Global Portfolio Rebalancing Under the Microscope

Harald Hau*
INSEAD and CEPR

and

Hélène Rey**
London Business School, CEPR and NBER

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Abstract

The dramatic increase in gross stock of foreign assets and liability has revived interest in the portfolio theory of international investment. Evidence on the validity of this theory has always been scarce and inconclusive. The current paper derives testable empirical implications from microeconomic foundations. We then use a new comprehensive data set on the investment decisions of approximately 2,000 international equity funds domiciled in four different currency areas to revisit the empirical relevance of international portfolio rebalancing. The disaggregated data structure allows us to examine whether foreign exchange and equity risk triggers predicted rebalancing behavior at the fund level. We find strong support for portfolio rebalancing behavior aimed at reducing both exchange rate and equity risk exposure for most countries.

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*Department of Finance, INSEAD, Boulevard de Constance, 77305 Fontainebleau, France. Telephone: +33 1 6072 44 84. E-mail: harald.hau@insead.edu. Web page: http://faculty.insead.fr/hau/

**Department of Economics, London Business School, Regent's Park, London NW1 4SA, UK. Telephone: +44 207 000 8412. E-mail: hrey@london.edu. Web page: www.princeton.edu/~hrey

1 Introduction

The gross stocks of foreign asset and liabilities have increased dramatically from roughly 50 percent of world GDP in the early 1990 to more than 120 percent a decade later (Lane and Milesi-Ferretti (2007)). Short-run capital gains and losses on those assets have significant effects on the current account. Valuation effects, expected or unexpected, take greater importance relative to traditional product account determinants of the current account (Gourinchas and Rey (2007) and Tille (2004)). What are the consequences of those valuation effects? Are they an important determinant of the simultaneous increase in international equity flows? Do they give rise to greater external imbalances or lead to an adjustment process which stabilizes the current account?

These questions have revived interest in the portfolio balance models of the 1970s devoted to the issue of international asset allocation and its relationship to exchange rate behavior.[1] This literature has often been dismissed for lack of microfoundations and inconclusive empirical performance in aggregate data. In the absence of suitable microeconomic data, it proved difficult to link differences in home and foreign investment returns to any observable capital flows. However, the increased leverage of the current international asset positions makes it important to revisit this linkage.

At the heart of portfolio balance models lies the assumption that domestic and foreign assets are imperfect substitutes. A country's residents have a preference for assets denominated in home currency. Price changes of foreign relative to home assets alter the investor's actual portfolio shares relative to his desired allocation. The increase in the foreign net asset position of the home country then motivates an asset reallocation towards home assets appreciating the home currency and mitigating the original valuation shock. Hau and Rey (2006) show that portfolio rebalancing implies an 'equity parity condition' in which exchange rates adjust and partly off-set the valuation effects of differential equity market performance. They provide evidence that dollar exchange rate changes of OECD countries are indeed negatively related to the relative performance of the respective equity markets. Higher stock returns in the European equity markets over the U.S. markets for example correlate with a depreciating Euro at all relevant frequencies from a day to a quarter. Interestingly, this negative correlation between exchange rates and relative equity market returns becomes more pronounced in the 1990s along with the quantitative rise of international asset positions.

The current paper makes two new contributions. First, we derive testable predictions for the investment behavior of international equity funds in a setting where the exchange rate risk is traded incompletely. These predictions concern the portfolio risk dynamics of individual funds. Second, we confront these predictions with new micro data. A unique data set allows us to track the investment strategies of international equity fund managers at the stock level. We can therefore test for portfolio rebalancing behavior at the fund level in a sample of pronounced heterogeneity both in investor location and investment destination. We first relate a fund's portfolio rebalancing to its specific return differential on international versus domestic

[1] See Kouri (1982). For a survey of this literature see Branson and Henderson (1985).For recent models of international portfolio investments see Devereux and Sutherland (2006) and Tille and Wincoop (2007).

equity positions. We then distinguish between equity risk and exchange rate risk and relate both of them to portfolio rebalancing at the fund level. This provides a more direct and powerful test of portfolio rebalancing behavior compared to empirical work based on aggregate data. Previous literature tests portfolio balance models on the base of macroeconomic data. The corresponding results are generally inconclusive (Frankel (1982b), Frankel (1982a), Rogoff (1984), Park (1984), Loopesko (1984)). The literature on portfolio analysis at the fund level is more recent and scarce, but provides interesting new insights in addition to a considerable gain in statistical power. For example, Laurent Calvet and Sodini (2007) analyze portfolio rebalancing using microeconomic data on Swedish households. They examine the rebalancing between equity and riskless assets and find evidence of portfolio rebalancing especially for the most educated households. Our own analysis differs in its focus on the international investment of institutional investors with explicit consideration and computation of the exchange rate and portfolio risk.

We find strong evidence in favor of portfolio rebalancing in our micro data.: i) funds rebalance out of (into) foreign assets when the share of foreign assets in their portfolio passively increases after returns and exchange rate realisations; ii) funds actively decrease the risk of their portfolio following a passive increase in the risk of their positions; there is evidence of rebalancing to reduce both equity and exchange rate related risks; iii) funds actively decrease the marginal risk contribution of specific stocks.

The following section 2 presents a simple two-country model with three periods. Its parsimonious microeconomic structure allows us to derive 4 testable propositions. Of particular interest are propositions 3 and 4 which concern the rebalancing dynamics at the fund level. Section 3 presents the new microdata. It allows us to examine the model predictions about the foreign equity share dynamics in section 4.1 and portfolio risk dynamics in section 4.2. Section 4.3 extends this analysis further to the stock level rebalancing reaction to changing marginal risk contributions of individual stocks in the fund portfolio. Section 5 concludes.

2 Model

Evidence from mutual fund surveys suggests that international equity funds do not widely use exchange rate derivatives to trade their exchange rate exposure. Here we explore the implications of such market incompleteness for the optimal investment behavior of international funds. Unhedged exchange rate risk makes domestic and foreign assets imperfect substitutes. We show that international equity fund managers rebalance out of foreign equities into domestic equities whenever the foreign component of their portfolio outperforms the domestic component. Intuitively, the exposure of international equity managers to exchange rate risk increases as the weight of foreign securities increases. Rebalancing towards domestic equity decreases their exchange rate exposure. The following model simplifies the continuous time framework in Hau and Rey (2006) to a discrete time version with three periods. This allows us to perform a simple decomposition of the effect of increased exchange rate risk and equity risk on portfolio rebalancing.

Assumption 1: Investment Opportunities

A home and foreign CARA investor with risk aversion ρ make optimal portfolio allocation decisions in periods 1 and 2 to maximize their terminal wealth in period 3. Each investor can invest in a risky home and foreign stocks with independent normally distributed (period 3) liquidation values, V^f and V^h, respectively, or in a domestic riskless asset with return r. In addition, the home and foreign stock each pay a stochastic (mean zero) dividend in period 3, d^h and d^f, respectively. The terminal exchange rate E_3 is also assumed to be normally distributed. Formally the asset payoffs are given by

$$\begin{aligned} P_3^h &= V^h + d^h \sim N(1, \sigma_d^2 + \sigma_V^2) \\ P_3^f &= V^f + d^f \sim N(1, \sigma_d^2 + \sigma_V^2) \\ E_3 &\sim N(1, \sigma_e^2). \end{aligned}$$

The normality assumption for the payoffs is a convenient specification to obtain linear asset demand functions under the CARA utility functions. We assume that the risk aversion of the investors is sufficiently low ($\rho < \overline{\rho}$) so to ensure that the international risk sharing equilibrium exists under exogenous exchange rate risk. For simplicity we normalize all unconditional terminal asset payoff to one. We also abstract from more complicated correlation structures between the terminal asset prices in order to simplify the exposition and model solution. Any correlation in the payoff structure will diminish the benefits from international asset diversification without altering any of the qualitative findings in the subsequent analysis. Finally, the model is formulated only for one home and one foreign asset. However, the general insights carry over to the case where the home and foreign asset are themselves portfolios of many individual stocks.

Assumption 2: Information Structure

At the beginning of period 2, both investors learn the dividend payments (d^h, d^f), while the liquidation values (V^f, V^h) remain unknown. The conditional terminal asset price distributions are then given by

$$\begin{aligned} P_3^h | d^h, d^f &\sim N(1 + d^h, \sigma_V^2) \\ P_3^f | d^h, d^f &\sim N(1 + d^f, \sigma_V^2) \\ E_3 | d^h, d^f &\sim N(1, \sigma_e^2). \end{aligned}$$

The analytical focus of the model is on the rebalancing effect of the dividend payoff information. It is assumed throughout the paper that the exchange rate risk cannot be hedged and that the optimal risk management of the investors is reflected in the asset holdings. We also highlight that the full revelation of the dividend values in period 2 and continued investor uncertainty about the liquidation values is just a stylized representation of partial revelation of different stock market fundamentals in the two countries. Other Bayesian formulations of the same problem are possible, but are likely to be more complicated.

Next we turn to the asset supply assumptions and the market clearing conditions.

Assumption 3: Asset Supplies

The net supply of equity is constant and normalized to 1. The riskless rate is in perfectly elastic supply and is constant at r. Excess demand for foreign currency D_t^{Fx} is balanced by an elastic supply with elasticity η. Let $X_t = (x_t^h, x_t^f)$ and $X_t^* = (x_t^{h*}, x_t^{f*})$ denote the equity demands of the home and foreign investor, respectively. Hence, we have (for $t = 1, 2$)

$$\begin{aligned}(x_t^h, x_t^f) + (x_t^{h*}, x_t^{f*}) &= (1, 1) \\ D_t^{Fx} &= \eta(E_t - 1).\end{aligned}$$

A fully elastic supply of the riskless asset and a fully inelastic supply of the risk asset are common in the finance literature. This describes a world in which investments with low and safe returns are always abundant, while investments with high payoff are both risky and in limited or fixed supply. The assumption about the constant elastic currency supply in periods 1 and 2 is quite natural. Assuming foreign exchange dealer with a CARA utility, we can show that their currency supply corresponds to a linear function $\eta(E_t - 1)$ given a normally distributed terminal value for foreign exchange balances. The linear currency supply is therefore best interpreted as a reduced form to more elaborate FX market model with risk averse dealers.

2.1 Solving the Model

Solving for the model is straightforward and mostly relegated to the appendix. We just outline the major steps which allow us to characterize the solution. In period 1, the excess return of home and foreign investment over the risk-less rate is given by the vector $\Delta R = (\Delta R^h, \Delta R^f)^T$ for the home country investor and by $\Delta R^* = (\Delta R^{h*}, \Delta R^{f*})^T$ for the foreign country investor, where[2]

$$\begin{aligned}\Delta R^h &= P_3^h - (1+r)P_1^h \\ \Delta R^f &= P_3^f E_3 - (1+r)P_1^f E_1 \\ \Delta R^{h*} &= P_3^h / E_3 - (1+r)P_1^h / E_1 \\ \Delta R^{f*} &= P_3^f - P_1^f(1+r).\end{aligned}$$

Furthermore, for international equity allocations $X_1 = (x_1^h, x_1^f)$ and $X_1^* = (x_1^{h*}, x_1^{f*})$, the period 3 wealth follows as

$$\begin{aligned}W_3 &= X_1 \Delta R + (1+r)W_1 \\ W_3^* &= X_1^* \Delta R^* + (1+r)W_1^*,\end{aligned}$$

[2]The domestic and foreign riskless rate could possibly differ. But this only introduces a model asymmetry between the home and foreign country which is of no qualitative relevance for the main model implications. Note also that date 1 and 2 are arbitrarily close so that the total interest accrued between dates 1 and 3 is $(1+r)$.

for the home and foreign investor, respectively. The utility of the home and foreign investor is given by a CARA utility, which amounts to mean-variance framework. Hence, investors optimize

$$U = max_{(x_1^h, x_1^f)} \left[\mathcal{E}_1(W_3) - \frac{\rho}{2} Var_1(W_3) \right], \qquad U^* = max_{(x_1^{h*}, x_1^{f*})} \left[\mathcal{E}_1(W_3^*) - \frac{\rho}{2} Var_1(W_3^*) \right],$$

where ρ denotes the coefficient of absolute risk aversion. For the expectations in period 1 symbolized by $\mathcal{E}_1$, we can express the variance-covariance matrix of the returns in home currency by $\Omega_1 = \mathcal{E}_1(\Delta R \Delta R^T)$ and in foreign currency by $\Omega_1^* = \mathcal{E}_1(\Delta R^* \Delta R^{*T})$. Optimal equity holdings for home and foreign investors follow as

$$\begin{aligned} X_1 &= \frac{1}{\rho} \mathcal{E}_1(\Delta R) \Omega_1^{-1} \\ X_1^* &= \frac{1}{\rho} \mathcal{E}_1(\Delta R^*) \Omega_1^{*-1}, \end{aligned}$$

respectively. For independently distributed dividends and liquidation values, we find furthermore

$$\Omega_1 = \Omega_1^* = \begin{pmatrix} \sigma_d^2 + \sigma_V^2 & 0 \\ 0 & \sigma_d^2 + \sigma_V^2 + \sigma_e^2 \end{pmatrix}$$

Market clearing in both equity markets implies two additional constraints for period 1.

