Global Risk and International Equity Portfolio Rebalancing*

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ABSTRACT

We study how international equity mutual funds allocate their portfolios across countries and what factors determine their asset allocation decisions using micro-level data on mutual funds between 1998 and 2012. Our empirical results demonstrate that fund managers actively engage in a rebalancing strategy to manage their foreign equity portfolios and a motive behind this action comes mainly from managing the underlying equity market risk rather than currency risk. We also find that fund managers' degree of rebalancing is larger in equity markets that exhibit a stronger correlation with the global market.

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1. Introduction

Foreign equity portfolio investment has accounted for a growing proportion of cross-border capital flows in the last couple of decades. With its critical effect on the dynamics of host equity markets and more broadly domestic investment activities, understanding forces that influence the country allocation decision of foreign investors becomes an important research topic in international finance. While recent works, notably Hau and Rey (2004, 2006, 2008) and Curcuru et al. (2011, 2014), find that US investors actively reallocate away from equity markets that recently performed well, a motive behind this rebalancing action has been controversial and still remains an open question in the literature.[2] In this paper, we ask two important questions: First, what is the dominant risk factor in driving portfolio rebalancing for international equity fund managers? Hau and Rey (2006, 2008) emphasize stabilizing international portfolio holders' exposure to foreign exchange risk. Under a two-country (home and foreign) framework, when a foreign share of international portfolios gains in value, the exchange rate risk associated with the higher foreign share inevitably rises if not rebalanced. But, the international portfolio risk also involves unexpected return changes in the underlying equity markets. We first examine if portfolio rebalancing is motivated by the risk of total return, the combination of the equity return evaluated in a local currency and exchange rate return. Then, we test if the rebalancing action is driven mainly by currency risk or by local equity market risk. Second, how do the local market return's correlations with the global market affect the equity portfolio rebalancing behavior? Financial market liberalization around the world has enabled investors to have an easy access to foreign markets but it has also made local markets more vulnerable to external shocks. Depending on the underlying equity market return's co-movement with the global return, which is heterogeneous across countries, we would expect to see very different reactions of the fund managers to local equity market innovations.

Earlier research, based on the bilateral capital flows data, documented that U.S. investors chase returns instead of rebalancing their foreign portfolios invested in OECD countries (Bohn and Tesar, 1996; Brennan and Cao, 1997).[3] However, recent portfolio-holdings data approach

[2] Regarding the rebalancing action in practice, risk-averse fund managers (or investors) reallocate away from a market whose relative weight in their portfolio deviates from a target allocation by a certain pre-specified threshold level, or on a regular basis, simply once every six or twelve months.

[3] Empirical analysis based on the bilateral capital flows data may suffer from an inference problem associated with

predominantly reports opposite results: portfolio rebalancing characterizes U.S. residents' international investment strategies (Hau and Rey, 2004, 2006, 2008; Curcuru et al., 2011, 2014).[4] Hau and Rey (2006, 2008)'s currency risk rebalancing hypothesis, however, does not always get empirical support. Gyntelberg et al. (2014) use Thailand stock market and foreign exchange data and document the presence of portfolio rebalancing of nonresident investors in the Thai equity market when the local market outperforms relative to a reference market. However, they find no evidence that such rebalancing is driven by exchange rate fluctuations. Moreover, Ülkü and Karpova (2014) document that foreign investors from non-Eurozone countries do not necessarily rebalance more to local equity market return shocks in Greece than European investors.[5]

While rebalancing may provide an efficient way for international investors to adjust their asset allocation in case a future adverse shock raises risk exposure of their portfolio, it may hurt their overall returns by selling winners and buying losers. In light of this concern, Curcuru et al. (2011, 2014) argue that the rebalancing may be a result of the tactical allocation that is determined by the returns-seeking preference rather than risk-mitigating; U.S. investors sell off equities that recently exhibited high returns and subsequently buy equities just before their strong performance. The mean-reverting behavior of the equity returns is the key assumption of the Curcuru et al. (2011, 2014)'s results, implying that the equity returns should be predictable to take advantage of the returns-seeking strategy.

