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The Equity Home Bias Puzzle: A Survey

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Abstract

Equity home bias — the empirical phenomenon that investors' portfolios are concentrated in domestic equities to a much greater degree than justified by portfolio theory — has puzzled academics for decades. Financial theory predicts that, relative to what investors actually hold, further international diversification would reduce risk significantly without affecting expected return. In this monograph, we survey the literature on the equity home bias puzzle and provide an integrative empirical analysis of some proposed explanations for the puzzle. The standard measures of home and foreign bias are critically reviewed both on *a priori* grounds and on their ex-post relation to variables that should be related to bias. Empirically, we find that the equity home bias reflects a combination of factors, with information asymmetries and economic openness (including the absence of costs such as taxes on international holdings) being the most important. We find that the bias is remarkably persistent and pervasive. It has fallen a little over time for Organisation for Economic Co-operation and Development (OECD) countries but still remains high, and has not diminished in non-OECD countries. We propose a new measure of home

bias, which has some desirable properties compared with alternative measures that are commonly used. We conclude that the puzzle remains essentially unsolved, even though researchers have observed variables that are highly correlated with the extent of home bias. We emphasize that the puzzle is to identify quantitatively the mechanisms acting to offset the large potential gains from international diversification, and we indicate what are, in our opinion, the most promising areas for future research.

Keywords: Equity; home bias; international portfolio choice.

JEL Codes: G11, G15, G02

Contents

Introduction

This paper has five goals: (1) we survey the literature on the equity home bias puzzle to provide an accessible overview, even for those with little prior knowledge of the issue; (2) we provide an integrative empirical analysis of some proposed explanations for the puzzle and offer a new measure of home bias; (3) we emphasize that the puzzle is to identify quantitatively the factors acting to offset the apparently large potential gains from international diversification; (4) we conclude that the puzzle remains essentially unsolved, even though researchers have observed variables that are highly correlated with the extent of home bias; and (5) we indicate what are, in our opinion, the most promising areas for future research.

Points (3) and (4) are particularly important, and closely related to each other. As an illustration, one of the factors strongly correlated with foreign portfolio investment is a measure of the distance between the country of the investor and the country of the investment. Equity investors who hold foreign shares do so disproportionately in countries that are "close" to their home country. This is contrary to standard portfolio theory, because these are the countries where the gains from

international diversification are smallest. For this policy to be justifiable in terms of standard portfolio theory, investors should obtain higher risk-adjusted returns from investing in these close countries rather than more distant ones with greater diversification potential. The mechanism that has been suggested is that there may be information advantages to investing in close countries. Yet there is no research to show that this translates into a differential level of return large enough to justify the investment choice. Thus there is a missing link in this part of the literature: What sort of extra return is sufficiently correlated with closeness and is sufficiently large to offset the difference in the diversification potential between close and distant countries?

This emphasizes the essentially quantitative nature of the puzzle. The home bias puzzle is not only about correlating patterns of behavior, but also about calibrating the mechanisms which generate different rates of return for investors in different locations that are of sufficient size to offset the gains from diversification. If such mechanisms cannot be found the challenge is to identify other highly pervasive and persistent features of global capital markets, whether they be institutional or behavioral, that can explain the phenomenon.

Our view is that, at present, despite decades of research we are still left with essentially the same puzzle, that there is still no way to reconcile portfolio theory with the size, pervasiveness, and persistence of the equity home bias. We believe that this is an opportune time for a survey of the issue to summarize the literature to date, and document in an integrative way the empirical patterns related to home bias. We hope that it gives encouragement, particularly to young researchers, to address the many unanswered questions in this field.

The structure of the paper is as follows. It opens with a brief survey of the literature on the home bias puzzle, the phenomenon that investors' holdings of local shares are totally out of line with the weight of these securities relative to the world market portfolio. The issues discussed in more depth in the remainder of the paper are, in Section 2, the measures of home bias per se, where we find that two of the commonly used yardsticks seem to be wanting and we propose an alternative measure; the methodologies measuring the economic significance

(Section 3); and, in Section 4, the country characteristics that are empirically associated with home and foreign bias and may provide hints about the underlying explanations. In Section 5, we briefly review the practical implications of the home bias literature, before providing our conclusions in Section 6.