In period 2, information about the dividends (d^h, d^f) is revealed, but values (V^h, V^f) are still unknown. Equity prices (P_2^h, P_2^f) and equity returns $(\Delta R,\, \Delta R^*)$ need to fulfill the new first order conditions

$$\begin{aligned} X_2 &= \frac{1}{\rho} \mathcal{E}_2(\Delta R) \Omega_2^{-1} \\ X_2^* &= \frac{1}{\rho} \mathcal{E}_2(\Delta R^*) \Omega_2^{*-1}. \end{aligned}$$

The conditional covariance Ω_2 and Ω_2^* depend on the dividend realization (d^h, d^f) and we find

$$\Omega_2 = \begin{pmatrix} \sigma_V^2 & 0 \\ 0 & \sigma_V^2 + (1+d^f)^2 \sigma_e^2 \end{pmatrix}, \qquad \Omega_2^* = \begin{pmatrix} \sigma_V^2 & 0 \\ 0 & \sigma_V^2 + (1+d^h)^2 \sigma_e^2 \end{pmatrix}.$$

Clearly, the period 3 equity prices (P_3^h, P_3^f) will now reflect any asymmetric realization of dividend payouts (d^h, d^f). This in turn implies that under high foreign dividends, the foreign asset is more valuable and therefore the foreign investment constitutes a large exchange rate exposure. Optimal asset demand in period 2 have to account for the higher conditional variance. We show that it leads to rebalancing into domestic equity. This rebalancing simultaneously changes the currency demand. The net currency demand corresponds to the foreign rebalancing of the home investor, $(x_2^f - x_1^f) P_2^f E_2$, minus the reverse demand on the part of the foreign investor, $(x_2^{h*} - x_1^{h*}) P_2^h$. Market clearing in the exchange rate market then implies

$$D^{FX} = (x_2^f - x_1^f) P_2^f E_2 - (x_2^{h*} - x_1^{h*}) P_2^h = \eta(E_t - 1).$$

In order to solve the model for the two periods, we have to first conjecture a linear solution for all asset prices as a function of the dividend realizations. In a second step we substitute these asset price solutions into the demand functions and use the market clearing and supply constraints to determine all coefficients. The appendix provides the solutions.

2.2 Model Implications

We summarize the implications of the model in 4 separate testable propositions. Propositions 1 and 2 concern stylized facts documented in the literature. Propositions 3 and 4 concern directly the rebalancing behavior at the investor level. The latter implications have not yet been subject to empirical testing.

Proposition 1: Equilibrium Prices and Home Bias

For the investment problem described in assumptions 1 and 2, there is a unique linear equilibrium for the asset prices with period 1 prices given by

$$\begin{aligned} P_1^h &= P_1^f = \frac{1}{(1+r)} - \frac{\rho\left(\sigma_d^2+\sigma_V^2+\sigma_e^2\right)\left(\sigma_d^2+\sigma_V^2\right)}{(1+r)\left[2\sigma_d^2+2\sigma_V^2+\sigma_e^2\right]} \\ E_1 &= 1. \end{aligned}$$

The equilibrium asset allocations in period 1 follow as

$$\begin{aligned} x_1^h &= x_1^{f*} = \frac{\sigma_d^2+\sigma_V^2}{2\sigma_d^2+2\sigma_V^2+\sigma_e^2} \\ x_1^f &= x_1^{h*} = \frac{\sigma_d^2+\sigma_V^2}{2\sigma_d^2+2\sigma_V^2+\sigma_e^2}. \end{aligned}$$

Proof: For the derivation see Appendix.

The asset prices of the home and foreign equity are identical in period 1 because of identical distributed unconditional payoffs. The term $1/(1+r)$ for period 1 equity prices denotes the present value of the expected liquidation value and the second term captures a price discount linear in the risk aversion ρ of the investors. Home and foreign investors hold symmetric positions biased towards home assets. The home bias can be quantified as

$$x_1^h - x_1^{h*} = x_1^{f*} - x_1^f = \frac{\sigma_e^2}{2\sigma_d^2+2\sigma_V^2+\sigma_e^2},$$

and equals the proportion of foreign exchange rate risk $\frac{1}{2}\sigma_e^2$ relative to total payoff risk $\sigma_d^2+\sigma_V^2+\frac{1}{2}\sigma_e^2$ of an allocation of identical home and foreign portfolio shares. Higher exchange rate volatility should therefore re-enforce the home bias in the absence of FX risk hedging. The home bias has been extensively documented in the international finance literature. More interesting is the role of the dividend information on the equilibrium prices and their covariance structure.

Proposition 2: Dividend Information and the Covariance Structure of Prices

Under the new dividend information the period 2 prices change to

$$\begin{aligned} P_2^h &= \overline{P}_2 + \gamma(d^h - d^f) + \beta(d^h + d^f) \\ P_2^f &= \overline{P}_2 - \gamma(d^h - d^f) + \beta(d^h + d^f) \\ E_2 &= \overline{E}_2 + \theta(d^h - d^f), \end{aligned}$$

with positive constants $\overline{P}_2, \overline{E}_2$, positive coefficients γ, β, θ with $\gamma - \beta > 0$, and

$$\theta = \frac{(\gamma - \beta)\left(2\sigma_V^2 + \sigma_e^2\right)}{\overline{P}_2 \sigma_V^2} > 0.$$

Information about different stock market fundamentals ($d^h - d^f \neq 0$) creates a negative covariance between relative home and foreign stock price $P_2^h - P_2^f$ and the exchange rate, that is

$$Cov\left[P_2^h - P_2^f, E_2\right] = -4\gamma\theta\sigma_d^2 < 0.$$

Proof: For the derivation see Appendix.

Asset prices in period 2 feature a particular correlation structure in spite of the assume independence of the final asset payoffs. When faced by increased foreign exchange risk due to an appreciation of the foreign assets of their portfolios relative to the domestic ones, investors rebalance out of foreign assets. This risk rebalancing investment strategy implies net sales of the foreign currency and hence an appreciation of the domestic currency. This correlation structure of stock prices and exchange rates has been examined by Brooks et al. (2001), Hau and Rey (2006), Cappiello and De Santis (2007), and Chaban (2007). For OECD countries the exchange rate returns and differential stock market returns indeed feature the predicted negative correlation at all relevant frequencies from daily to quarterly data. But such covariance structures could potentially be induced by macroeconomic channels which do not rely on portfolio rebalancing. It is therefore interesting to explore more direct microeconomic evidence on the relevance of the portfolio channel. Model implications concerning individual fund behavior can then be tested directly with the new data on international portfolio holdings. Proposition 3 states the microeconomic hypothesis of fund rebalancing:

Proposition 3: Portfolio Rebalancing Measures Based on Portfolio Shares

International investors exposed to exchange rate risk react to relatively higher returns on their foreign portfolio component by rebalancing into domestic assets. We define a measure of rebalancing from foreign to domestic equity for the home country investor as

$$RB^f = w_2^f - \widehat{w}_2^f,$$

where $w_t^f = x_t^f P_t^f / (x_t^h P_t^h + x_t^f E_t P_t^f)$ denotes the foreign portfolio weight for an optimal rebalanced allocation at the beginning of period 2 and $\widehat{w}_2^f$ the portfolio weight induced by passive holding of the weight from the previous period 1. The latter follows as

$$\widehat{w}_2^f = w_1^f \left(\frac{1 + r_1^f}{1 + r_1^P} \right),$$

where r_2^P represents the home investor's total portfolio return (in period 1), while r_1^h and r_1^f denote the return on his home and foreign investment component, respectively. The model implies a negative covariance between RB^f and the return differential $r_1^f - r_1^h$, that is

$$Cov\left[RB^f,\ r_1^f - r_1^h\right] < 0.$$

Proof: For the derivation see Appendix.

The rebalancing measure for the home investor RB^f is intuitive. If the investors do not rebalance after period 1 return differences between the foreign investment component r_2^f and the entire portfolio r_2^P, then we expect that new period 2 portfolio weights to just reflect this return differential according to

$$w_2^f = \widehat{w}_2^f = w_1^f \left(\frac{1 + r_1^f}{1 + r_1^P} \right).$$

In this case the rebalancing measure is zero. Active rebalancing into home equity implies $RB^f < 0$ and should occur for foreign market excess returns, hence whenever $r_2^f - r_2^h > 0$. This corresponds to the negative covariance between RB^f and $r_2^f - r_2^h$. A positive covariance by contrast would imply rebalancing that further increases exchange rate exposure after such exposure has increased due to price changes.

A more direct approach to the analysis of rebalancing behavior is to measure its effect on the exchange rate risk of the portfolio. We can decompose the return vector denominated in home currency ΔR into a pure equity return vector denominated in local currency ΔR_{Eq} and the complementary exchange rate vector $\Delta R_{Fx} = \Delta R - \Delta R_{Eq}$. Accordingly, the covariance matrix can be decomposed into the pure equity covariance and into a complementary exchange rate covariance matrix, that is

$$\mathcal{E}_t(\Delta R \Delta R^T) = \Omega_t = \Omega_t^{Eq} + \Omega_t^{Fx},$$

where we define

$$\begin{array}{rcl} \Omega_t^{Eq} & = & \mathcal{E}_t(\Delta R_{Eq} \Delta R_{Eq}^T) \\ \Omega_t^{Fx} & = & \mathcal{E}_t(\Delta R_{Eq} \Delta R_{Fx}^T) + \mathcal{E}_t(\Delta R_{Fx} \Delta R_{Eq}^T) + \mathcal{E}_t(\Delta R_{Fx} \Delta R_{Fx}^T) \end{array}.$$

The total portfolio risk of an international investor and the exchange rate component can be defined as

$$\begin{array}{rcl} Risk(w_t) & = & w_t \Omega_t w_t^T \\ Risk^{Fx}(w_t) & = & w_t \Omega_t^{Fx} w_t^T, \end{array}$$

respectively. We can now characterize rebalancing behavior based on portfolio risk in proposition 4:

Proposition 4: Portfolio Rebalancing Measures Based on Portfolio Risk

International investors reduce their exposure to exchange rate risk after an increase in such exposure following differences in equity performance at home and abroad. We denote by $w_1 = (w_1^h, w_1^f)$ the initial portfolio weights in period 1, $\widehat{w}_2 = (\widehat{w}_2^h, \widehat{w}_2^f)$ the portfolio weights of the home investor resulting from a passive investment strategy in period 2 and by $w_2 = (w_2^h, w_2^f)$ the actual portfolio weights in period 2. The passive risk changes (without rebalancing) between period 1 and 2 are given by

$$\begin{aligned} \Delta Risk(\widehat{w}_2, w_1) &= \widehat{w}_2 \Omega_2 \widehat{w}_2^T - w_1 \Omega_1 w_1^T \\ \Delta Risk^{Fx}(\widehat{w}_2, w_1) &= \widehat{w}_2 \Omega_2^{Fx} \widehat{w}_2^T - w_1 \Omega_1^{Fx} w_1^T, \end{aligned}$$

where the first line corresponds to the total portfolio risk while the second line accounts for changes in foreign exchange risk only. Active risk changes due to optimal portfolio management are given by

$$\begin{aligned} \Delta Risk(w_2, \widehat{w}_2) &= w_2 \Omega_2 w_2^T - \widehat{w}_2 \Omega_2 \widehat{w}_2^T \\ \Delta Risk^{Fx}(w_2, \widehat{w}_2) &= w_2 \Omega_2^{Fx} w_2^T - \widehat{w}_2 \Omega_2^{Fx} \widehat{w}_2^T, \end{aligned}$$

where the first line corresponds to the total portfolio risk while the second line accounts for changes in foreign exchange risk only. Risk rebalancing implies a negative covariance between passive and active weight changes

$$\begin{aligned} Cov\left[\Delta Risk(w_2, \widehat{w}_2), \Delta Risk(\widehat{w}_2, w_1)\right] &< 0 \\ Cov\left[\Delta Risk^{Fx}(w_2, \widehat{w}_2), \Delta Risk^{Fx}(\widehat{w}_2, w_1),\right] &< 0, \end{aligned}$$

for total risk and exchange rate risk rebalancing, respectively.