As seen from the literature summarized above, there is no consensus regarding the main rebalancing motive of the international investors. Indeed, the empirical results in the literature seem to be sensitive to the characteristics of data (aggregate vs. micro-level), choice of sample countries and periods, and underlying assumptions of asset returns.[6] In addition, the standard approach in the literature focuses on the idiosyncratic factors to explain the portfolio risk and its

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the wealth effect and reserve causality. Detail discussions regarding these issues are provided in subsection 2.1.

[4] The same strategy, however, does not always characterize foreign equity investments. For example, Chaban (2009) looks at three commodity-exporting countries (Australia, Canada and New Zealand) and finds that the correlation between the equity return and currency return is not as strong as non-commodity-dependent countries, suggesting a weaker portfolio rebalancing motive for commodity-producing countries. The reason provided in the paper is that when the equity prices rise in the U.S. due to the high income shock, commodity prices as well as equity prices in commodity-exporting countries increase as well, reducing the need to rebalance globally-diversified portfolios.

[5] The determinants of portfolio rebalancing at the household-level are also discussed in Calvet et al. (2009). They find more active rebalancing behavior from sophisticated households in Sweden characterized by holding higher levels of education and wealth with better diversified portfolios.

[6] While we do not test explicitly in this paper, the extent to which investors rebalance their foreign portfolios may also depend on their risk preferences. In general, risk-averse investors are more likely to engage in rebalancing strategies than risk-tolerant investors because they are more sensitive to the expected risk of their portfolios.

effect on the rebalancing motive and ignores the global common factors that may have an asymmetric effect on underlying equity markets. With the greater globalization in goods and capital markets and increasing volume of equity trading, stock returns exhibit a high degree of co-movement worldwide, indicating that the portfolio risk may come not only from the local equity market but also from its link with the global market.

The main goal of this paper is to provide a finer understanding of international equity fund managers' portfolio management and the motive behind their actions.[7] To this end, we employ the fund-level micro data that come from Emerging Portfolio Fund Research (EPFR) database. The database tracks country allocation information of equity mutual funds domiciled mostly in advanced countries over the period 1998-2012. Unlike most studies in the literature that focus on the advanced country investor's asset holdings in a small number of OECD countries for a relatively short-time period, we use the comprehensive international portfolio holdings data: the EPFR data set contains broad geographic coverage of equity investment destinations and investor domiciles around the world and long time periods.[8]

Taking advantage of the microstructure data, our analysis proceeds as follows: First, we measure a time-varying equity market variance shock and use it to test a risk-rebalancing hypothesis. We consider the rebalancing action not just between home and foreign countries but also between foreign countries. This is plausible with the rich portfolio allocation data set which gives us information about capital flows across various country-pairs. Second, instead of relying on survey evidence of Levich et al. (1999) that the unhedged foreign exchange exposure of portfolio investments is a main motive behind international equity portfolio rebalancing as in Hau and Rey (2006), we directly test this exchange rate driven risk rebalancing hypothesis using the Eurozone funds' allocation information. If the foreign exchange risk hedging is behind fund managers' rebalancing strategy, we would expect to observe a more negative response of Eurozone investors' portfolio holdings to the stock market shocks in non-Eurozone areas than in Eurozone areas. Lastly, we provide new empirical evidence on how the correlation of the local

[7] We focus on the risk channel rather than the return-seeking channel as a rebalancing motive because we do not find strong evidence for the equity return predictability in our sample. The estimated autoregressive coefficients for total returns are significant in less than a half of our sample countries. Excluding the recent global crisis periods (2008-09), we find that the AR(1) coefficients remain significant in less than a third of our sample countries (not reported but available upon request). See Table A1 in Appendix for details.