1

What Is the Equity Home Bias Puzzle and Why Is It Important?

1.1 Domestic and International Diversification of Portfolios

Diversification of risk is central to both practical investing and finance theory. In practice it is widely accepted that an investor's equity portfolio should be highly diversified unless there are particular reasons (such as tax, information differences, hedging needs, or non-financial motives such as "ethical" investing) for the investor to deviate from this norm. Many empirical studies, including our work below, take the world equity-market portfolio as the standard, in the sense that any deviation between observed portfolio weights and the world market weights is regarded as potentially anomalous and in need of an explanation. In this section, we review the soundness of this benchmark, and the possible reasons why, in reality, portfolios might rationally be different from that benchmark. If these explanations fail, we are left with a puzzle, an anomaly.

The proposition that the world market portfolio should be the investor's best choice is derived by assuming that individuals differ very little from each other and, therefore, all face a very similar problem. One version is that investors have hyperbolic absolute risk aversion

(HARA) utility functions with a common exponent and a common time preference. The more conventional starting point is that investors have mean–variance objectives. Additional assumptions are that all investors face the same investment opportunities and agree on the joint distribution of real pay-offs; markets are perfect; and the portfolio decision can be made in isolation because non-financial income ("labor income") is absent or at least non-stochastic. Some heterogeneity is allowed: notably, investors can differ in wealth and risk aversion. Given these assumptions, agents with the same information and opportunity sets but different risk preferences should hold the same portfolio of risky assets, and adjust for risk aversion by optimally mixing this "fund" with risk-free borrowing or lending (two-fund separation). If everyone does hold the same portfolio of risky assets and if markets clear, this portfolio must be the market portfolio of risky assets.

The original mean–variance model was proposed by Markowitz (1952) without any reference to the expected-utility paradigm that is behind the HARA case, but soon became integrated into that literature. Merton (1971) then derives the standard portfolio proposition and capital asset pricing model (CAPM) in continuous time, under the assumption that the joint distribution of asset returns is constant over time (the static CAPM). We return to the case of changing investment opportunity sets, and the corresponding consumption CAPMs, toward the end of this section. First, we review the issues within the standard static-CAPM framework.

Like in most of the empirical work on the CAPM, the home bias literature usually narrows down the universe of assets under consideration from "all risky assets" to "all listed stocks," since these represent the bulk of freely tradable risky assets. So the corresponding market portfolio is commonly taken to be a portfolio of all public equities. Standard arguments about diversification do not distinguish between stocks of different countries. If the fact that investors live in different countries does not affect the homogeneity of their expectations and opportunities, everyone would still hold the same portfolio of risky assets, which would then have to be the world market portfolio. However, in reality, investors hold disproportionate amounts of home equities relative to the world market portfolio. This under-diversification phenomenon is

called the equity portfolio home bias. In our brief review of the prior literature we discuss to what extent this bias can be explained within the usual rationality framework, first assuming a static environment.

It is worth noting that any explanation for the home bias should ideally also be able to explain other closely related phenomena. For instance, investors not only overinvest in their home equity market but they also invest most heavily in markets that are "close" to them (Portes and Rey, 2005). Markets that are geographically close or related by strong information flows receive the bulk of foreign equity investment, regardless of the potential diversification gains. This "foreign bias" is as marked and persistent as the home bias and equally presents a challenge to standard portfolio theory, although the determinants of foreign bias appear to be different from the determinants of home bias (Chan et al., 2005). Similarly, Coval and Moskowitz (1999) document a "local bias" in equity investment within the U.S. market, whereby U.S. investment managers exhibit a strong preference for shares of locally headquartered firms. Sørensen et al. (2007) document a home bias in holdings of bonds. In a broader economic context there are home bias puzzles in consumption (for a summary, see Lewis, 1999), trade (for a summary, see Obstfeld and Rogoff, 2000), mergers and acquisitions (Grote and Umber, 2007), and even in academic research (Karolyi, 2012).