Proof: For the derivation see Appendix.

An increase in the portfolio risk between periods 1 and 2 due to the dividend information is measured by the term $\Delta Risk(\widehat{w}_2, w_1)$ for the total portfolio risk and by $\Delta Risk^{Fx}(\widehat{w}_2, w_1)$ for the exchange rate risk. The optimal portfolio adjustment and the corresponding change in risk is measured by the term $\Delta Risk(w_2, \widehat{w}_2)$ for the total risk and $\Delta Risk^{Fx}(w_2, \widehat{w}_2)$ for its exchange rate component. The model predicts that any risk increases of a passive strategy should be counterbalanced by weight changes inducing the opposite portfolio risk reduction. Hence we expect a negative covariance.

3 Data

We employ a data set on global equity holdings created by Thomson Financial Securities (TFS) that contains detailed mutual fund equity holdings worldwide. The data documents stock holdings of individual mutual funds and other institutional investors at the stock level. We obtain the data from TFS, which was created by the merger of The Investext Group, Security Data Company and CDA/Spectrum. The same holding data has been previous used and documented by Chan, Covrig and Ng (2005) for the years 1999 and 2000. Our own data set consists of an extended version of their data set and covers the five year period 1997 to 2002.[3]

TFS provided us with the following variables: fund number, fund name, management company name, country code of the fund incorporation, reporting date, stock identifier, country code of the stock, stock position (number of stocks held), reporting dates for which holding data is available, security price on the reporting date and the security price on the closest previous days in case the reporting date had no price information on the security, total return index (including dividend reinvestments) in local currency, daily dollar exchange rates for all investment destinations.

Most funds report only with a frequency of 6 months. This motivates why we undertake our analysis at the semester frequency. Reporting dates differ somewhat, but more than 90 percent of the reporting occurs in the last 10 days of each half-year. Roughly a third of the funds also reported also on a quarterly frequency and a still smaller percentage at the monthly frequency. But moving to this higher reporting frequency would have implied a substantial sample reduction which seemed not justified.

We calculated the portfolio weights of each stock for each reporting date. In a second step computed return and risk characteristics. Several filters were applied to eliminate data outliers and obtain a data set which is manageable:

- We focus on funds incorporated in four countries, namely the United States (US), Canada (CA), United Kingdom (UK) and the Euro area (EU).[4] These locations represent approximately 85 percent of all reported holdings and feature at least a 100 funds in each semester. Euro area funds are pooled together because of their common currency after 1999. We start exploiting euro area data in 1999/1 (creation of the euro). There are anyway very few observations for the euro area countries in 1998/1 and 1998/2.

- We use only the last reporting date for each fund in any semester and retain only those funds which reported at most 30 days before the end of the semester. A fund has to feature in two consecutive semesters in order to be retained. Consecutive reporting dates are a pre-requisite for the dynamic inference in this paper. The first reporting semester to be retained is 1998.[5]

- Funds with less than 1 million U.S. Dollar of total asset value in any semester are discarded. These might represent incubator funds and other non-representative entities.

- We retain only international funds which hold at least 5 stocks in the domestic currency and at least 5 stocks in another currency area. This excludes all stocks with less than 10 stock positions and

[3]Other papers using disaggregated data on international institutional investors holdings are Ferreira and Matos (2006), who study the characteristics of firms attracting international investors; Covrig, Fontaine Jimenez-Garces, and Seasholes (2007) focus on the effect of information asymmetries on international stock holdings. Warnock, Thomas and Wongwan (2006) use TIC data to study the international investment strategy of US investors. Cai and Warnock (2006) investigates US investors holdings in multinational company stocks.

[4]Ireland, Finland, France, Greece, Germany, Austria, Netherlands, Italy, Belgium, Luxembourg, Portugal, Spain.

[5]Very few holdings were reported in the first semester of 1997. The first sizeable combination of consecutive reporting dates is therefore 1997/2 and 1998/1 which is reported under 1998/1.

also purely domestic or purely international funds. International rebalancing for the latter might be incompatible with the fund investment objective.

- Stocks are eliminated from the fund portfolio if their total return index increases by more than 500% or decreases by more than −90%. Stocks with return outliers might be caused by data errors and are therefore discarded. In the portfolio risk analysis we also discard funds for which more than 15 percent of the asset value concerns stocks with return outliers or incomplete daily return data. Incomplete daily return histories prevents estimation of the covaraince matrix and therefore of the portfolio risk.

Prior to further analysis we examine the representativeness of our disaggregated data set. For this purpose we compute the correlations statistics of aggregate destination country holdings in our sample with the aggregate cross-country holdings data of the Coordinated Portfolio Investment Survey of the IMF. The CPIS data.are systematically collected since 2001 and constitute the best measures we have of aggregate cross-country asset holdings. The correlations of our holdings with the CPIS geographical distribution[6] are indeed very high as shown in Table 1. They range from 0.73 for Euro area funds to 0.99 for Canadian funds. The high correlations for both years suggests that our sample is representative of foreign equity positions in the world economy.

Next, we document the summary statistics for the holding data. In Table 2, Panel A, we report by semester the number of funds per country, the number of equity positions and their market value. For example, for the U.S. in 2002, first semester, we have more than 1046 funds and 277,577 positions valued at around $993 bn. For funds domiciled in the Euro area, the reporting of holdings only starts in the second part of 1998. Since we require two consecutive semesters of reported holdings, the first European funds to enter our sample have a reporting date at the end of the first semester of 1999. In Panel B, we report the total investment over the period 1998-2002 by destination market, broken up into US, Euro area, UK, Canada, other OECD economies, off-shore markets[7] and emerging markets. As expected our data show a clear home bias and sizable cross-country investments among the more developed economies.

4 Empirical analysis

The international finance literature has often been dismissive of the portfolio balance approach because of the lack of empirical support. In a more recent study, Hau and Rey (2004) use a VAR analysis with sign restrictions and find some support in aggregate macroeconomic data for portfolio rebalancing. The contribution of this paper is to document rebalancing behavior based on microeconomic data across a broad sample of funds and countries. Using disaggregated data allows for a more precise identification of portfolio rebalancing. Section 4.1 examines rebalancing evidence based on the time series of the foreign portfolio share. The analysis relies only on imperfect substitutability of foreign and domestic portfolio holdings due

[6]These correlations have been computed on foreign holdings only and do not include zeros. Adding investments into the domestic markets would push these correlations even higher.

[7]The off-shore markets in our sample are Bermuda, Cayman Islands, Netherlands Antilles, Bahamas, Belize, British and US Virgin Islands, Jersey, Guernesey, Liechtenstein, Puerto Rico and the Dominican Republic.

to exchange rate risk. Rebalancing out of foreign equity is considered an implicit risk reduction in terms of exchange rate risk. In Section 4.2, we analyze portfolio risk explicity by calculating it from the fund and semester specific covariance matrix of all fund positions and their corresponding portfolio weights. We verify if the rebalancing behavior contributes to a reduction of the portoflio risk and if such active risk management through rebalancing is more pronounced for small or large funds. Section 4.3 examines the risk contribution of each individual stock to the portfolio risk of a fund and verifies that rebalancing concerns stocks which expericience the largest increase in their marginal risk contribution to total portfolio risk. We also examine the hypothesis if larger and therefore more liquid stocks are prefered as vehicles for the risk reduction. Additional robustness considerations follow in Section 4.4.

4.1 Foreign Portfolio Share Rebalancing

According to proposition 3, domestic and foreign equity are imperfect substitutes because of different exchange rate risk. If this exchange rate risk is imperfectly traded, we showed that equity holdings themselves dynamically reflects this lack of substitutability. In particular, a relative increase in the value of the foreign portfolio share triggers a rebalancing in favor of domestic equity and vice versa. The rebalancing behavior reflects the desire of foreign investors to maintain a stable exposure to exchange rate risk. But do fund managers indeed sell foreign equities whenever foreign holdings outperform the domestic part of their portfolio in order to decrease their exposure to exchange rate risk? In order to answer this questions, we measure portfolio rebalancing by computing the rebalancing statistic RB^f stated in proposition 3. It compares the actual foreign equity weights to those implied by a simply holding strategy which induces weight changes due to price changes only. A negative rebalancing statistics implies an active decrease of the foreign equity weight in the portfolio, while a positive rebalancing statistics indicates an active increase in foreign exchange rate exposure. Let the weight of foreign securities at date t in the portfolio of investor j be denoted by $w^f_{j,t}$. Formally, the rebalancing statistics for fund j is defined as

$$RB^f_{j,t} = w^f_{j,t} - w^f_{j,t-1}\left(\frac{1 + r^f_{j,t}}{1 + r^P_{j,t}}\right),$$

where $r^P_{j,t}$ represents the total portfolio return and $r^f_{j,t}$ the return on the foreign component of the portfolio of fund j. Furthermore,

$$w^f_{j,t} = \sum_{s=1}^{N_j} 1_{s=f} \times w_{s,j,t-1},$$

where $1_{s=f}$ is a dummy variable which is 1 if stock s is a foreign stock and 0 otherwise. We note that if we defined symmetrically a rebalancing measure for the domestic part of the portfolio, we would get

$$RB^f_{j,t} + RB^h_{j,t} = 0.$$

The total portfolio return $r^P_{j,t}$ on fund j is defined as

$$r^P_{j,t} = \sum_{i=1}^{N_j} w_{i,j,t-1} r_{i,t},$$

where $r_{i,t}$ is the return on security i and N_j is the total number of stocks in the portfolio of fund j. The foreign and domestic return components of the portfolio are defined as

$$r^f_{j,t} = \sum_{s=1}^{N_j} \frac{w_{s,,t-1}}{w^f_{j,t}} r_{s,t} \times 1_{s=f} \qquad r^h_{j,t} = \sum_{s=1}^{N_j} \frac{w_{s,j,t-1}}{w^h_{j,t}} r_{s,t} \times 1_{s=h}.$$

As a test of the rebalancing hypothesis, we regress the portfolio rebalancing measure on the excess return of the foreign part of the portfolio over the home part of the portfolio, that is

$$RB^f_{j,t} = c + \alpha \left[r^f_{j,t-k} - r^h{}_{j,t-k} \right] + D_t + \varepsilon_{j,t},$$

where $k = 0$ represents instantaneous rebalancing and $k = 1, 2, 3...$ captures delayed portfolio reallocations. Time dummies D_t capture all common reallocations in each period which are not related to relative return differences and c represents a constant term. For the half-anual data in our data set, we restrict the analysis to $k = 0$ and $k = 1$. The rebalancing hypothesis outlined in the model implies a negative regression coefficient ($\alpha < 0$). Note that a passive buy and hold strategy of an index produces $PB^f_{j,t} = 0$ and should imply a zero coefficient.

Table 3 reports summary statistics of the variables used in the regressions. Table 4 report the regressions results for funds from the United States (US), Canada (CA), the United Kingdom (UK) and Euro area (EU), respectively, as well as the pooled regression results. The baseline regression with contemporaneous returns ($k = 0$) yields a statistically significant negative coefficient for all the geographic areas. We also note that the estimated coefficients are of economic significance. Excess performance of the foreign portfolio share by 1 percent implies a 4 percent shift towards domestics holdings for the U.S. funds for example. This rebalancing effect attains 12 percent for funds in the Euro area. This is a non negligeable portfolio shift in itself. It is important to note that since these shifts occur for all funds located in a currency area, they do not cancel each other in aggregate and lead to a net order flow on the foreign exchnage market. Evidence on portfolio rebalancing seems weaker for the UK than for the other three currency areas. One possible explanation could be that the UK market is more internationalized in terms of final ownership of the securities than any of the other three markets. If a sizable fraction of equity investors are from South Africa or New Zealand, say, they do not face the same exchange rate risk as UK investors.

We could be underestimating the magnitude of the rebalancing effect by only looking at contemporaneous reblancing. Some reblancing might occur with a time lag and hence not be fully captured by the contemporaneous return differential. Columns (3), (6), (9), and (12) with $k = 1$ show that the lagged return differentials are also statistically significant for all four fund locations (except the UK) and are of quantitatively similar magnitude. Using past returns has also the advantage of controlling for potential endogeinity problems of the regressors.