[8] Note that EPFR Global database includes over 1100 international equity mutual funds that invest in over 120 countries around the world. However, the required data screening process, described in subsection 2.1, leaves 799 equity funds with 43 investment destination countries in our sample.

equity return with the global return affects rebalancing decisions. To explore the theoretical implications, we also present a simple mean-variance portfolio balance model in section 4 whose prediction is consistent with the main empirical findings on the effect of global risk.

Our results confirm risk-rebalancing behavior of international equity fund managers and demonstrate the importance of underlying equity market risk, rather than exchange rate risk, as a main motive behind the portfolio rebalancing action, corroborating the earlier empirical findings (Gyntelberg et al., 2014; Ülkü and Karpova, 2014). This is not surprising as volatility of equity returns is almost always bigger than that of currency returns across countries and risk-averse investor's hedging motive is more sensitive to the higher risk. In addition, global fund managers tend to show the higher degree of rebalancing in equity markets that exhibit a stronger correlation with the global market. Intuitively, equity markets that are more sensitive to global factors are considered riskier due to reduced diversification benefits of the fund managers, a majority of which reside in advanced countries.

The rest of the paper is organized as follows. Section 2 describes the data and the empirical model specification. Section 3 reports and discusses empirical results. Section 4 presents brief theoretical interpretations of main results using a mean-variance portfolio balance model. Section 5 concludes.

2. Empirical methodology

2.1. Data and sources

This paper employs a micro-level data set provided by the Emerging Portfolio Fund Research (EPFR) Global database, which collects country allocation information directly from fund managers or administrators of 799 international equity mutual funds over the period 1998m01-2012m12. The EPFR database reports each fund's total net assets (TNA) denominated in U.S. dollars, country allocation weights as a percentage share of the fund assets and funds'

portfolio returns.[9] The latter two sources are used in our empirical analysis. The database also provides information about fund domiciles that are primarily located in advanced market jurisdictions including United States, United Kingdom, and the EU area. Funds are different in investment scopes and are sorted by the market segments as shown in Table 1. For example, 142 funds from all domiciles invest more than 95% of their portfolio in Asia, primarily in China and India. The table also shows the US dollar value of total net assets at the end of our sample period.[10]

[Insert Table 1 here]

In order for our empirical results to be immune to the outliers or inconsistency resulting from the emergence or disappearance of funds during the sample period, we drop funds whose total number of observations is less than 12 months. Moreover, small funds whose initial net asset value is less than 15 million U.S. dollars are also excluded as they often report the data at less frequent intervals. Applying these data screening procedures leave 23 developed and 20 emerging countries of portfolio investment recipients in our sample. All the major equity markets around the world are included in our sample and therefore our empirical results are unlikely to be sensitive to the data screening procedure. Table 2 lists a full set of countries.

[Insert Table 2 here]

The data for the equity market returns in both daily and monthly for each country, region and world are from MSCI index. Country j's return r_{jt} is defined as $r_{jt} = ln\left(\text{MSCI}_{jt}/\text{MSCI}_{jt-1}\right)$. The daily spot exchange rates are from Bloomberg and these are recorded in the way that a higher exchange rate means the local currency appreciation against the currency of the fund domicile. In our empirical procedure, we use extreme caution to precisely measure the total

[9] Total net assets in our sample amount to 624 billion US dollars as of the end of 2012, approximately 2.4% of the worldwide mutual fund total net assets of 26 trillion US dollars. Source: 2013 Investment Company Fact Book, ICI. As for another evidence of the representativeness of our data, Jotikasthira et al. (2012) confirm similar patterns for portfolio flows data provided by EPFR and the data on the net foreign transactions of U.S. investors reported in the Treasury International Capital System (TIC) by the U.S. Treasury department.

[10] EPFR data have also been used by Broner et al. (2006), Forbes et al. (2016), Fratzscher (2012), Gelos and Wei (2005), Jotikasthira et al. (2012), Raddatz and Schmukler (2012), and Wei et al. (2010), but they address different questions from ours.

return from a country's equity market because the currency return has to reflect the exchange rates between the host country and the fund domicile. For example, the U.S. domiciled funds' total return from the equity investment in Germany is a combination of euro-denominated local equity market return in Germany and the changes in exchange rate between the U.S. and Germany in a given time period.