1.2 The Importance of Home Bias

In 2010 U.S. investors held 78% of their equity portfolio in U.S. stocks whereas U.S. stocks represented about one-third of the world market portfolio, by capitalization. This would not be worrisome if that portfolio choice were superior. But that does not appear to be the case: our illustration in this section suggests that U.S. investors seem to have chosen a portfolio on the lower (inefficient) half of the mean–variance frontier. The size of the inefficiency is large, corresponding to a potential shortfall of several percentage points relative to fully diversified portfolios (Cooper and Kaplanis (CK), 1986; French and Poterba, 1991 (FP)).

Although over the last few decades investors have tended to increase the share of foreign stocks in their equity portfolios, the decline of the

degree of home bias in international financial portfolios has been so slow that portfolios remain severely under-diversified. Recent figures from the Coordinated Portfolio Investment Survey (CPIS) show that the fraction of stock market wealth invested in foreign assets at the end of 2010 was 22% for the United States, 24% for Canada, 49% for Germany, and 39% for the United Kingdom. The earliest figures of the CPIS are for the year 1997, when the proportion of foreign equities in the total equity portfolio was only 10% for the United States, 11% for Canada, 18% for Germany, and 22% for the United Kingdom. So, on the bright side, as far as the industrialized countries are concerned the share of foreign equities has roughly doubled over a period of 13 years. Still, the bulk of the portfolio remains domestic.

A simple two-country example makes clear why financial economists are puzzled by the observed level of under-diversification. Figure 1.1 shows the mean–variance characteristics of portfolios consisting of only

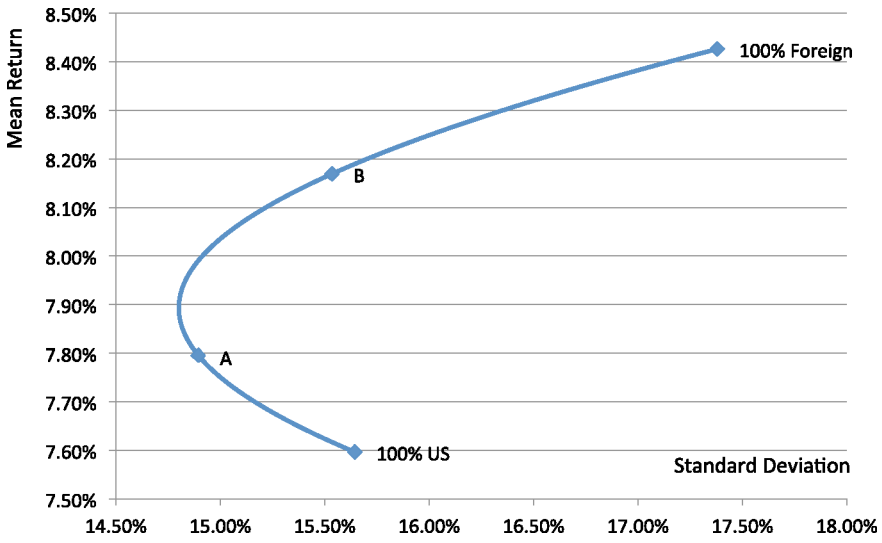

Fig. 1.1 Efficient frontier U.S.–Non-U.S. portfolio.
We plot the mean and standard deviation of annualized monthly returns, estimated over January 1970 to December 2011, for various convex combinations of a purely U.S. portfolio and a purely foreign one. Point A is the U.S.' actually chosen mix. Point B on the curve represents a portfolio that consists of 71% foreign equities and has the same standard deviations as the pure U.S. portfolio.