It is also interesting to explore the possible asymmetries in the rebalancing behavior of international investors. For this purpose, we split the sample into negative and positive excess returns and estimate separate regression coefficients α^+ and α^- for positive and negative return differentials. Formally, we have

$$RB^f_{j,t} = c + \alpha^+ \left[r^f_{j,t-k} - r^h{}_{j,t-k} \right] \times 1_{\Delta r \geq 0} + \alpha^- \left[r^f_{j,t-k} - r^h_{j,t-k} \right] \times 1_{\Delta r < 0} + D_t + \varepsilon_{j,t},$$

where $1_{\Delta r \geq 0}$ represents a dummy which is equal to 1 whenever the foreign excess return $\Delta r = r^f_{j,t-k} - r^h{}_{j,t-k} \geq 0$ and 0 otherwise. The complementary dummy marking negative foreign excess returns is given by $1_{\Delta r<0}$. Both coefficients are negative for all geographical areas. Furthermore, rebalancing appears to be stronger for an overexposure to exchange rate risk than for an underexposure especially in the case of the United States.

Our theory does not allow for changes in expectations regarding future returns since all the effects come from realized values, which are considered exogenous from thepoint of view of the investor. The hypothesis we maintain in the empirical exercize is that any changes in expectations enter the error term and is uncorrelated with the excess return. Note that if changes in expectations were positively correlated with current realized excess returns, then this would bias our results *against* finding a negative correlation. Only in the case where changes in expectations are negatively correlated with current realized excess returns could we get a potentially spurious negative coefficient. The theory also does not allow for fund specific liquidity shocks. Similarly, our empirical results should not be affected if those are uncorrelated with the excess return variables that enter the regressions.

4.2 Risk Rebalancing at the Fund Level

While the previous section provides micro evidence of large-scale rebalancing behavior of international investors due to exchange rate risk, we cannot directly assert that such rebalancing behavior is undertaken in pursuit of portfolio risk reduction as captured by proposition 4. If for example a particular foreign stock has a negative correlation with an investors' overall portfolio return, a reduction in its portfolio share following a value increase might actually increase the total portfolio risk. Showing empirically that rebalancing behavior also occurs in a direction of overall portfolio risk reduction is the objective of this section.

Testing proposition 4 poses a formidable computational task. The portfolio risk needs to be calculated for approximately 18,000 fund semesters with each fund semester requiring a different data input. We estimate the covariance matrix $\widehat{\Omega}_{j,t}$ based on daily equity returns expressed in home currency and decompose it into the pure equity component and the complementary exchange rate component according to

$$\widehat{\Omega}_{j,t} = \widehat{\Omega}^{Eq}_{j,t} + \widehat{\Omega}^{Fx}_{j,t}.$$

The estimation of the covariance matrix for each fund j and semester t is based on daily return data for the three semesters $t-1, t-2$, and $t-3$. The return data represents a total return index and therefore accounts for stocks splits and dividend reinvestment. We apply the same data filters with respect to the fund data as in the previous section on share rebalancing measures. However, estimating the covariance matrix for each fund poses additional challenges. In particular, the return data must be sufficiently complete to not impair our inference about the covariance estimation. We include a particular stock in the calculation of the covariance matrix if it has least 360 non-missing return observations over the three semester data window. If too many return observations are missing for the calculation of a particular covariance element, we assume that this matrix element has as its covariance term the average covariance of all matrix other elements. Moreover, a fund is discarded from the sample if more than 15 percent of its stocks (in terms of the fund asset value) feature incomplete return data. This retension criterium reduces the available number of funds as documented in Table 2.

In accordance with proposition 4, the empirical portfolio risk measures are defined as

$$\begin{aligned}
\Delta Risk(\widehat{w}_{j,t+1}, w_{j,t}) &= \widehat{w}_{j,t+1}\widehat{\Omega}_{j,t}\widehat{w}_{j,t+1}^T - w_{j,t}\widehat{\Omega}_{j,t}w_{j,t}^T \\
\Delta Risk(w_{j,t+1}, \widehat{w}_{j,t+1}) &= w_{j,t+1}\widehat{\Omega}_{j,t}w_{j,t+1}^T - \widehat{w}_{j,t+1}\widehat{\Omega}_{j,t}\widehat{w}_{j,t+1}^T \\
\Delta Risk^{Fx}(\widehat{w}_{j,t+1}, w_{j,t}) &= \widehat{w}_{j,t+1}\widehat{\Omega}_{j,t}^{Fx}\widehat{w}_{j,t+1}^T - w_{j,t}\widehat{\Omega}_{j,t}^{Fx}w_{j,t}^T \\
\Delta Risk^{Fx}(w_{j,t+1}, \widehat{w}_{j,t+1}) &= w_{j,t+1}\widehat{\Omega}_{j,t}^{Fx}w_{j,t+1}^T - \widehat{w}_{j,t+1}\widehat{\Omega}_{j,t}^{Fx}\widehat{w}_{j,t+1}^T,
\end{aligned}$$

where $w_{j,t}$ denotes the weights at the end of period t for fund j, respectively. The risk rebalancing hypothesis is tested through a linear regression given by

$$\begin{aligned}
\Delta Risk(w_{j,t+1}, \widehat{w}_{j,t+1}) &= c + \alpha \times \Delta Risk(\widehat{w}_{j,t+1}, w_{j,t}) + D_t + \varepsilon_{j,t} \\
\Delta Risk^{Fx}(w_{j,t+1}, \widehat{w}_{j,t+1}) &= c + \alpha^{Fx} \times \Delta Risk^{Fx}(\widehat{w}_{j,t+1}, w_{j,t}) + D_t + \varepsilon_{j,t}.
\end{aligned}$$

A negative coefficient $\alpha < 0$ indicates mean reversion for the total portfolio risk through active risk rebalancing and $\alpha^{Fx} < 0$ confirms active risk rebalancing for the foreign exchange rate risk component.

So far we have imposed homogenous rebalancing behavior across fund managers from the same location across all foreign stocks. We now also examine potential heterogeneity in rebalancing behavior due to fund size. On the one hand, large funds may face larger adverse price impacts when they rebalance so we should expect more active trading behavior for smaller funds, on the other hand large funds should rebalance more if there is any fixed costs in transacting. In order to determine the sign of the effect of fund size on rebalancing behavior, we run separate regressions for large and small funds. Funds are deemed large if their value is at least 90% of the total asset value of the biggest fund for their country of incorporation.

Table 5 presents the regression results. We find strong evidence in favor of equity risk rebalancing except for the UK. We find that smaller funds tend to rebalance more than larger funds as far as equity risk is concerned. We also find strong evidence in favor of foreign exchange risk rebalancing (except, once more, for the UK), but the evidence regarding the size of funds is more mixed in this case. For the US, the rebalancing effect seems to come mainly from the largest funds while in the euro area and in Canada, all funds, regardless of size, tend to rebalance out of foreign exchange risk.

4.3 Risk Rebalancing at the Stock Level

We can push the logic of our model even further and consider now the marginal contribution of each stock to the portfolio risk of a fund. We first note that the product $(\widehat{w}_{j,t} - w_{j,t-1})\widehat{\Omega}_{j,t-1}(\widehat{w}_{j,t} - w_{j,t-1})^T$ denotes the total risk increase of a portfolio under a passive holding strategy. The marginal risk contribution of each stock position is captured by the vector $\Delta MRisk(i, w_{j,t-1}, \widehat{w}_{j,t}) = (\widehat{\Omega}_{j,t-1})_{i\bullet}(\widehat{w}_{j,t} - w_{j,t-1})^T$. A positive scalar in row i implies that the marginal risk contribution of stock i in the portfolio of fund j increased. We can therefore test for marginal risk rebalancing by regressing for each stock i held by each fund j the marginal risk change $\Delta MRisk(i, w_{j,t}, \widehat{w}_{j,t})$ on the marginal risk change under a passive holding strategy denoted by $\Delta MRisk(i, \widehat{w}_{j,t}, w_{j,t-1})$. Panel A of Table 6 reports regressions for the the total marginal risk changes in the currency of the registered fund and Panel B reports the corresponding regressions for the FX component of the marginal risk, where the covariance matrix is replaced by a covariance matrix capturing only the FX risk. We find strong evidence in favor of marginal risk rebalancing except, once again, for the UK.

Testing for rebalancing at the stock level allows us to analyze the effect of liquidity on rebalancing. Stocks with different liquidity levels face different transaction costs. Our working hypothesis is that liquidity correlates positively with market capitalization. Hence we split the sample into stocks with low levels of market capitalization (defined as capitalization below 50% of the largest capitalization in the relevant sample of stocks) and stocks with large capitalizations. In our sample, foreign stocks tend to be large market capitalization stocks. The previous literature has explained this fact by problems of asymmetric information faced by foreign investors. Large cap stocks tend to be more covered by analysts. Interestingly we find that, for most countries, rebalancing tends to occur in larger stocks rather than in small cap stocks (Panel A of Table 6). This is also true for foreign exchange risk rebalancing for US funds but does not seem to hold for Canada and for the euro area however.

In Table 7, we investigate the investigate whether rebalancing behaviour at the stock level is stronger for a risk increase than for a risk decrease. We had found some evidence of such an asymmetry when looking at the aggregate foreign share in Table 4. At the stock level, the evidence on asymmetric responses is stronger. Fund managers tend to rebalance more in the case of an increased risk than they do when the risk of the marginal risk of a stock decreases. this holds true for total marginal risk and for foreign exchange risk. Particularly striking are the UK results which indicate very strong active rebalancing to counterbalance an increase in marginal risk at the stock level but no rebalancing at all in the case of a risk decrease. This strong asymmetry is responsible for the non significance of the UK results when symmetric rebalancing is assumed.

4.4 Robustness

Our marginal risk rebalancing results involved the computation of variance-covariance matrices for each fund. In our regressions, those matrices are on the left and on the right hand-sides. Hence the possibility of some spurious results in the case of measurement errors. We investigate the robustness of our results by using as the left handside variable the simple change in stock weights instead of our marginal stock risk variable. Thus the left hand side variable does not include our possibly mismeasured variance-covariance matrix. Results are presented in Table 8. They mostly confirm our Table 7 results on active rebalancing by fund managers when there is a positive increase in marginal risk. But they also show some evidence of selling stocks whose marginal risk contribution decreases.

5 Conclusions

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Appendix

Proof of Proposition 1.

The notations marks with an overbar $\overline{X}$ the steady state value of a variable X . Variables referring to the foreign country are denoted by *. We also note that the investment problem is strictly symmetric for the home and foreign investors in period 1. Hence, we can assume that the equilibrium in period 1 coincides with the steady state, that is $P_1^h = P_1^f = \overline{P}_1$ and $E_1 = \overline{E}_1 = 1$ since final payoffs $V^h + d^h$ and $V^f + d^f$ have identical distributions. Symmetric holdings imply furthermore $x_1^h = x_1^{f*}$ and $x_1^f = x_1^{h*}$. The returns for the home investor follow as

$$\begin{aligned}
\Delta R^h &= P_3^h - (1+r)\overline{P}_1 \\
\Delta R^f &= P_3^f E_3 - (1+r)\overline{P}_1\overline{E}_1,
\end{aligned}$$

and linearizing the second equation around the steady state gives

$$\begin{aligned}
\Delta R^f &= \overline{P}_3^f\overline{E}_3 + \overline{P}_3^f\left(E_3 - \overline{E}_3\right) + \overline{E}_3\left(P_3^f - \overline{P}_3^f\right) - (1+r)\overline{P} \\
&= E_3 + P_3^f - (1+r)\overline{P} - \overline{E}_3\overline{P}_3^f \\
&= E_3 + P_3^f - (1+r)\overline{P} - 1.
\end{aligned}$$

It is straightforward to derive the period 1 holdings as

$$\begin{aligned}
x_1^h &= x_1^{f*} = \frac{\mathcal{E}_1(P_3^h - (1+r)\overline{P}_1)}{\rho\left(\sigma_d^2 + \sigma_V^2\right)} \\
x_1^f &= x_1^{h*} = \frac{\mathcal{E}_1(E_3 + P_3^f - (1+r)\overline{P}_1 - 1)}{\rho\left(\sigma_d^2 + \sigma_V^2 + \sigma_e^2\right)}
\end{aligned}$$

or

$$\begin{aligned}
x_1^h &= x_1^{f*} = \frac{(1-(1+r)\overline{P})}{\rho\left(\sigma_d^2 + \sigma_V^2\right)} = \frac{\sigma_d^2 + \sigma_V^2 + \sigma_e^2}{2\sigma_d^2 + 2\sigma_V^2 + \sigma_e^2} \\
x_1^f &= x_1^{h*} = \frac{(1-(1+r)\overline{P}_1)}{\rho\left(\sigma_d^2 + \sigma_V^2 + \sigma_e^2\right)} = \frac{\sigma_d^2 + \sigma_V^2}{2\sigma_d^2 + 2\sigma_V^2 + \sigma_e^2},
\end{aligned}$$

where we substituted the solution for $\overline{P}_1$ obtained from market clearing.

$$\begin{aligned}
1 &= \frac{1-(1+r)\overline{P}_1}{\rho\left(\sigma_d^2 + \sigma_V^2\right)} + \frac{1-(1+r)\overline{P}_1}{\rho\left(\sigma_d^2 + \sigma_V^2 + \sigma_e^2\right)} \\
\left(1-(1+r)\overline{P}_1\right) &= \frac{\rho\left(\sigma_d^2 + \sigma_V^2 + \sigma_e^2\right)\left(\sigma_d^2 + \sigma_V^2\right)}{\left[2\sigma_d^2 + 2\sigma_V^2 + \sigma_e^2\right]} \\
\overline{P}_1 &= \left[-\frac{\rho\left(\sigma_d^2 + \sigma_V^2 + \sigma_e^2\right)\left(\sigma_d^2 + \sigma_V^2\right)}{(1+r)\left[2\sigma_d^2 + 2\sigma_V^2 + \sigma_e^2\right]} + \frac{1}{(1+r)}\right].
\end{aligned}$$

Proof of Proposition 2.