Our micro-level data offer a couple of identification advantages in an empirical procedure. With bilateral flows data, it is difficult to figure out if any change in bilateral capital flow is induced by the wealth effect or by the effect of other economic variables. For example, a US fund manager who recently experiences an increase in her wealth may distribute the excess wealth to all assets in her portfolio but lower a share of portfolio for a particular country's asset that recently performed well. By observing an increase in aggregate capital inflows to the host country and a rise in the underlying equity market return, one may incorrectly conclude that the US investor chases returns, while a portfolio data-based approach precisely points to portfolio rebalancing (Curcuru et al., 2011). Furthermore, when the foreign equity return increases due to changes in either local equity prices or currency values, the foreign share of the fund manager's portfolio automatically rises. By removing this valuation effect from current period's portfolio weight for a country, the portfolio allocation data allow us to measure the active portfolio management that reflects the investor's net demand for the country's assets. Lastly, a regression model involving aggregate capital flows between two countries on one side and the market return differentials on the other side may suffer from an endogeneity problem due to reverse causality. This is not an issue with the micro-level fund's allocation data because the direction of causality is clear from a country's equity market return change to the fund's country weight change and not vice versa.

2.2. Dependent variable

In order to measure an active change in the weight of country j in a fund manager's portfolio, we follow Curcuru et al. (2011) and use the expression below as our dependent variable in empirical models. Formally, the change in the fund i's country j weight or portfolio share w at time t is defined as follows:

$$\Delta w_{ij,t} = w_{ij,t} - w_{ij,t-1} \underbrace{\left(\frac{1+r_{jt}}{1+r_{it}}\right)}_{\text{valuation effect}} \quad (1)$$

where r_{jt} is the equity return in country j from period $t-1$ to t; r_{it} is fund i's weighted average portfolio return at time t defined as $r_{it} = \sum_{j=1}^{J} w_{ij,t-1} r_{ij,t}$. When country j's equity market outperforms fund i's average portfolio return at time t, country j weight in fund i's portfolio at time t automatically rises due to the valuation effect. So, the second term in the right-hand-side of equation (1) is often called a buy-and-hold weight or passive holding. Under the passive buy-and-hold strategy, $\Delta w_{ij,t} = 0$. By eliminating the valuation effect from the observed country weight at time t, we can track a global fund manager's *active* portfolio shifting behavior.

2.3. Regression model specification

Fund managers are heterogeneous: They trade assets at different times; Moreover, they have different minimum thresholds for portfolio reallocation, inducing some to rebalance their portfolios but keeping others inactive even when exposed to the same return changes. For this reason, our empirical procedure based on a panel dataset tries to discover the average tendency of fund managers' reaction to return changes and other risk factors. To empirically test the risk-rebalancing hypothesis, we use the following panel fixed-effect regression model: For fund i, country j and time t,

$$\Delta w_{ij,t} = \alpha_{ij} + \beta_1 \Delta r_{ij,t} + \beta_2 X_{ij,t} + \beta_3 \Delta r_{ij,t} X_{ij,t} + u_{ij,t} \quad (2)$$

where $\Delta w_{ij,t}$ is the active change of the portfolio weight as defined in equation (1); α_{ij} controls for a time-invariant fund-country specific fixed effect; $\Delta r_{ij,t}\left(= r_{jt} - r_{it}\right)$ is country j's equity market return over the fund i's portfolio average return; $X_{ij,t}$ is a country-specific market risk measure that will be specified later; and $u_{ij,t}$ is a disturbance term. Our primary objective in the empirical analysis is to estimate and interpret the coefficients β_1 and β_3 from equation (2) in order to see the marginal effect of excess returns as follows:

$$\frac{\partial\left(\Delta w_{ij,t}\middle|\Delta r_{ij,t}, X_{ij,t}\right)}{\partial \Delta r_{ij,t}} = \beta_1 + \beta_3 X_{ij,t} \tag{3}$$

Equation (3) shows that the fund manager's portfolio reallocation in response to return changes depends on the conditional factor X. A significant and negative coefficient β_1 would confirm the rebalancing hypothesis (return chasing hypothesis if $\beta_1 > 0$) given X is equal to zero, and a significant and negative β_3 would signify that the higher the value of the conditional factor X, the greater the degree of portfolio rebalancing for fund i's equity holdings in country j.