two assets in various proportions: a U.S. fund, represented by the MSCI U.S.A. index, and a non-U.S. equity fund, notably the MSCI World ex U.S.A. Index. Specifically, we estimate annualized means and (co)variances using 42 years of monthly data, January 1970 to December 2011, and we plot the annualized mean and standard deviation for various convex combinations of the two portfolios. The lowest-return point turns out to be the 100% U.S. portfolio. There is a mixed portfolio, with 71% foreign equities, that has the same standard deviation as a portfolio containing only U.S. stocks, but it paid a 161 basis points (bp) extra return (8.19% relative to 7.60%) and should therefore be preferred over a purely U.S. equity portfolio. Adding a mere 22% foreign assets, as the United States did in 2010, does improve both the mean and the standard deviation (point A). But further diversification would have paid even more: point A remains on the inefficient half. Of course, mean–variance optimization using ex-post means is of questionable value; Britten-Jones (1999), for instance, demonstrates that errors tend to eclipse the true solution, and our findings below are fully consistent with this view. (The unreliability of sample means is why much of this literature works with risk-implied returns that can be directly inferred from portfolio weights.) But while a graph like this one could still invoke sampling errors,[1] the phenomenon is too widespread to be dismissed as the effect of chance. Thus, the puzzle to be resolved is why investors universally seem to stop far short of the optimum and leave further diversification benefits unexploited.

1.2.1 Imperfect Diversification in a Static Framework: An Overview

The equity home bias is a puzzle because the risk reductions foregone by not diversifying internationally are substantial, and it is difficult to identify equally large offsetting benefits from concentrating an equity portfolio locally. But universal two-fund separation holds only under a rather specific set of assumptions; so violations of any of these

[1] In this particular instance, a "spanning" regression test of the world excess return on the excess returns from the U.S.-held portfolio produces a significant intercept; that is, the apparent inefficiency is probably not due to bad luck ex post.

assumptions might provide a reason for an individual investor to diverge from that fully diversified benchmark portfolio:

(i) *Heterogenous expectations.* This heading can cover two rather different issues:

- **(a)** *Real exchange risk.* The investors care about real returns, but consumption prices evolve differently across countries even after translation into a common currency. So real returns differ depending on where one lives, affecting both expected returns and covariances.
- **(b)** *Different beliefs.* The investor has different information about some stocks compared with the average investor and so will over- or under-weight those stocks to take advantage of the differential information.[2]

(ii) *Heterogenous opportunities.* Exchange regulations and capital restrictions may hinder a country's residents' ability to invest abroad, and foreign investment rules may likewise hinder foreigners' ability to invest in the home country.

(iii) *Trading costs, taxes, etc.* Some investors may receive different net returns relative to the average investor, for instance because they pay more taxes or higher trading costs, and the effect may not be the same across all assets. Optimizing on the basis of returns net of such taxes should result in a portfolio that differs from the market.

(iv) *"Labor" income.* The investor cares about the sum of financial and non-financial wealth, and the risk of that sum contains not just the variance of financial wealth but also its covariance with non-financial income. Human wealth is non-tradeable, so the portfolio should adjust, not the other way around. The weight of human wealth may differ across investors, and so may its correlation with various stocks.

[2] The difference between the two cases is that in the first scenario the differences are genuine while in the second case they might be just in the investors' minds. For example, a USD risk-free asset objectively has zero nominal risk to an American investor but not to a European one.

In addition to the above rational reasons, investors may choose to deviate from the market portfolio for behavioral reasons. For instance, an investor may feel more comfortable investing in shares of companies which operate locally, even if their prospects are objectively no different from those further away. More subtly, investors may give mandates to portfolio managers that induce them to display home bias. In such cases the bias induced by the mandate will appear to be the cause of the home bias, but that simply raises the deeper question of why the investor gives such mandates if they involve a considerable opportunity cost.