To solve for the equilibrium in period 2, we linearize again the foreign return equations to obtain

$$
\begin{aligned}
\Delta R^f &= \overline{P}_3^f \overline{E}_3 + \overline{P}_3^f \left(E_3 - \overline{E}_3\right) + \overline{E}_3 \left(P_3^f - \overline{P}_3^f\right) \\
&\quad -(1+r)\left[\overline{P}_2^f \overline{E}_2 + \overline{P}_2^f \left(E_2 - \overline{E}_2\right) + \overline{E}_2 \left(P_2^f - \overline{P}_2^f\right)\right] \\
&= E_3 + P_3^f - \overline{E}_3 \overline{P}_3^f - (1+r)\left[\overline{P}_2^f E_2 + \overline{E}_2 P_2^f - \overline{E}_2 \overline{P}_2^f\right] \\
&= E_3 + P_3^f - 1 - (1+r)\left[\overline{P}_2^f E_2 + \overline{E}_2 P_2^f - \overline{E}_2 \overline{P}_2^f\right] \\
\Delta R^{h*} &= \overline{P}_3^h / \overline{E}_3 - \overline{P}_3^h \left(E_3 - \overline{E}_3\right) / \left(\overline{E}_3\right)^2 + \left(P_3^h - \overline{P}_3^h\right) / \overline{E}_3 \\
&\quad -(1+r)\left[\overline{P}_2^h / \overline{E}_2 - \overline{P}_2^h \left(E_2 - \overline{E}_2\right) / \left(\overline{E}_2\right)^2 + \left(P_2^h - \overline{P}_2^h\right) / \overline{E}_2\right] \\
&= -E_3 + P_3^h + 1 - (1+r)\left[-\overline{P}_2^h E_2 + P_2^h / \overline{E}_2 + \overline{P}_2^h / \overline{E}_2\right]
\end{aligned}
$$

Next, we conjecture a linear solution in the two state variables d^h and d^f, namely

$$
\begin{aligned}
P_2^h &= \overline{P}_2 + \gamma(d^h - d^f) + \beta(d^h + d^f) \\
P_2^f &= \overline{P}_2 - \gamma(d^h - d^f) + \beta(d^h + d^f) \\
E_2 &= \overline{E}_2 + \theta(d^h - d^f)
\end{aligned}
$$

where (γ, β, θ) represent coefficients to be determined.

We note in particular that $cov(\Delta R^h, \Delta R^f | d^h, d^f) = 0$ and $cov(\Delta R^{h*}, \Delta R^{f*} | d^h, d^f) = 0$. The conditional covariances therefore follow as

$$
\Omega_2 = \begin{pmatrix} \sigma_V^2 & 0 \\ 0 & \sigma_V^2 + (1+d^f)^2 \sigma_e^2 \end{pmatrix} \qquad \Omega_2^* = \begin{pmatrix} \sigma_V^2 & 0 \\ 0 & \sigma_V^2 + (1+d^h)^2 \sigma_e^2 \end{pmatrix}.
$$

Using market clearing for the equity markets, the coefficient for the exchange rate can then be characterized as

$$
\theta = \frac{(\gamma - \beta)\left(2\sigma_V^2 + \sigma_e^2\right)}{\overline{P}_2 \sigma_V^2}.
$$

Next we show that $\gamma - \beta > 0$.

$$
2(1+r)(\gamma - \beta) = \frac{\sigma_V^2}{(2\sigma_V^2 + \sigma_e^2)} > 0
$$

Hence $\gamma - \beta > 0$. It follows that $\theta > 0$.

For the steady state values with $d^h = d^f = 0$, we have

$$
\begin{aligned}
\overline{x}_2^h &= \overline{x}_2^{f*} = \frac{(1 - (1+r)\overline{P}_2)}{\rho \sigma_V^2} = \frac{\sigma_V^2 + \sigma_e^2}{2\sigma_V^2 + \sigma_e^2} \\
\overline{x}_2^f &= \overline{x}_2^{h*} = \frac{(1 - (1+r)\overline{P}_2)}{\rho\left(\sigma_V^2 + \sigma_e^2\right)} = \frac{\sigma_V^2}{2\sigma_V^2 + \sigma_e^2},
\end{aligned}
$$

where we used

$$
\begin{aligned}
\overline{P}_2 &= -\frac{\rho\left(\sigma_V^2 + \sigma_e^2\right)\sigma_V^2}{(1+r)\left[2\sigma_V^2 + \sigma_e^2\right]} + \frac{1}{(1+r)} \\
(1+r)\overline{P}_2 &= -\frac{\rho\left(\sigma_V^2 + \sigma_e^2\right)\sigma_V^2}{\left[2\sigma_V^2 + \sigma_e^2\right]} + 1 \\
1 - (1+r)\overline{P}_2 &= \frac{\rho\left(\sigma_V^2 + \sigma_e^2\right)\sigma_V^2}{\left[2\sigma_V^2 + \sigma_e^2\right]} > 0.
\end{aligned}
$$

Note furthermore that

$$\begin{aligned}\beta &< \frac{1}{2(1+r)} < \frac{1}{2} \\ \beta &> \frac{1}{2(1+r)}\left[1 - \frac{\rho\sigma_e^2\sigma_V^2}{(2\sigma_V^2+\sigma_e^2)}\right] > 0 \quad \text{for } \rho < \frac{2\sigma_V^2+\sigma_e^2}{\sigma_V^2\sigma_e^2}\end{aligned}$$

Hence a sufficient condition for $\gamma > 0$ is given by

$$\begin{aligned}1 + \frac{\sigma_V^2}{(2\sigma_V^2+\sigma_e^2)} - \frac{\rho\sigma_V^2\sigma_e^2}{(2\sigma_V^2+\sigma_e^2)} &> 0 \\ 3\sigma_V^2 + \sigma_e^2 - \rho\sigma_V^2\sigma_e^2 &> 0 \\ \rho &< \frac{3\sigma_V^2+\sigma_e^2}{\sigma_V^2\sigma_e^2} = \overline{\rho}\end{aligned}$$

Finally, market clearing in the currency market implies

$$(x_2^f - x_1^f)P_2^f E_2 - (x_2^{h*} - x_1^{h*})P_2^h = \eta(E_2 - 1).$$

Using the linear approximation $\overline{P}_2\overline{E}_2(x_2^f - x_1^f) - \overline{P}_2(x_2^{h*} - x_1^{h*}) = \eta(E_2 - 1)$ and $\overline{P}_2\overline{E}_2 x_1^f = \overline{P}_2 x_1^{h*}$, we get

$$(x_2^f - x_2^{h*}) = \frac{\eta\theta}{\overline{P}_2}(d^h - d^f)$$

with $\eta\theta > 0$. The relative foreign equity allocation $(x_2^f - x_2^{h*})$ of the home investor is therefore reduced by relatively higher foreign dividends, that is $(d^h - d^f) < 0$. Furthermore,

$$\begin{aligned}P_2^f - P_2^h &= -2\gamma(d^h - d^f) \\ E_2 - \overline{E}_2 &= \theta(d^h - d^f) \\ Cov\left[P_2^f - P_2^h, E_2\right] &= -4\gamma\theta\sigma_d^e < 0.\end{aligned}$$

Note that $\gamma > 0$ follows for sufficiently low risk aversion $\rho < \overline{\rho}$. Note: For high risk aversion under exogenous FX risk, the risk sharing equilibrium may no longer exist if the FX risk is too large relative to the risk aversion of the agents. Then the only solution is the autarky solution in which every investor only holds his home equity.

Proof of Proposition 3: Portfolio Rebalancing Measures Based on Foreign Portfolio Shares
Let the portfolio return for the home country investor be denoted by r^P. Using the linear solution

$$\begin{aligned}P_2^h &= \overline{P}_2 + (\beta+\gamma)\,d^h + (\beta-\gamma)d^f \\ P_2^f &= \overline{P}_2 + (\beta-\gamma)\,d^h + (\beta+\gamma)d^f \\ E_2 &= \overline{E}_2 + \theta(d^h - d^f)\end{aligned}$$

for the asset prices ($\overline{E}_2 = 1$), we obtain

$$\begin{aligned}r^P &= w^h r^h + (1-w^h)r^f \\ &= \frac{\overline{P}_2 - \overline{P}_1}{\overline{P}_1} + \frac{1}{\overline{P}_1}\beta(d^h + d^f) + \frac{1}{\overline{P}_1}\left[(-1+2w^h)\gamma + (1-w^h)\overline{P}_2\theta\right](d^h - d^f)\ .\end{aligned}$$

The home investor's return on his foreign portfolio component is given by (setting $w^h = 0$)

$$\begin{aligned} r^f &= \frac{1}{\overline{P}_1}\left[P_2^f - \overline{P}_1 + \overline{P}_2(E_2 - 1)\right] \\ &= \frac{\overline{P}_2 - \overline{P}_1}{\overline{P}_1} + \frac{1}{\overline{P}_1}\beta(d^h + d^f) - \frac{1}{\overline{P}_1}\left[\gamma - \overline{P}_2\theta\right](d^h - d^f) \end{aligned}$$

and the domestic return component follows as (setting $w^h = 1$)

$$\begin{aligned} r^h &= \frac{1}{\overline{P}_1}\left[P_2^h - \overline{P}_1\right] \\ &= \frac{\overline{P}_2 - \overline{P}_1}{\overline{P}_1} + \frac{1}{\overline{P}_1}\beta(d^h + d^f) + \frac{1}{\overline{P}_1}\gamma(d^h - d^f). \end{aligned}$$

The excess return of the foreign over the domestic foreign component is then

$$r^f - r^h = -\frac{1}{\overline{P}_1}\left[2\gamma - \overline{P}_2\theta\right](d^h - d^f)$$

We have $2\gamma - \overline{P}_2\theta > 0$, because

$$\theta = \frac{(\gamma - \beta)\left(2\sigma_V^2 + \sigma_e^2\right)}{\overline{P}_2\sigma_V^2} < \frac{2\gamma}{\overline{P}_2}.$$

News about high foreign dividends imply also high returns on the foreign equity. The term $\overline{P}_2\theta$ captures the diminished home currency return of the foreign country investment due to the depreciation of the foreign currency.