3. Estimation results

3.1. Risk and reallocation

In this subsection, we test the risk-rebalancing hypothesis by looking at how the risk associated with total return changes affects fund managers' reallocation decisions. To measure risk of returns, we first calculate monthly variance of total return for each country using the daily return data. Then, we define variance shock for each country as a deviation of the current month's variance from the average of past three months, generating a time-varying variance shock of return over the sample period.[11] The variance of total return differs substantially across countries with the generally higher variance observed from emerging economies than advanced economies. For this reason, using the *level* of variance for each country in our panel data analysis would capture a difference in income levels rather than idiosyncratic market risks. Therefore, we employ a variance *shock* instead of its level as a country-specific portfolio risk of fund managers.

In testing the rebalancing hypothesis, Hau and Rey (2008) take a two-country approach by aggregating foreign countries into one group and assuming each fund to allocate between two countries only, home and foreign. What's ignored in their analysis is that fund managers may substitute away from country *j* holdings towards another foreign asset instead of the home asset.

[11] The choice of three months is arbitrary. Our results are robust to the longer periods of 6 or 12 months. Results can be provided upon request.

Ignoring this possibility, the simple two-country approach overemphasizes the role of currency risk and exaggerate home bias. In this paper, we allow portfolio shifts between foreign countries as well:

$$\Delta w_{ij,t} = \alpha_{ij} + \beta_1 \Delta r_{ij,t} + \beta_2 \Delta r_{ij,t} \Delta V_{ij,t} + \beta_3 \Delta V_{ij,t} + u_{ij,t} \quad (4)$$

In equation (4), the *relative* variance shock of country j $\left(\Delta V_{ij,t}\right)$ is now defined as a deviation of the country's variance shock V_{jt} $\left(= var(r_{jt}) - \left(\{\sum_{k=1}^{3} var(r_{j,t-k})\}/3\right)\right)$ from the fund average variance shock V_{it} $\left(= \sum_{j=1}^{J} w_{ij,t-1} V_{jt}\right)$.[12] Likewise, $\Delta r_{ij,t}$ $\left(= r_{jt} - r_{it}\right)$ is the excess return of country *j* from the fund average return.

Table 3 reports the estimated coefficients of equation (4). Looking at columns (1) to (3) in Table 3, we first observe that there is a significant and negative relation between the return differential and the change in portfolio share for country *j*; our panel regressions confirm the rebalancing hypothesis with robust empirical evidence in both advanced and emerging host countries. It is interesting to note that the equity holdings in advanced economies respond more negatively to the equity market return shocks than in emerging economies. In general, the risk associated with the equity and currency markets are lower in developed economies than in emerging economies, indicating that the idiosyncratic market risks alone may not fully account for the higher rebalancing coefficient in column (1) than in column (2) in Table 3. This is one of the reasons why we look into the impact of global return in subsection 3.3. Returning to the pooled sample in columns (3) and (4), we see the greater degree of rebalancing in response to a higher variance shock in country *j*'s local equity market, verifying that the rebalancing is motivated by managing the risk of asset returns. One can look at the joint *F*-test between return differential and interaction terms in order to infer the significance of the conditional impact of return differential on the portfolio weight changes for country *j*. Table 3 shows that the *p*-value for the *F*-statistic is below 1%, and we conclude that excess return and interaction terms are jointly significant and informative in explaining the active portfolio reallocation.