As a result of these factors a particular group of investors may rationally concentrate their equity portfolios in particular types of stocks. For instance, investors with low income tax rates may hold a disproportionate share of high-dividend stocks. It could likewise be rational for investors to concentrate their holdings of equities in their home market if it is justified by differential information, costs, taxes, or hedging needs. Just as investors in the lower tax brackets might concentrate their shareholdings in high-dividend companies because the net return to them on these stocks is higher (relatively) than for more heavily taxed investors, so investors in the United States might concentrate their shareholdings in U.S. stocks if foreign investors face a cost of investing in these stocks that residents do not. Alternatively, investors with a behavioral bias toward familiar stocks may concentrate their holdings in shares of companies which are headquartered locally.

Hence by observing the portfolios of different groups of investors we can infer something about the differences in their information, opportunity sets, hedging needs, or behavioral biases that would be needed to explain the observed bias, and we can then verify the plausibility of the implicit costs. This "inverts the problem" by converting the home bias into a measure of opportunity cost that can be compared directly with measures of the purported explanations. Alternatively, one can introduce an imperfection using plausible parameters (like tax rates and so on) and investigate how much home bias, if any, this might generate. Obviously, any such trade-off depends on the model of international portfolio choice and especially on what type of international heterogeneity is being introduced.

1.2.2 Static International Portfolio Theory and Equity Home Bias

In this subsection, we first review risk-related explanations (differential inflation-hedging effects; human wealth risk) and then theories that focus on expected returns.

1.2.2.1 Possible Hedging Arguments

If exchange rates change, the nominal returns from a given asset diverge depending on what currency the investor uses. In the same way, there is real exchange risk if investors realize different real returns from holding the same asset, depending on where they live. This may affect portfolio choice. For example, in real terms the Australian T-bill may be a low-risk asset to Australian residents but a medium-risk one to U.S. investors, and vice versa, so that investors invest differently even if they have the same relative risk aversion. If domestic stocks tend to be the ones that have lower real risks or better real returns, this might create home bias in the equities part of the portfolios.

The formal analysis works as follows. Suppose investors care about real returns, but data are all in some nominal unit, say USD. To obtain the real stock price for investors from country k, $v^{(k)}$, one deflates the dollar stock prices V by a translated price level, which is the product of the nominal exchange rate (S_k, in dollar per unit of k's currency) and the price level Π_k as measured in the investor's home currency: $v^{(k)} = V/[S_k \Pi_k]$. The question is how the dependence of the means and covariances of real returns on k affects the demand of different investors for the same security, and especially for investments in equities in different countries.

Friend et al. (1976) show that investors still hold two funds, one being a particular nominally efficient portfolio and the other one the portfolio of all stocks that does best in tracking the inflation rate.[3] The

[3] The analysis needs the continuous-time setting, otherwise a real mean–variance problem cannot adequately be restated in terms of means and (co)variances of nominal returns, exchange rate changes, and inflation rates. Sercu (1981b) compares the implications of the conventional linear approximation to those of the Ito treatment and finds the former generates contradictions.

first fund is the portfolio chosen by a log-utility investor (with relative risk aversion equal to unity); in the second fund, a stock's weight is set equal to the regression coefficient the stock would receive in a regression of inflation rates on all stock returns simultaneously. If, as is likely, the sum of these slope coefficients is not summing to unity, a position in the nominally risk-free asset is added to bring the sum of the weights to unity.