Next, we derive the implications for the portfolio shares of the home country investor. In period 1, we have $P^h = P^f = \overline{P}_1$ and therefore total equity wealth is $W = \overline{P}_1(\overline{x}_1^h + \overline{x}_1^f)$ and the wealth shares follow as

$$\begin{aligned} w_1^h &= \frac{\overline{P}_1\overline{x}_1^h}{\overline{P}_1(\overline{x}_1^h + \overline{x}_1^f)} = \overline{x}_1^h \\ w_1^f &= \frac{\overline{P}_1\overline{x}_1^f}{\overline{P}_1(\overline{x}_1^h + \overline{x}_1^f)} = \overline{x}_1^f = 1 - \overline{x}_1^h \end{aligned}$$

Let $(\widehat{w}_2^h, \widehat{w}_2^f)$ denote the new period 2 wealth shares under the new prices, but absent any portfolio adjustments. These are

$$\begin{aligned} \widehat{w}_2^h &= \frac{P_2^h\overline{x}_1^h}{P_2^h\overline{x}_1^h + P_2^f E_2\overline{x}_1^f} = \frac{1}{1 + \frac{P_2^f E_2\overline{x}_1^f}{P_2^h\overline{x}_1^h}} \\ \widehat{w}_2^f &= \frac{P_2^f E_2\overline{x}_1^f}{P_2^h\overline{x}_1^h + P_2^f E_2\overline{x}_1^f} = \frac{1}{1 + \frac{P_2^h\overline{x}_1^h}{P_2^f E_2\overline{x}_1^f}} = 1 - \widehat{w}_2^h \end{aligned}$$

However, under period 2 prices, the home investor will also adjust his portfolio share. The observable wealth shares are given by

$$\begin{aligned} w_2^h &= \frac{P_2^h x_2^h}{P_2^h x_2^h + P_2^f E_2 x_2^f} = \frac{1}{1 + \frac{P_2^f E_2 x_2^f}{P_2^h x_2^h}} \\ w_2^f &= \frac{P_2^f x_2^f}{P_2^h x_2^h + P_2^f E_2 x_2^f} = \frac{1}{1 + \frac{P_2^h x_2^h}{P_2^f E_2 x_2^f}} \end{aligned}$$

Linearization around $\overline{P}_2^f = \overline{P}_2^h$ and $\overline{E} = 1$ implies

$$\begin{aligned}
\widehat{w}_2^h &= \overline{x}_1^h + \frac{\overline{x}_1^f \overline{x}_1^h}{\overline{P}_2^h} \left(P_2^h - P_2^f \right) - \overline{x}_1^f \overline{x}_1^h (E_2 - 1) \\
&= \overline{x}_1^h + \frac{\overline{x}_1^f \overline{x}_1^h}{\overline{P}_2^h} \left[2\gamma - \overline{P}_2^h \theta \right] (d^h - d^f)
\end{aligned}$$

and

$$\widehat{w}_2^f = \overline{x}_1^f + \frac{\overline{x}_1^f \overline{x}_1^h \overline{P}_1}{\overline{P}_2^h} [r^f - r^h]$$

The terms w_2^h and w_2^f capture the total portfolio weight effect, which can be decomposed into the previous price effects $\widehat{w}_2^h$ and $\widehat{w}_2^f$ and the reallocation effects $w_2^h - \widehat{w}_2^h$ and $w_2^f - \widehat{w}_2^f$ due to changes in the holdings. Again, linearizing the total portfolio weigh change effect implies:

$$\begin{aligned}
w_2^h &= \widehat{w}_2^h + \frac{\left[1 - (1 + r)(\beta + \gamma)\right] d^h - (1 + r)(\beta - \gamma) d^f}{\rho \sigma_V^2} \\
w_2^f &= 1 - w_2^h \\
&= \widehat{w}_2^f - \frac{\left[1 - (1 + r)(\beta + \gamma)\right]}{\rho \sigma_V^2} d^h + \frac{(1 + r)(\beta - \gamma)}{\rho \sigma_V^2} d^f
\end{aligned}$$

This results is intuitive. For example if $d^f > 0$, rebalancing should occur away from the foreign position. This is the case as $(\beta - \gamma) < 0$ and then most likely $w_2^f - \widehat{w}_2^f < 0$.

The portfolio rebalancing statistics PB^f is simply given by

$$PB^f = w_2^f - \widehat{w}_2^f = -\frac{\left[1 - (1 + r)(\beta + \gamma)\right]}{\rho \sigma_V^2} d^h + \frac{(1 + r)(\beta - \gamma)}{\rho \sigma_V^2} d^f$$

and its covariance with the foreign excess return

$$r^f - r^h = -\frac{1}{\overline{P}_1} \left[2\gamma - \overline{P}_2 \theta \right] (d^h - d^f)$$

follows as

$$\begin{aligned}
Cov\left[PB^f, r^f(h) - r^h(h)\right] &= Cov\left[w_2^f - \widehat{w}_2^f, r^f - r^h \right] \\
&= -\frac{1}{\overline{P}_1} \left[2\gamma - \overline{P}_2 \theta \right] \left(-\frac{1}{\rho \sigma_V^2} \left[1 - (1 + r)(\beta + \gamma)\right] - \frac{1}{\rho \sigma_V^2} (1 + r)(\beta - \gamma) \right) \sigma_d^2 < 0
\end{aligned}$$

because

$$\begin{aligned}
2\gamma - \overline{P}_2 \theta &> 0 \\
(1 + r)(\beta - \gamma) &< 0 \\
\left[1 - (1 + r)(\beta + \gamma)\right] &= \frac{1}{2} \left[1 - (1 + r) 2\beta\right] + \frac{1}{2} \left[1 - (1 + r) 2\gamma\right] \\
&= \frac{2\rho \sigma_V^2 \sigma_e^2 \frac{\sigma_V^2}{\left[2\sigma_V^2 + \sigma_e^2\right]} - \frac{1}{2}\sigma_V^2}{(2\sigma_V^2 + \sigma_e^2)} = \frac{2\rho \sigma_V^4 \sigma_e^2 - \frac{1}{2}\sigma_V^2 \left[2\sigma_V^2 + \sigma_e^2\right]}{(2\sigma_V^2 + \sigma_e^2)^2} < 0 \text{ for small } \rho.
\end{aligned}$$

Proof of Proposition 4: Portfolio Rebalancing Measures Based on Portfolio Risk
For risk measures defined as

$$\begin{aligned}
\Delta Risk(\widehat{w}_2, w_1) &= \widehat{w}_2\Omega_2\widehat{w}_2^T - w_1\Omega_1 w_1^T \\
\Delta Risk(w_2, \widehat{w}_2) &= w_2\Omega_2 w_2^T - \widehat{w}_2\Omega_2\widehat{w}_2^T \\
\Delta Risk^{Fx}(\widehat{w}_2, w_1) &= \widehat{w}_2\Omega_2^{Fx}\widehat{w}_2^T - w_1\Omega_1^{Fx} w_1^T \\
\Delta Risk^{Fx}(w_2, \widehat{w}_2) &= w_2\Omega_2^{Fx} w_2^T - \widehat{w}_2\Omega_2^{Fx}\widehat{w}_2^T,
\end{aligned}$$

we have to show a negative covariance

$$\begin{aligned}
Cov\left[\Delta Risk(w_2, \widehat{w}_2), \Delta Risk(\widehat{w}_2, w_1)\right] &< 0 \\
Cov\left[\Delta Risk^{Fx}(w_2, \widehat{w}_2), \Delta Risk^{Fx}(\widehat{w}_2, w_1)\right] &< 0,
\end{aligned}$$

where

$$\begin{aligned}
\Omega_1 &= \Omega_1^* = \begin{pmatrix} \sigma_d^2 + \sigma_V^2 & 0 \\ 0 & \sigma_d^2 + \sigma_V^2 + \sigma_e^2 \end{pmatrix} \\
\Omega_1^{Fx} &= \Omega_1^{Fx*} = \begin{pmatrix} 0 & 0 \\ 0 & \sigma_e^2 \end{pmatrix}
\end{aligned}$$

$$\begin{aligned}
\Omega_2 &= \begin{pmatrix} \sigma_V^2 & 0 \\ 0 & \sigma_V^2 + (1+d^f)^2\sigma_e^2 \end{pmatrix} & \Omega_2^* &= \begin{pmatrix} \sigma_V^2 & 0 \\ 0 & \sigma_V^2 + (1+d^h)^2\sigma_e^2 \end{pmatrix} \\
\Omega_2^{Fx} &= \begin{pmatrix} 0 & 0 \\ 0 & (1+d^f)^2\sigma_e^2 \end{pmatrix} & \Omega_2^{Fx*} &= \begin{pmatrix} 0 & 0 \\ 0 & (1+d^h)^2\sigma_e^2 \end{pmatrix}
\end{aligned}$$

A first order Taylor expansion around the steady state with $d^h = d^f = 0$ gives

$$\begin{aligned}
\Delta Risk^{Fx}(\widehat{w}_2, w_1)/\sigma_e^2 &= \left(\widehat{w}_2\Omega_2^{Fx}\widehat{w}_2^T - w_1\Omega_1^{Fx} w_1^T\right)/\sigma_e^2 \\
&\approx 0 + \left(2(\overline{x}_1^f)^2 + 2\overline{x}_1^f \frac{\overline{x}_1^f\overline{x}_1^h}{\overline{P}_2^h}\left[2\gamma - \overline{P}_2^h\theta\right]\right)(d^f - 0) - 2\overline{x}_1^f \frac{\overline{x}_1^f\overline{x}_1^h}{\overline{P}_2^h}\left[2\gamma - \overline{P}_2^h\theta\right](d^h - 0)
\end{aligned}$$

and also

$$\begin{aligned}
\Delta Risk^{Fx}(w_2, \widehat{w}_2)/\sigma_e^2 &= \left(w_2\Omega_2^{Fx} w_2^T - \widehat{w}_2\Omega_2^{Fx}\widehat{w}_2^T\right)/\sigma_e^2 = \\
&\approx 0 + 0 - 2\overline{x}_1^f \frac{\left[1 - (1+r)\,(\beta+\gamma)\right]}{\rho\sigma_V^2}(d^h - 0) + 2\overline{x}_1^f \frac{(1+r)(\beta-\gamma)}{\rho\sigma_V^2}(d^f - 0) + 0
\end{aligned}$$

The covariance can then be written as here we linearize the risk terms around the steady state with $d^h = d^f = 0$ and the second term up the second order terms.

$$\begin{aligned}
Cov\left[\Delta Risk^{Fx}(w_2, \widehat{w}_2), \Delta Risk^{Fx}(\widehat{w}_2, w_1)\right]/\sigma_e^4 &= \mathcal{E}\left[\Delta Risk^{Fx}(w_2, \widehat{w}_2)\Delta Risk^{Fx}(\widehat{w}_2, w_1)\right] - 0 \\
&= \frac{4(\overline{x}_1^f)^3{\sigma_d}^2}{\rho\sigma_V^2}\left((1+r)(\beta-\gamma) + \frac{\overline{x}_1^h}{\overline{P}_2^h}\left[2\gamma - \overline{P}_2^h\theta\right](1 - (1+r)2\gamma)\right)
\end{aligned}$$

$\beta - \gamma < 0$.
so the overall expression is < 0 since $\gamma > 0$.

$$\begin{aligned}
Cov\left[\Delta Risk^{eq}(w_2, \widehat{w}_2), \Delta Risk^{eq}(\widehat{w}_2, w_1)\right] &= \mathcal{E}\left[\Delta Risk^{eq}(w_2, \widehat{w}_2)\Delta Risk^{eq}(\widehat{w}_2, w_1)\right] \\
&= 2\left(\overline{x}_1^h - \overline{x}_1^f\right)4\sigma_V^2\overline{x}_1^{h2}\frac{\overline{x}_1^f}{\overline{P}_2^h}\left[2\gamma - \overline{P}_2^h\theta\right](1 - 2(1+r)\gamma)\frac{\sigma_d^2}{\rho} < 0
\end{aligned}$$

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Proof of Proposition 5: Portfolio Rebalancing Measures Based on Marginal Risk

TBA

DATA APPENDIX

TFS provided us with the following four data files: (i) the 'Holding Master File', containing the fund number, fund name, management company name, country code of the fund incorporation, reporting date, stock identifier, country code of the stock, and stock position (number of stocks held); (ii) the 'Security Price File', containing the stock identifier, reporting dates for which holding data is available, security price on the reporting date and the security price on the closest previous days in case the reporting date had no price information on the security; (iii) the 'Return File' containing the stock identifier, the country code of the stock, the total return index (including dividend reinvestments) in local currency; (iv) 'Exchange Rate File' containing daily dollar exchange rates for all investment destinations.

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Table 1: Geographic Holding Correlation with IMF Data

For funds registered in the United States (US), Canada (CA), the United Kingdom (UK) and the Euro area (EU) we correlated the end of the year aggregate asset holdings in each of 97 investment destination countries with the corresponding asset holdings reported in 'Coordinated Portfolio Investment Survey' of the IMF.

Country of Fund Registration	Correlations	
	Year 2001	Year 2002
US	0.93	0.94
CA	0.99	0.99
UK	0.95	0.97
EU	0.81	0.73
Average	0.92	0.91

Table 2: Summary Statistics on Fund Holdings

For funds registered in the United States (US), Canada (CA), the United Kingdom (UK) and the Euro area (EU) we report the number of funds, their total number of stock positions, and the corresponding asset value (in $billion) by semester in panel A and by investment destination in panel B.

