$\chi2$ [p-value]	Equity	Bonds	$\chi2$ [p-value]	Equity	Bonds	$\chi2$ [p-value]	Equity	Bonds	$\chi2$ [p-value]	Equity	Bonds	$\chi2$ [p-value]
ln(real exchange rate volatility)	0.206 ***	0.312 ***	30.27	0.089 ***	0.231 ***	19.07	0.090 ***	0.222 ***	16.27	0.063 *	0.116 *	1.74	0.095 ***	0.218 ***	13.10	0.079 ***	0.198 ***	13.45	0.082 **	0.189 ***	10.10
	(0.011)	(0.018)	[0.000]	(0.018)	(0.031)	[0.000]	(0.018)	(0.032)	[0.000]	(0.022)	(0.039)	[0.188]	(0.02)	(0.034)	[0.000]	(0.02)	(0.031)	[0.000]	(0.023)	(0.033)	[0.002]
currency union										-0.089	-0.345 *	11.39									
										(0.043)	(0.074)	[0.001]									
imports/GDP							0.000	0.000	0.23	0.000	0.000	0.26	0.000	0.000	0.00	0.000	0.001	0.67	0.000	0.000	0.08
							(0.001)	(0.001)	[0.631]	(0)	(0.001)	[0.611]	(0.001)	(0.001)	[0.961]	(0.001)	(0.001)	[0.414]	(0.001)	(0.001)	[0.778]
ln(distance)				0.105 ***	0.119 ***	0.47	0.099 ***	0.121 **	1.03	0.105 ***	0.144 ***	3.14	0.105 ***	0.100 **	0.04	0.097 ***	0.124 **	1.49	0.106 ***	0.101 **	0.06
				(0.011)	(0.019)	[0.495]	(0.012)	(0.021)	[0.309]	(0.012)	(0.021)	[0.076]	(0.014)	(0.023)	[0.837]	(0.014)	(0.022)	[0.222]	(0.017)	(0.024)	[0.814]
common language				0.012	-0.041	1.50	0.024	-0.021	1.05	0.026	-0.015	0.85	0.037	0.021	0.12	0.034	-0.038	2.93	0.044	0.004	0.88
				(0.024)	(0.041)	[0.220]	(0.025)	(0.043)	[0.305]	(0.025)	(0.043)	[0.357]	(0.027)	(0.046)	[0.727]	(0.026)	(0.041)	[0.087]	(0.029)	(0.042)	[0.347]
colonial relationship				-0.062	0.054	3.62	-0.054	0.070	4.03	-0.054	0.072	4.13	-0.071	0.016	1.72	-0.058	0.044	2.81	-0.076	-0.021	0.72
				(0.034)	(0.057)	[0.057]	(0.035)	(0.061)	[0.045]	(0.035)	(0.06)	[0.042]	(0.039)	(0.066)	[0.189]	(0.038)	(0.059)	[0.094]	(0.044)	(0.062)	[0.395]
regional trade agreement				0.027	0.016	0.05	0.035	0.003	0.37	0.049	0.056	0.02	0.069	-0.028	2.79	0.033	-0.053	2.58	0.047	-0.100	6.82
				(0.029)	(0.049)	[0.830]	(0.03)	(0.052)	[0.545]	(0.03)	(0.053)	[0.982]	(0.034)	(0.057)	[0.095]	(0.033)	(0.051)	[0.108]	(0.038)	(0.055)	[0.009]
n border				-0.162 ***	0.088 *	21.72	-0.177 ***	0.074	19.82	-0.174 **	0.089	21.71	-0.169 **	0.042	12.97	-0.238 ***	0.055	23.00	-0.225 **	0.016	15.40
				(0.03)	(0.051)	[0.000]	(0.032)	(0.055)	[0.000]	(0.032)	(0.055)	[0.000]	(0.034)	(0.058)	[0.000]	(0.038)	(0.059)	[0.000]	(0.042)	(0.06)	[0.000]
of landlocked				-0.071	0.024	1.32	-0.068	0.059	2.47	-0.066	0.067	2.75	-0.074	0.065	2.80	-0.118	0.047	2.34	-0.127	0.014	1.78
				(0.046)	(0.078)	[0.251]	(0.045)	(0.079)	[0.116]	(0.045)	(0.078)	[0.097]	(0.049)	(0.082)	[0.094]	(0.067)	(0.104)	[0.126]	(0.072)	(0.103)	[0.182]
of islands				-0.074 *	-0.096	0.04	-0.065	-0.132	0.42	-0.064	-0.128	0.39	-0.071 *	-0.090	0.03	-0.062	-0.332 ***	4.68	-0.082 *	-0.296 ***	2.85
				(0.057)	(0.097)	[0.834]	(0.058)	(0.101)	[0.515]	(0.057)	(0.1)	[0.531]	(0.062)	(0.105)	[0.855]	(0.078)	(0.12)	[0.031]	(0.086)	(0.124)	[0.091]
ln(areaiareaj)				-0.006	-0.026 *	1.71	-0.006	-0.026	1.70	-0.006	-0.026 *	1.73	-0.010	-0.012	0.01	-0.017	-0.054	4.39	-0.023	-0.039	0.79
				(0.008)	(0.014)	[0.191]	(0.009)	(0.015)	[0.192]	(0.009)	(0.015)	[0.189]	(0.009)	(0.016)	[0.903]	(0.011)	(0.017)	[0.036]	(0.012)	(0.017)	[0.376]
common legal origin				-0.114 ***	-0.168 ***	3.62	-0.133 ***	-0.185 ***	3.11	-0.131 ***	-0.178 ***	2.58	-0.148 ***	-0.179 ***	0.97	-0.143 ***	-0.175 ***	1.16	-0.159 ***	-0.162 ***	0.02
				(0.016)	(0.027)	[0.057]	(5.548)	(9.497)	[0.078]	(0.016)	(0.029)	[0.108]	(0.018)	(0.031)	[0.325]	(0.018)	(0.028)	[0.281]	(0.02)	(0.029)	[0.897]
stock market correlation													-0.116	0.228	10.70				-0.008 **	0.260 **	6.44
													(0.062)	(0.104)	[0.001]				(0.072)	(0.103)	[0.012]
GDP correlation																-0.022	-0.034	0.05	-0.023	-0.052	
																(0.032)	(0.049)	[0.816]	(0.037)	(0.052)	
R^2	0.319	0.308		0.502	0.423		0.517	0.421		0.519	0.429		0.542	0.431		0.571	0.5		0.595	0.526	
No. observations	2046	2046		1388	1388		1203	1203		1203	1203		1041	1041		940	940		804	804	
No. right censored	1035	923		451	367		382	311		382	311		287	250		271	219		195	175	