The international version, where the translated foreign price levels $S_k\Pi_k$ and the changes therein are different across countries k, offers some relevant insights (Sercu, 1980, 1981a,b; Stulz, 1981a,b; Adler and Dumas, 1983). First, the calculated weights in the log-utility portfolio are the same no matter in what currency the means and (co)variances are expressed. That is, this portfolio is efficient in any nominal or real unit one can think of, and is the same for all investors regardless of their economic nationality.[4] So the first fund cannot be a source of home bias. A second result is that, when a real risk-free asset is available for country k, the inflation-tracker fund collapses to an investment in that inflation-hedged asset (the standard separation result). For instance, when inflation is zero or otherwise non-stochastic, the regression coefficients that stocks receive when the inflation rate is regressed on all stock returns are all zero, meaning that the tracker fund consists of just the local T-bill. Alternatively, if inflation is stochastic but there is an index bond paying out a fixed real return plus the inflation rate, then the tracker fund will consist of just the index bond. So in either case, the tracker-fund part of any efficient portfolio would be country-dependent, with everyone selecting their country's real risk-free asset, but that would not affect the demand for stocks since the tracker does not contain any stocks. In a third interesting case inflation is again stochastic and there is no index bond, but stock returns are uncorrelated with unexpected inflation. Then the stocks' weights in the inflation tracker

[4] This result, first derived in a continuous-time setting by Sercu (1980) and Stulz (1981a) after an early lead by Solnik (1974), reflects the separation property of the log function. Maximization of $\mathrm{E}(\ln W/P)$, where P is a relevant price variable, has the same first-order conditions as maximization of $\mathrm{E}(\ln W)$ or even $\mathrm{E}(\ln W/P')$, P' another price-level variable, because $\mathrm{E}(\ln W/P) = \mathrm{E}(\ln W) - \mathrm{E}(\ln P)$ and because, for a price taker, $\mathrm{E}(\ln P)$ is unaffected by the individual's portfolio decision.

would still be zero, meaning there is no home bias coming from the inflation hedge fund. Conversely, inflation hedging can explain home bias only if there is no index bond, at least some stocks are positively correlated with inflation, and local stocks are much better at tracking local inflation.[5]

The simplest empirical application of this type of approach shows that equities hardly hedge local inflation risk (Adler and Dumas, 1983; Cooper and Kaplanis, 1994), and hedging of aggregate Consumer Price Index (CPI) inflation certainly does not explain home bias. In the same vein, the disappearance and re-appearance of inflation-linked bonds in, for example, the United Kingdom and the United States does not seem to correspond to changes in home bias, suggesting that local stocks are not acting as substitutes for index bonds. The fact that few countries do have index bonds suggests that, recently, inflation hedging has not been a widespread concern among investors in the first place.

More subtle explanations of the home bias caused by hedging demands have been proposed whereby local equities hedge the consumption risk of non-traded goods (Obstfeld and Rogoff, 2000). In this type of model the imperfections that generate the home bias are frictions in goods markets rather than capital market imperfections. One should add that the prediction can be quite sensitive to the choice of the utility function. Also, despite the intuitive plausibility of this line of argument it faces an important empirical challenge. It generates home bias because owning shares in companies that produce local non-traded goods is a good way to hedge their future consumption. If that is the explanation for home bias, the hedging benefits of local equities should be visible in a high empirical correlation of their returns with the price of a local consumption basket, and, as stated already, it is difficult to identify such a correlation (Van Wincoop and Warnock, 2010).

Lewis (1999) discusses other possible hedging explanations, such as hedging human capital, which suffer from similar empirical shortcomings. If home stocks would be better able to diversify away the risk of labor income, the portfolio would rationally be home biased. But a

[5] A preference for positive covariance with inflation assumes that relative risk aversion (RRA) exceeds unity, but the consensus is that this is the case.

long literature, starting from Fama and Schwert (1977), finds that stock returns are not meaningfully correlated with changes in the country's aggregate labor income. This then implies that portfolio choice can be made without reference to the country's labor income. Similar results hold for real estate: it represents a substantial part of most investors' wealth, but its value changes are only weakly correlated with stock returns, and one can surely not claim that local stocks are better hedges of local real-estate price risk than foreign stocks.