Panel A: Summary Statistics by Semester

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Fund Reg.	US			CA			UK			EU			Pooled		
Semester	Funds	Positions	Value	Funds	Positions	Value	Funds	Positions	Value	Funds	Positions	Value	Funds	Positions	Value
1998/1	470	96,987	1,563	143	14,083	49	107	8,821	91	2	110	2	722	120,001	1,705
1998/2	485	101,437	1,258	170	16,461	54	108	10,909	99	2	402	4	765	129,209	1,415
1999/1	509	107,318	1,208	181	15,871	58	121	13,605	87	501	36,589	237	1,312	173,383	1,590
1999/2	473	99,786	1,097	143	6,604	26	99	6,108	12	105	6,920	67	820	119,418	1,201
2000/1	530	132,134	1,227	142	13,210	50	109	13,872	81	110	8,323	86	891	167,539	1,444
2000/2	713	163,868	1,158	206	19,012	54	191	22,176	118	1,772	119,000	411	2,882	324,056	1,740
2001/1	702	181,194	962	191	17,067	40	226	38,493	72	1,533	111,245	153	2,652	347,999	1,228
2001/2	888	214,087	994	192	17,587	37	215	33,230	63	1,311	96,252	105	2,606	361,156	1,198
2002/1	1,046	277,577	993	243	20,769	48	262	41,660	75	1,251	106,720	96	2,802	446,726	1,212
2002/2	961	23,0624	693	259	20,620	42	316	54,851	63	1,292	107,938	81	2,828	414,033	879
Total	6,777	1,605,012	11,153	1,870	161,284	457	1,754	243,725	760	7,879	593,499	1,242	18,280	2,603,520	13,612

Panel B: Summary Statistics by Investment Destination

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Fund Reg.	US			CA			UK			EU			Pooled		
	Funds	Positions	Value	Funds	Positions	Value	Funds	Positions	Value	Funds	Positions	Value	Funds	Positions	Value
US	6,777	1,383,638	8,864	1,860	66,617	91	1,135	60,597	100	5,208	129,341	153	14,980	1,640,193	9,208
CA	6,152	30,031	201	1,870	71,421	323	811	3,589	10	2,390	5,298	4	11,223	110,339	538
UK	5,093	36,406	272	900	5,021	6	1,754	46,022	124	7,564	83,404	144	15,311	170,853	545
EU	6,180	54,700	332	982	7,175	9	1,719	57,212	144	7,879	268,066	420	16,760	387,153	905
Other OECD	4,333	58,364	839	854	71,421	21	1,736	54,727	311	7,738	91,547	510	14,661	211,923	1,682
Off-shore	4,321	10,050	52	606	1,154	1	1,144	5,962	11	1,464	4,160	3	7,535	21,326	68
Emerg. Mkts	5,949	31,823	593	857	2,611	6	1,275	15,616	59	2,239	11,683	8	10,320	61,733	666
Total	6,777	1,605,012	11,153	1,870	161,284	457	1,754	243,725	760	7,875	593,499	1,243	18,280	2,603,520	13,612

Table 3: Summary statistics on regression variables

For each of the 4 fund locations (US, CA, UK, EU) we report summary statistics on all regresssion variables. The rebalancing statistices $RB^f_{j,t}$ for fund j in semester t states the aggregate weight change of the foreign investment share relative to weight of a passive holding strategy. The term $r^f_{j,t} - r^h{}_{j,t}$ denotes the excess return performance of the foreign portfolio share over the domestic share. Portfolio risk changes $\Delta Risk(w_{j,t}, \widehat{w}_{j,t})$ characterize the portfolio risk difference between the observed weights $w_{j,t}$ and weights $\widehat{w}_{j,t}$ of a passive holding strategy. The change in the marginal risk contribution of stock i to the portfolio risk of fund j due to rebalancing from weights $\widehat{w}_{j,t}$ to $w_{j,t}$ is denoted by $\Delta MRisk(i, w_{j,t}, \widehat{w}_{j,t})$. In each case we distinguish the foreign exchange risk component of the total portfolio risk by a superscript Fx.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
Fund Reg.	US				CA				UK				EU			
Variable	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max	Mean	S.D.	Min	Max
Total Assets (USD millions)	1650	8430	1	236,000	244	452	1	4,000	433	1920	1	31,200	158	693	1	23.700
Home Assets (USD millions)																
Foreign Assets (USD millions)																
$RB^f_{j,t}$	−0.133	7.231	−57.852	53.407	0.886	8.108	−40.315	62.325	−1.041	7.260	−46.503	55.509	−0.563	11.263	−72.111	65.934
$\left[r^f_{j,t} - r^h{}_{j,t}\right]$	−0.017	0.185	−0.530	0.747	−0.038	0.174	−0.566	0.560	−0.026	0.135	−0.442	0.385	0.016	0.113	−0.319	0.361
$\left[r^f_{j,t} - r^h{}_{j,t}\right] \times 1_{\Delta r \geq 0}$	0.060	0.114	0	0.747	0.050	0.097	0	0.560	0.040	0.073	0	0.385	0.0532	0.069	0	0.361
$\left[r^f_{j,t} - r^h{}_{j,t}\right] \times 1_{\Delta r \leq 0}$	−0.077	0.110	−0.530	0	−0.087	0.112	−0.566	0	−0.065	0.087	−0.442	0	−0.037	0.063	−0.319	0
$\Delta Risk^{eq}(w_{j,t}, \widehat{w}_{j,t})$	−0.027	0.523	−4.780	5.918	−0.061	0.544	−4.457	6.297	−0.006	0.641	−3.869	7.200	−0.051	0.550	−4.612	6.347
$\Delta Risk^{Fx}(w_{j,t}, \widehat{w}_{j,t})$	0.000	0.0259	−0.369	0.331	−0.000	0.030	−0.184	0.209	0.000	0.078	−0.485	0.670	−0.000	0.061	−0.474	0.517
$\Delta Risk^{eq}(\widehat{w}_{j,t}, w_{j,t-1})$	0.034	0.217	−1.091	2.889	0.059	0.243	−1.845	2.455	0.000	0.136	−1.269	1.003	0.019	0.160	−0.903	1.809
$\Delta Risk^{Fx}(\widehat{w}_{j,t}, w_{j,t-1})$	0.000	0.007	−0.071	0.079	0.000	0.011	−0.063	0.091	−0.000	0.20	−0.443	0.074	0.000	0.015	−0.123	0.109
$\Delta MRisk(i, w_{j,t}, \widehat{w}_{j,t})$	0.002	0.174	−1.781	1.785	0.007	0.228	−2.569	2.418	0.004	0.195	−1.875	1.652	0.001	0.260	−2.762	2.455
$\Delta MRisk^{Fx}(i, w_{j,t}, \widehat{w}_{j,t})$	−0.000	0.127	−0.169	0.145	−0.000	0.023	−0.209	0.201	−0.000	0.045	−0.447	0.368	−0.000	0.037	−0.289	0.307
$\Delta MRisk(i, \widehat{w}_{j,t}, w_{j,t-1})$	0.001	0.071	−0.655	0.876	0.001	0.083	−0.940	0.988	−0.003	0.0529	−0.622	0.468	−0.000	0.077	−0.722	0.861
$\Delta MRisk^{Fx}(i, \widehat{w}_{j,t}, w_{j,t-1})$	0.000	0.004	−0.366	0.263	−0.000	0.008	−0.189	0.181	−0.000	0.011	−0.421	0.506	−0.000	0.009	−0.242	0.244

Table 4: Rebalancing of Foreign Portfolio Share

The portfolio rebalancing statistics $RB_{j,t} = w^f_{jt} - \widehat{w}^f_{jt}$ of fund j in semester t is defined as the observed foreign portfolio share w^f_{jt} at the end of a semester minus the implied foreign portfolio share $\widehat{w}^f_{jt}$ under passive asset holding strategy over the same semester. We regressed $RB_{j,t}$ on the excess return $\Delta r = r^f_{j,t-k} - r^h{}_{j,t-k}$ of the foreign over the home component of the portfolio and also its decomposition into positive and negative excess returns using dummy variables for positive ($1_{\Delta r \geq 0}$) and negative ($1_{\Delta r \leq 0}$) excess returns, respectively. We report separate regressions for funds registered in the United States (US), Canada (CA), the United Kingdom (UK).and the Euro currency area (EU). Our sample spans each semester between 1998 and 2002. We also included time dummies (unreported) for each semester. Robust standard errors are stated below the coefficients. We mark significance on a 5 percent level (*) and a 1 percent level (**).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Fund Reg.	US			CA			UK			EU			Pooled		
	$k=0$	$k=0$	$k=1$	$k=0$	$k=0$	$k=1$	$k=0$	$k=0$	$k=1$	$k=0$	$k=0$	$k=1$	$k=0$	$k=0$	$k=1$
$\left[r^f_{j,t-k} - r^h{}_{j,t-k}\right]$	−4.14**		−2.63**	−10.51**		−4.15**	−4.49*		−2.46	−11.86**		−10.63**	−9.12**		−5.98**
	(0.6)		(0.47)	(1.55)		(1.0)	(1.9)		(1.4)	(1.6)			(0.6)		(0.5)
$\left[r^f_{j,t-k} - r^h{}_{j,t-k}\right] \times 1_{\Delta r \geq 0}$		−7.27**			−7.98**			−5.05			−13.68**			−11.53**	
		(1.2)			(2.9)			(3.7)			(2.9)			(1.3)	
$\left[r^f_{j,t-k} - r^h{}_{j,t-k}\right] \times 1_{\Delta r \leq 0}$		−0.85			−12.52**			−4.08			−9.95**			−6.83**	
		(1.0)			(2.5)			(1.3)			(3.0)			(1.1)	
Constant	−0.14**	0.28	−0.18**	0.53**		0.56**	−1.30**	−1.25**	−0.86**	−0.41**	−0.24**	−0.57**	−1.17**	−0.90**	−1.23**
Obs.	5,329	5,329	4,568	1,473	1,473	1,270	1,378	1,378	1,028	6,193	6,193	3,911	17,560	17,560	12,867
Adjusted R^2	0.12	0.12	0.12	0.14	0.15	0.15	0.20	0.20	0.21	0.07	0.07	0.06	0.08	0.08	0.11

Table 5: Portfolio Risk Rebalancing

The risk rebalancing measure $\Delta Risk(w_{j,t}, \widehat{w}_{j,t})$ for fund j in semester $t+1$ is regressed on the risk change $\Delta Risk(\widehat{w}_{j,t}, w_{j,t-1})$ between weights $\widehat{w}_{j,t}$ implied by a passive holding strategy and the risk of the the original weights $w_{j,t}$ observed at the end of semester t. We undertake separate regressions for funds registered in the United States (US), Canada (CA), the United Kingdom (UK) and the Euro currency area (EU), respectively. Panel A reports the risk rebalancing regression for the equity risk component $\Delta Risk^{eq}$ measured in local currency of the fund registration and Panel B reports risk rebalancing regression for the exchange rate component $\Delta Risk^{Fx}$ of the portfolio risk. The unbalanced panel includes fund data for 10 semesters over the period 1998 to 2002. All regressions include fixed effects for each semester and report standard errors which allow for clustering of the error structure on the fund level. Robust standard errors are stated below the coefficients. We mark significance on a 5 percent level (*) and a 1 percent level (**).