[12] Precisely speaking, the relative variance shock included in equation (4) should be based not on the realized variance but on the expected variance which is then to affect a reallocation decision for country weights at time *t*. However, we find that the variance is highly persistent in our monthly data (evidence shown in Figure A1 in Appendix) and use the variance of contemporaneous returns as a proxy for the expected future variance in our empirical analysis.

[Insert Table 3 here]

Estimation results in Table 3 emphasize the portfolio rebalancing as an equity portfolio management strategy and the role of time-varying risk on the rebalancing decision. One thing that is impossible to infer from results in Table 3 is a distinctive role of currency risk or equity risk on portfolio allocation. In fact, those two risk concepts are embedded in our total return variance shock measure. Thus, the following subsection explores the total return variance in greater detail to test the Hau and Rey (2006, 2008)'s foreign exchange risk driven rebalancing hypothesis.

3.2. Is the exchange rate risk the dominant risk factor in rebalancing?

The relative variance shock in the earlier subsection was introduced as a measure of market specific risk. If the risk matters in accounting for a negative relationship between returns and reallocation, what kind of risk is important? Hau and Rey's earlier works (2006, 2008) stress exposure to the foreign exchange risk as a driving force of rebalancing between home and foreign countries. Their argument is as follows: When a foreign country's equity return rises, the foreign share of the fund's portfolio automatically increases due to the valuation effect. This high foreign share brings risk-averse investors into the greater exposure to the foreign exchange risk and induces them to pull out their outperforming assets. By doing so, the investors restore their original portfolio allocation, which reflects their risk preferences.

Since the total return r_{jt} from country j's equity market is a sum of the equity market return evaluated at a local currency and the local currency's appreciation rate against the investor's currency from time $t-1$ to t, we can decompose conditional variance of excess (total) return of country j over home country h as follows:

$$var\left(r_{jt} - r_t^h\right) = var(s_{jt} - s_t^h) + var(e_{jt}) + 2cov\left(s_{jt} - s_t^h, e_{jt}\right) \quad (5)$$

where s_{jt} and e_{jt} are the realized stock and exchange rate returns of country j, respectively. We assume that s_{jt} includes both dividends and stock index changes. The United States is chosen to be a home country for now. There are three factors determining the risk of excess return when

investing in a foreign country over a home country. First, investing in foreign country j is riskier when there exists much fluctuation in return differentials between home and foreign equity markets measured by the relative equity return variance $\left(var(s_{jt} - s_t^h)\right)$. Second, the exchange rate risk $var(e_{jt})$ also contributes to the excess risk of foreign country j investment. Third, the covariance $cov\left(s_{jt} - s_t^h, e_{jt}\right)$ between the stock and exchange rate returns can either amplify or dampen the excess risk of foreign investment depending on its sign. In general, the sign of covariance is negative in markets where the currency return variance constitutes a relatively large share of total return variance (with a couple of exceptions) as displayed in Figure 1. In a symmetric model as in Hau and Rey (2008) where home and foreign equity returns follow exactly the same distribution, the relative equity return variance is set to zero, leaving the variance of exchange rate return as the only source of foreign investment uncertainty. However, as seen from Figure 1, the relative equity return variance is not trivial at all and far exceeds the currency return variance in most countries. Furthermore, we observe the great variation in relative equity return variance across countries and generally lower volatility in equity returns in the advanced economies than emerging economies. However, we do not see such a volatility pattern from the exchange rate returns across countries.

[Insert Figure 1 here]

Although decomposing the variance of total return into equity and exchange rate components is not a difficult task in theory, it is empirically challenging to distinguish between the two without knowing the exact contribution of the common risk. Such decomposition is inevitable to introduce substantial degrees of errors and bias into the linear regression analysis. For this reason, we rely on a sub-sampling approach to test an exchange rate risk driven rebalancing hypothesis. In this exercise, we choose funds that invest in countries which involve the exchange rate risk if different currencies are used between the fund's domicile and investment recipient countries and no such risk otherwise. The best candidate for this exercise is Eurozone funds. To test an exchange risk driven rebalancing hypothesis, we run the following regression to see if the rebalancing coefficient is stronger in the presence of exchange rate risk:

$$\Delta w_{ij,t} = \alpha_{ij} + \beta_1 \Delta r_{ij,t} + \beta_2 \Delta r_{ij,t} \cdot D + u_{ij,t} \quad (6)$$

where $\Delta r_{ij,t}$ is defined as a deviation of country j's total return from fund i's average return $(= r_{jt} - r_{it})$ and D is a binary variable taking the value of unity for host countries that use currencies other than the funds' domicile currencies.