1.2.2.2 Biases in Expected Return and/or Costs to Foreign Equity Flows

If home bias is hard to explain by differences in riskiness related to the investor's context (prices and labor income), then maybe the expected returns are affected by one's place of residence, instead. A simple extension of the mean–variance model incorporates extra costs for investors holding foreign equities, such as additional taxes. This creates a wedge between the net returns to foreign and domestic investors and results in a home bias. It has implications for both international portfolio holdings and asset pricing. Models of this type, developed by Black (1974), Stulz (1981a,b), and Errunza and Losq (1985) have later been used to quantify the size of costs that would be necessary to explain the observed home bias, starting with Cooper and Kaplanis (1986). These implied costs amount to several percentage points per annum (p.a.) and exceed any reasonable estimates of actual costs. For example, differential trading costs for foreigners would have to be an order of magnitude greater than they actually are to explain the home bias (Glassman and Riddick, 2001). In the same vein, Sercu and Vanpée (SV) (2008) find that implied costs for investments into emerging markets are many times higher than for mature Western economies, a difference that seems to be totally out of line with direct cash costs.

A similar wedge between the returns to local and foreign investors can be created by assuming that local investors expect lower returns on foreign assets, for reasons other than pure costs. This approach has been used by French and Poterba (1991) to infer differences of beliefs between local and foreign investors. These implied differences in expected

returns are large, amounting to several percentage points, for which there is no obvious explanation. Since this metric is observationally indistinguishable from a Cooper–Kaplanis implied cost, one cannot be sure whether the effect is caused by differences in costs or differences in expectations; all one observes is the spread between the estimated true expectation and the implied beliefs net of cost.

French and Poterba (1991), and many after them (see e.g., Glassman and Riddick, 2001; Jeske, 2001) estimate the bias that may have been behind observed under-diversification in international equity portfolios by comparing true gross expected returns to implied expected returns. The true expected returns, denoted as the vector $\underline{\mu}$, are estimated via mean realized returns. The implied expected net returns, in contrast, are the beliefs that investors i must have held if they really thought their portfolio was efficient, after costs if any:

$$(\underline{\mu}^i - \underline{1}r)^{impl} = \gamma \Omega a^i, \tag{1.1}$$

where $\underline{\mu}^i - \underline{1}r$ is the vector of expected net excess returns as perceived by investor i, γ denotes the coefficient of RRA, Ω is the covariance matrix of risky asset returns, and a_1 is the vector of actual portfolio shares. Investor i's perceived net return may fall below the true expected return because there are costs (Cooper and Kaplanis), or there is undue pessimism (French and Poterba), or a mixture of both:

$$\underline{C}^i := \underline{\mu} - \underline{\mu}^i = [\text{pessimism}]^i + \text{costs}^i, \tag{1.2}$$

where, it will be recalled, the true expectations in $\underline{\mu}$ (unsubscripted) can be estimated by the sample means. Regardless of the source (true bias or cost), we can ask the question whether the total bias seems reasonable.

1.2.2.3 Regulation

Another potential explanation of home bias is regulation. Of course, severe investment restrictions still do apply in some emerging countries, and these are easily identified as the 100% biased cases in the tables of Section 3. The question is whether within, say, the OECD such rules still matter. French and Poterba also examine the possibility that

investment restrictions explain the lack of international diversification and find that portfolios held by western investors do not appear to be affected by any binding institutional restrictions. Most studies cited in Section 4 agree.

1.2.2.4 Other Explanations

Hence, it does not appear to be possible to explain the extent of equity home bias within the paradigm of standard mean–variance international portfolio theory. It is conceivable that several reasons combined could be the cause (for example costs, restrictions, hedging demand). Another possibility is that home bias reflects factors that are not included in standard portfolio models, for example agency costs (Stulz, 2005) and information disadvantages of foreigners (Gehrig, 1993; Kang and Stulz, 1997). A third possibility is that the apparent puzzle is due to mis-measurement of the benefits of international diversification (Errunza et al., 1999) or the extent to which foreign shares are freely available (Dahlquist et al., 2003). Finally, it is possible that the bias is simply behavioral, resulting from an irrational preference for local shares, regardless of their financial characteristics.