Panel A: Equity Risk Rebalancing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Fund Reg.		US			CA			UK			EU			Pooled	
Fund Size	Small	Large	All	Small	Large	All	Small	Large	All	Small	Large	All	Small	Large	All
$\Delta Risk^{eq}(\widehat{w}_{j,t}, w_{j,t-1})$	−0.51**	−0.07	−0.49**	−0.60**	−0.62	−0.59**	0.20	−0.15	0.16	−0.25*	−0.08	−0.24**	−0.34**	−0.23	−0.33**
	(.10)	(.26)	(.10)	(.17)	(.36)	(.17)	(.29)	(.29)	(.27)	(.10)	(.27)	(.10)	(.07)	(.18)	(.07)
Fixed time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	4396	492	4888	1176	135	1311	1076	124	1200	4975	557	5532	11622	1296	12918
Funds	1501	153	1606	347	35	363	396	58	422	2139	247	2292	4397	473	4681
R^2	0.05	0.03	0.05	0.17	0.26	0.17	0.12	0.12	0.12	0.02	0.05	0.02	0.02	0.03	0.02

Panel B: FX Portfolio Risk Rebalancing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Fund Reg.		US			CA			UK			EU			Pooled	
Fund Size	Small	Large	All	Small	Large	All	Small	Large	All	Small	Large	All	Small	Large	All
$\Delta Risk^{Fx}(\widehat{w}_{j,t}, w_{j,t-1})$	−0.34	−1.13**	−0.38**	−0.50*	−0.98*	−0.55**	−0.18	0.52	0.18	−0.56**	−0.17	−0.52**	−0.43**	−0.57	−0.44**
	(.20)	(.22)	(.19)	(.20)	(.40)	(.19)	(.25)	(.05)	(.22)	(.09)	(.30)	(.10)	(.08)	(.38)	(.08)
Fixed time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	4396	492	4888	1176	135	1311	1076	124	1200	4975	557	5532	11622	1296	12918
Funds	1501	153	1606	347	35	363	396	58	422	2139	247	2292	4397	473	4681
R^2	0.01	0.18	0.01	0.04	0.23	0.04	0.01	0.27	0.01	0.02	0.02	0.02	0.01	0.02	0.01

Table 6: Stock Risk Rebalancing

For each stock i held by each fund j the marginal risk change $\Delta MRisk(i, w_{j,t}, \widehat{w}_{j,t})$ in stock i due to rebalancing is regressed on the marginal risk change under a passive holding strategy denoted by $\Delta MRisk(i, \widehat{w}_{j,t}, w_{j,t-1})$. Panel A reports regressions for the the total marginal risk changes in the currency of the registed fund and Panel B reports the corresponding regressions on for the FX component of the marginal risk, where the covariance matrix is replace by a covariance matrix capturing only the FX risk. Formally the dependent variables are defined as

$$\begin{aligned} \Delta MRisk(i, w_{j,t}, \widehat{w}_{j,t}) &= (\widehat{\Omega}_{j,t-1})_{i\bullet}(\widehat{w}_{j,t+1} - w_{j,t})^T \\ \Delta MRisk^{Fx}(i, w_{j,t}, \widehat{w}_{j,t}) &= (\widehat{\Omega}_{j,t-1})^{Fx}_{i\bullet}(\widehat{w}_{j,t+1} - w_{j,t})^T \end{aligned}$$

where $(\widehat{\Omega}_{j,t})_{i\bullet}$ represents the i-th row of the covariance matrix of stocks held by fund j. The unbalanced panel is based on stock holding data for 10 semesters over the period 1998 to 2002. All regressions include fixed effects for each semester and report standard errors which allow for clustering of the error structure on the fund level. Robust standard errors are stated below the coefficients. We mark significance on a 5 percent level (*) and a 1 percent level(**).

Panel A: Marginal Stock Risk Rebalancing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Fund Reg.		US			CA			UK			EU			Pooled	
Stock Size	Small	Large	All	Small	Large	All	Small	Large	All	Small	Large	All	Small	Large	All
$\Delta MRisk(i, \widehat{w}_{j,t}, w_{j,t-1})$	-0.31^{**}	-0.34^{**}	-0.34^{**}	-0.32^{**}	-0.45^{**}	-0.40^{**}	-0.14	-0.07	-0.09	-0.20^{**}	$-.31^{**}$	-0.29^{**}	-0.27^{**}	-0.33^{**}	-0.32^{**}
	(0.06)	(0.04)	(0.04)	(0.07)	(0.08)	(0.07)	(0.12)	(0.09)	(0.09)	(0.08)	(0.05)	(0.05)	(0.04)	(0.03)	(0.03)
Fixed time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	257, 771	1221, 914	1, 479, 685	42, 598	104, 380	146, 978	45, 091	198, 203	243, 294	55, 751	495, 602	551, 353	401, 211	2, 020, 099	2, 421, 310
Funds	1, 381	1, 608	1, 608	363	364	364	414	423	423	2, 066	2, 296	2, 296	4, 224	4, 691	4, 691
R^2	0.02	0.02	0.02	0.02	0.03	0.02	0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.01

Panel B: Marginal FX Risk Rebalancing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Fund Reg.		US			CA			UK			EU			Pooled	
Stock Size	Small	Large	All	Small	Large	All	Small	Large	All	Small	Large	All	Small	Large	All
$\Delta MRisk^{Fx}(i, \widehat{w}_{j,t}, w_{j,t-1})$	-0.20	-0.23^{**}	-0.23^{**}	-0.45^{**}	-0.40^{**}	-0.41^{**}	-0.05	-0.11	-0.09	-0.47^{**}	-0.40^{**}	-0.42^{**}	-0.26^{**}	-0.29^{**}	-0.28^{**}
	(0.14)	(0.10)	(0.10)	(0.12)	(0.14)	(0.13)	(0.13)	(0.11)	(0.11)	(0.22)	(0.08)	(0.08)	(0.11)	(0.05)	(0.06)
Fixed time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	257, 771	1, 221, 914	1, 479, 685	42, 598	1, 043, 880	146, 978???	45, 091	198, 203	243, 294	55, 751	495, 602	551, 353	401, 211	2, 020, 099	2, 421, 310
Funds	1, 381	1, 608	1, 608	363	364	364	414	423	423	2, 066	2, 296	2, 296	4, 224	4, 691	4, 691
R^2	0.01	0.01	0.01	0.04	0.02	0.03	0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.01

Table 7: Stock Risk Rebalancing by Marginal Risk Direction

Similar to the regressions in Table 5, for each fund j the marginal risk change $\Delta MRisk(i, w_{j,t}, \widehat{w}_{j,t})$ in stock i due to rebalancing is regressed on the marginal risk change under a passive holding strategy denoted by $\Delta MRisk(i, \widehat{w}_{j,t}, w_{j,t-1})$. Compared to Table 5, we relax the symmetry constraint for the coefficient on $\Delta MRisk(i, \widehat{w}_{j,t}, w_{j,t-1})$ by allowing for a different risk rebalancing coefficient in the case of a passive risk increase (marked with a dummy $1_{\Delta MRisk \geq 0}$) compared to the rebalancing under a passive risk decrease (marked by the dummy $1_{\Delta MRisk<0}$). Panel A reports regressions for the the total marginal risk changes measured in the currency of the registed fund and Panel B reports the corresponding regressions on for the FX component of the marginal risk. All regressions include fixed effects for each semester and report standard errors which allow for clustering of the error structure on the fund level. Robust standard errors are stated below the coefficients. We mark significance on a 5 percent level (*) and a 1 percent level(**).

Panel A: Marginal Stock Risk Rebalancing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Fund Reg.	US		CA		UK		EU		Pooled	
Symmetry Imposed?	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
$\Delta MRisk(i, \widehat{w}_{j,t}, w_{j,t-1})$		-0.34^{**}		-0.40^{**}		-0.09		-0.29^{**}		-0.32^{**}
		(0.04)		(0.07)		(0.09)		(0.05)		(0.03)
$\Delta MRisk(i, \widehat{w}_{j,t}, w_{j,t-1}) \times 1_{\Delta MRisk \geq 0}$	-0.51^{**}		-0.67^{**}		-0.75^{**}		0.01		-0.53^{**}	
	(0.06)		(0.12)		(0.13)		(0.08)		(0.04)	
$\Delta MRisk(i, \widehat{w}_{j,t}, w_{j,t-1}) \times 1_{\Delta MRisk<0}$	-0.19^{**}		-0.17		0.23		-0.31^{**}		-0.109^{**}	
	(0.06)		(0.09)		(0.11)		(0.05)		(0.04)	
Fixed time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	1,479,685	1,479,685	146,978	146,978	243,294	243,294	551,353	551,353	2,421,310	2,421,310
Funds	1,608	1,608	364	364	423	423	2,296	2,296	4,691	4,691
R^2	0.02	0.02	0.05	0.02	0.03	0.00	0.02	0.01	0.03	0.01

Panel B: Marginal FX Risk Rebalancing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Fund Reg.	US		CA		UK		EU		Pooled	
Symmetry Imposed	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
$\Delta MRisk^{Fx}(i, \widehat{w}_{j,t}, w_{j,t-1})$		-0.23^{**}		-0.41^{**}		-0.09		-0.42^{**}		-0.28^{**}
		(0.10)		(0.13)		(0.11)		(0.08)		(0.06)
$\Delta MRisk^{Fx}(i, \widehat{w}_{j,t}, w_{j,t-1}) \times 1_{\Delta MRisk \geq 0}$	-0.42^{**}		-0.39^{*}		-0.62^{**}		-0.41^{**}		-0.47^{**}	
	(0.16)		(0.18)		(0.17)		(0.11)		(0.07)	
$\Delta MRisk^{Fx}(i, \widehat{w}_{j,t}, w_{j,t-1}) \times 1_{\Delta MRisk<0}$	-0.06		-0.46^{*}		0.16		-0.24^{*}		-0.14	
	(0.10)		(0.20)		(0.15)		(0.12)		(0.08)	
Fixed time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	1,479,685	1,479,685	146,978	146,978	243,294	243,294	551,353	551,353	2,421,310	2,421,310
Funds	1,608	1,608	364	364	423	423	2,290	2,296	4,691	4,691
R^2	0.01	0.01	0.02	0.03	0.06	0.00	0.01	0.01	0.01	0.01

Table 8: Stock Weight Change Rebalancing by Marginal Risk Direction

We substitute as the dependent variable the actual weight change $w_{j,t} - \widehat{w}_{j,t}$ of fund j in stock i for the marginal risk change $\Delta MRisk(i, w_{j,t}, \widehat{w}_{j,t})$ and repeat the rebalacing regressions.as in Table 6. The marginal risk change under a passive holding strategy denoted by $\Delta MRisk(i, \widehat{w}_{j,t}, w_{j,t-1})$.is again split into a positive component marked with a dummy $1_{\Delta MRisk \geq 0}$ and a negative component marked by the dummy $1_{\Delta MRisk<0}$. Panel A reports regressions for the stock weight rebalancing due to total marginal risk changes measured in the currency of the registed fund and Panel B reports the corresponding regressions for the FX component of the marginal risk change. All regressions include fixed effects for each semester and report standard errors which allow for clustering of the error structure on the fund level. Robust standard errors are stated below the coefficients. We mark significance on a 5 percent level (*) and a 1 percent level(**).

Panel A: Stock Weight Rebalancing for Marginal Equity Risk Change

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Fund Reg.	US		CA		UK		EU		Pooled	
Symmetry Imposed?	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
$\Delta MRisk(i, \widehat{w}_{j,t}, w_{j,t-1})$		-0.21^{**}		-0.68^{**}		-0.42^{**}		-0.73^{**}		-0.40^{**}
		(0.01)		(0.08)		(0.08)		(0.05)		(0.02)
$\Delta MRisk(i, \widehat{w}_{j,t}, w_{j,t-1}) \times 1_{\Delta MRisk \geq 0}$	-0.55^{**}		-2.23**		-2.48^{**}		-2.06^{**}		-1.14^{**}	
	(0.05)		(0.12)		(0.27)		(0.15)		(0.07)	
$\Delta MRisk(i, \widehat{w}_{j,t}, w_{j,t-1}) \times 1_{\Delta MRisk<0}$	0.20^{**}		0.76^{**}		0.83^{**}		0.94^{**}		0.49^{**}	
	(0.02)		(0.12)		(0.15)		(0.08)		(.03)	
Fixed time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	1,479,685	1,479,685	146,978	146,978	243,294	243,294	551,353	551,353	2,421,310	2,421,310
Funds	1,608	1,608	364	364	423	423	2,296	2,296	4,691	4,691
R^2	0.02	0.00	0.00	0.00	0.02	0.00	0.01	0.00	0.01	0.00

Panel B: Stock Weight Rebalancing for Marginal FX Risk Change

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Fund Reg.	US		CA		UK		EU		Pooled	
Symmetry Imposed?	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
$\Delta MRisk(i, \widehat{w}_{j,t}, w_{j,t-1})$		-0.36		0.71		0.15		-0.66^{**}		-0.35^{**}
		(0.19)		(0.49)		(0.27)		(0.24)		(0.13)
$\Delta MRisk(i, \widehat{w}_{j,t}, w_{j,t-1}) \times 1_{\Delta MRisk \geq 0}$	-0.30		0.25		-0.09		-0.83^{*}		-0.27	
	(0.23)		(0.65)		(0.11)		(0.40)		(0.2)	
$\Delta MRisk(i, \widehat{w}_{j,t}, w_{j,t-1}) \times 1_{\Delta MRisk<0}$	-0.51		2.03		-0.09		-0.19		-0.30	
	(0.35)		(1.07)		(0.11)		(0.42)		(0.19)	
Fixed time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	1,479,685	1,479,685	146,978	146,978	243,294	243,294	551,353	551,353	2,421,310	2,421,310
Funds	1,608	1,608	364	364	423	423	2,296	2,296	4,691	4,691
R^2	0.01	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.01	0.01