Table 4 shows the estimated coefficients β_1 and β_2 from equation (6). As shown in the results, we verify the rebalancing hypothesis for European fund managers. In fact, the estimated rebalancing coefficient β_1 is very close to the estimation results in columns (3) and (4) of Table 3. This finding makes sense as a large fraction of our EPFR data comes from funds located in the Eurozone area.[13] Next, we examine if the exchange rate risk places an additional rebalancing motive to fund managers. The insignificant coefficient of the interaction term $\Delta r_{ij,t} \cdot D$ reflects that the Eurozone fund managers are not necessarily more sensitive to the currency risk. The currency risk may be hedged elsewhere already and therefore it may not serve as a risk factor in portfolio reallocation decisions. Therefore, we find no definitive evidence that rebalancing is driven by the motive of managing foreign exchange exposure as stressed in Hau and Rey (2006, 2008).[14] In other words, the underlying equity market risk rather than currency risk may be a driving force of risk rebalancing of international fund managers. These results are broadly consistent with the earlier empirical findings of Gyntelberg et al. (2014) and Ülkü and Karpova (2014) in that expected exchange rate fluctuations are not the main cause of portfolio reallocation decisions and the underlying asset market risk may play a bigger role.

[Insert Table 4 here]

3.3. Correlation with the global market and its impact on rebalancing

One empirical challenge to address the risk-rebalancing hypothesis comes from the fact that the global equity market integration may obscure the exact identification of the cross-country return differentials and their effect on the foreign investors' portfolio allocation. In fact, the results in Table 3 show that the estimated rebalancing coefficient associated with the excess equity return in advanced economies is larger in absolute value than in emerging economies,

[13] In our sample, 351 out of 799 funds are domiciled in the Eurozone area such as Germany and France.
[14] We also find consistent evidence (significant rebalancing coefficient β_1 and insignificant β_2 from equation (6)) using US funds whose international portfolio includes a rigid US dollar peg country, Hong Kong. Results are available upon request.

while the risk levels in local equity and currency markets are generally much lower in advanced markets. This suggests that the idiosyncratic market risk alone cannot explain the international fund managers' portfolio shifting decisions. Hence, in this subsection, we explore the new possibility for the global risk as an important source of portfolio risk and its effect on portfolio allocations.

As a preliminary step to understand whether the rebalancing coefficient is related with the global risk, we first estimate the time-varying rebalancing coefficients by a rolling regression with a window size of 12 months over the sample period.[15] The patterns observed in Figure 2 reflect that the lower the global equity market risk, the less likely the international investors engage in active portfolio rebalancing behavior.[16]

[Insert Figure 2 here]

Next, in order to investigate the heterogeneous effect of correlation with the global return on the host country's market risk, we partition host countries in our sample into 3 groups according to their strength of correlation with the global equity return (MSCI world return). More specifically, country group dummy variables are created in the following way: Group 1 (G_{1t}) includes countries whose equity markets are most strongly correlated (top 33%) with the global market while group 3 (G_{3t}) includes countries with the least correlation (bottom 67-100%). Thus, group 2 (G_{2t}) includes countries with the moderate correlation (34-66%) with the global return. Return correlations are calculated recursively using monthly data from January, 1998 with initial time coverage of 12 months and a wider range thereafter. In other words, whether a country is classified as G_{it} for $i = 1, 2, 3$ at time t is determined by a recursive correlation up to time t. Because this return correlation often changes for each country, country lists in each group

[15] Given that the U.S. equity market is the largest in the world and has significant spillover effect on other countries, we use the VIX index as a proxy for the world equity market uncertainty. The VIX index is a measure of the implied volatility of S&P 500 index options and better serves as a measure of the expected risk. On the other hand, the variance of MSCI world return is a measure of the realized volatility of the global return. Both implied and realized volatility measures tend to move closely together. See Figure A2 in Appendix.