Notes: The estimated model is that of equation (21), including fixed effects for both countries i and j: $HB_{ij} = \ln w_j^* - \ln w_{ij} = \alpha_i + \alpha_j + \beta \ln \sigma_{\eta_{ij}} + \varepsilon_{ij}$, which implies that $\ln P_i$ cannot be included in this model specification, adding a vector of controls X_{ij}. R^2 is the coefficient of determination. Standard errors are given in parentheses. Significance at the 99%, 95% and 90% level is denoted by ***, **, * respectively. χ^2 is the test statistic for equality of the respective coefficients in the equity and bond home bias regressions. P-values are given in brackets.

Table 9: Role of other sources of uncertainty – political and institutional factors

	I		II		III		IV		V		VI		VII	
	Equity	Bonds	Equity	Bonds	Equity	Bonds	Equity	Bonds	Equity	Bonds	Equity	Bonds	Equity	Bonds
ln(real exchange rate volatility)	0.062 ***	0.189 ***	0.065 ***	0.131 ***	0.073 ***	0.136 ***	0.072 ***	0.180 **	0.071 ***	0.222 ***	0.065	0.130 *	0.092	0.172 *
	(0.017)	(0.03)	(0.017)	(0.029)	(0.016)	(0.028)	(0.016)	(0.028)	(0.017)	(0.03)	(0.016)	(0.029)	(0.016)	(0.026)
ln(wealth$_i$/world market cap)	-0.034 ***	-0.074 ***	-0.034 ***	-0.087 ***	-0.031 ***	-0.085 ***	-0.032 ***	-0.081 ***	-0.032 ***	-0.068 ***	-0.033 ***	-0.086 ***	-0.040 ***	-0.057 ***
	(0.005)	(0.009)	(0.005)	(0.009)	(0.005)	(0.008)	(0.005)	(0.008)	(0.005)	(0.008)	(0.005)	(0.008)	(0.005)	(0.008)
Investment risk	-0.003 ***	-0.004 **												
	(0.001)	(0.002)												
Political risk			-0.002 **	-0.002 **										
			(0.001)	(0.001)										
nal conflict					-0.008	-0.015 *								
					(0.005)	(0.009)								
ciency of the judiciary							0.024	-0.129 **						
							(0.038)	(0.066)						
Inflation									0.008	-0.050 ***				
									(0.006)	(0.01)				
Corruption											-0.018 ***	-0.017 *		
											(0.006)	(0.011)		
Quality of information disclosure													-0.103 **	-0.391 ***
													(0.042)	(0.069)
R^2_{MZ}	0.370	0.269	0.384	0.278	0.360	0.267	0.346	0.263	0.352	0.270	0.374	0.270	0.371	0.294
No. observations	1152	1152	1129	1129	1129	1129	1154	1154	1152	1152	1129	1129	875	875
No. right censored	364	292	367	298	367	298	366	301	364	292	367	298	223	210