For each potential explanation of home bias the challenge is to generate effects that have the size and persistence of the actual home bias using realistic parameter values. In addition, if information disadvantages to individual investors are the cause they must still hold in the face of investment vehicles such as index funds and exchange-traded funds (ETFs), where decisions are relegated to better-informed professionals and where management fees (and, therefore, the scope for rent extraction) are very low indeed.

1.2.3 The Consumption CAPM, and Dynamic Models

Neither standard portfolio models augmented in the way discussed above, nor the factors discussed in the previous subsection appear to explain fully the home bias. Another possible line of analysis is to use a different type of portfolio model. One possibility is the consumption CAPM of Breeden (1979). The seminal result is that any risk premium is proportional to the covariance of the asset's return with the

growth rate of consumption. If we assume that observed consumption is optimal in the sense assumed in the model, then we might end up with a case for home bias rather than perfect international diversification if local assets are better at financing observed consumption than international assets. The fact indeed is that current portfolios, along with non-investment income ("labor" income), tautologically do finance every country's aggregate consumption. The question however is whether this really happens in the way the model predicts. Familiarly, even U.S. assets' covariances with U.S. consumption growth rates are extremely low; so to explain observed risk premiums, relative risk aversion should be 50 or 100 times larger than the kind of numbers that economists think of as reasonable (Mehra and Prescott, 1985).[6] Given these low correlations, we also have no basis for a claim that local assets are inherently better at financing observed consumption growth than international assets. That is, any proposition that the consumption CAPM explains home bias looks fragile.

The Stulz (1981b) variant of the Breeden approach does contain additional variables besides real consumption growth, notably all goods' individual inflation rates and potentially any state variables that may affect the utility of consumption.[7] This may seem to suggest additional hedging dimensions; and especially commodities do exhibit strong correlations with the related primary-sector stocks. However, Stulz's goods are consumer goods not commodities. Moreover, Stulz shows the individual-good inflation rates can still be grouped into two differently-weighted averages, which one can think of as total inflation and marginal inflation.[8] While a real-world CPI inflation rate is

[6] Relatedly, the model has a hard time discovering the predicted link between the risk-free real interest rate and expected real growth. For reviews, read e.g., Cochrane (2001, 2011) or Campbell et al. (1997).

[7] Stulz generalizes the setting to cover many goods, allowing for non-homothetic preferences. In Stulz' equations, which one can easily generalize to include state-dependent utility of consumption, any risk premium remains proportional to the return's covariance with the growth rate of marginal utility, but that growth rate now has many more determinants than in Breeden's model: the growth in nominal spending, all individual-good inflation rates, and changes in all state variables that affect the utility of consumption.

[8] Denote prices and consumed quantities of good g by p_g and c_g, and the nominal consumption budget by C. Total inflation is computed from good-by-good inflation rates weighted by those goods' total consumption rates; that is, the weight for good g is $(c_g p_g)/C$. In marginal inflation, by contrast, the weights are not based on total consumption c_g but on

not quite identical to Stulz's total inflation rate, it must be close. The problem again is that, empirically, asset returns exhibit virtually no correlation with CPI inflation rates. It is true that marginal inflation is further from CPI inflation, as it overweights luxury goods and underweights elementary items, but it still is a weighted average of many consumer-good prices, and is therefore unlikely to be notably more hedgeable than CPI inflation.

In the Breeden specification, one need not worry about state variables that, as in Merton's (1973) model, cause changes in expected returns and (co)variances: all optimal intertemporal choices are fully and uniquely reflected in the consumption decision. In a more generalized model the cause of home bias could be that local equities are better hedges against shifting opportunity sets than are international equities. For example, this would happen if local equities hedge the effects of major events, such as war, better than do foreign equities. However, it is hard to imagine why domestic stocks would be the chosen instruments to hedge against events that might depress local consumption. If anything, foreign stocks or perhaps alternative investment classes would look like the wiser choice.

marginal consumption, $\partial c_g/\partial C$, and these marginal weights differ from the first set unless income elasticities are equal to unity.

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