Notes: The estimated model is that of equation (21), pooling across all country pairs: $HB_{ij} = \ln w_j^* - \ln w_{ij} = \alpha + \beta \ln \sigma_{\eta_{ij}} + \gamma \ln P_i^D + \varepsilon_{ij}$, adding a vector of controls X_{ij}. R^2_{MZ} is the McKelvey-Zavoina Pseudo-R^2. Standard errors are given in parentheses. Significance at the 99%, 95% and 90% level is denoted by ***, **, * respectively.

Table 10: Alternative country samples

	Only mature countries		Only developing host countries		Only mature source countries	
	Equity	Bonds	Equity	Bonds	Equity	Bonds
ln(real exchange rate volatility)	0.092 ***	0.140 ***	0.126 ***	0.226 ***	0.043 ***	0.162 ***
	(0.035)	(0.062)	(0.046)	(0.137)	(0.028)	(0.079)
imports/GDP	-0.001	0.001	-0.011	-0.004	-0.001	0.000
	(0.002)	(0.001)	(0.015)	(0.01)	(0.002)	(0.002)
ln(distance)	0.276 ***	0.230 ***	0.117 ***	0.112 ***	0.227 ***	0.212 **
	(0.046)	(0.057)	(0.041)	(0.07)	(0.039)	(0.088)
common language	-0.102 *	-0.081	-0.003	-0.011	-0.047 *	-0.071 ***
	(0.065)	(0.074)	(0.044)	(0.11)	(0.022)	(0.044)
colonial relationship	0.183	0.082	-0.100	-0.159	-0.004	0.004
	(0.154)	(0.154)	(0.133)	(0.131)	(0.102)	(0.089)
regional trade agreement	0.324 ***	0.003	0.166	-0.060	0.153 **	-0.062
	(0.077)	(0.098)	(0.178)	(0.278)	(0.077)	(0.225)
common border	-0.040	-0.190 ***	-0.199	-0.201	-0.165 ***	0.111
	(0.107)	(0.068)	(0.238)	(0.2)	(0.089)	(0.087)
number of landlocked	0.390 **	-0.215	-0.193	0.274	-0.267	0.084 *
	(0.142)	(0.18)	(0.135)	(0.21)	(0.151)	(0.277)
number of islands	-0.117	-0.240 **	0.012 *	-0.303 ***	-0.122	-0.288 **
	(0.112)	(0.121)	(0.11)	(0.119)	(0.094)	(0.117)
ln($area_i area_j$)	-0.012	0.011	0.001	0.027 *	-0.035	0.006
	(0.024)	(0.017)	(0.019)	(0.028)	(0.017)	(0.037)
common legal origin	-0.232 ***	-0.341 ***	-0.120 ***	-0.137 ***	-0.167 ***	-0.230 **
	(0.061)	(0.09)	(0.043)	(0.084)	(0.041)	(0.059)
stock market correlation	0.125	0.229	-0.033	0.417	0.225	0.285
	(0.291)	(0.27)	(0.263)	(0.251)	(0.148)	(0.335)
GDP correlation	0.031	0.010	-0.055	0.176	-0.038	-0.002
	(0.052)	(0.082)	(0.051)	(0.133)	(0.019)	(0.082)
R^2_{MZ}	0.757	0.774	0.365	0.414	0.669	0.533
No. obs	254	254	369	369	553	553
No. right censored	4	0	115	120	72	74

Notes: The estimated model is that of equation (21), including fixed effects for both countries i and j: $HB_{ij} = \ln w_j^* - \ln w_{ij} = \alpha_i + \alpha_j + \beta \ln \sigma_{\eta_{ij}} + \varepsilon_{ij}$, which implies that $\ln P_i$ cannot be included in this model specification, adding a vector of controls X_{ij}. R^2_{MZ} is the McKelvey-Zavoina Pseudo-R^2. Standard errors are given in parentheses. Significance at the 99%, 95% and 90% level is denoted by ***, **, * respectively.

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