[16] One concern that arises in a rolling-window regression in Figure 2 is that the number of funds included in each window may change over the sample period, which may cause an inference issue by observing estimation results from an unstable sample. We also run a rolling-window regression with a balanced panel including 121 funds and find a very close co-movement of rebalancing coefficient estimates from the unbalanced panel (full-sample) and balanced panel. See Figure A3 in Appendix.

vary over time and thus we keep time subscripts for dummy variable G's. We address the impact of correlation with the global market on portfolio rebalancing by running specification (7):

$$\Delta w_{ij,t} = \alpha_{ij} + \left(\beta_1 + \beta_2 X_t + \sum_{k=1}^{3} \beta_{2+k} G_{kt}\right) \Delta r_{ij,t} + \beta_6 X_t + \sum_{k=1}^{3} \beta_{6+k} G_{kt} + u_{ij,t} \quad (7)$$

where α_{ij} controls fund-country fixed effects; X_t is the global risk measured by the variance of MSCI world returns; and G_{1t}, G_{2t} and G_{3t} are time-varying country group dummy variables defined above. Our primary interest centers on the coefficient β_1 which measures how strongly, on average, international investors respond to country j's excess equity market returns and on the coefficients β_3, β_4 and β_5 that measure the additional degree of rebalancing conditional on the excess return for groups 1, 2, and 3, respectively.

Table 5 shows a clear difference in the degree of rebalancing across groups. As displayed in columns (1)-(2) in Table 5, conditional on the excess return, global uncertainty X_t makes the degree of rebalancing larger on average, consistent with time-series evidence in Figure 2. Moreover, countries have heterogeneous exposures to global equity market conditions and we find that the degree of rebalancing is greater for a group of countries whose equity return moves more closely with the global return. We reach this conclusion by combining coefficient estimates of excess return and interaction terms for each group. Indeed, countries included in group 1 (G_{1t}) are mostly advanced markets such as Australia, Canada, Germany, the United Kingdom, and the United States. And, fund managers in our sample, majority of which reside in advanced economies, perceive a strong stock market correlation of their own with the global market as an additional source of risk. This covariance risk puts pressure on the funds' portfolio allocation and leads to a more sensitive rebalancing action. One of the reasons for this finding may be that the return changes in advanced markets are strongly associated with the global factors that are easy to access and evaluate compared to the country-specific factors.

[Insert Table 5 here]

On the other hand, markets around the world tend to fall altogether during the global crisis which may also work as a common shock to every country. To control for the potentially

unusual market movements worldwide during the peak of recent global crisis, we include crisis dummy variables between January, 2008 and December, 2009 in our alternative specifications.[17] Robust results with controlling crisis dummies are presented in columns (3) and (4) in Table 5, where we see little change from the results without crisis controls. In contrast to the previous regression, the global risk (X_t) is now statistically significant and the negative sign implies that fund managers lower their portfolio holdings when the level of global uncertainly is high. Moreover, we do a robustness check for the results in Table 5 by partitioning our sample countries into 4 groups instead of 3 groups. A further segmentation does not alter the main conclusion as demonstrated by the results in Table A2 in Appendix.[18]

In this subsection, we show that how strongly fund managers reallocate away from a country's equity market depends on the correlation between the local market return and the global return. This result complements the existing literature emphasizing that global common (or push) factors are partly responsible for cross-border capital flows (Cerutti et al., 2014; Forbes and Warnock, 2012; Fratzscher, 2012). Lastly, the intuition behind our empirical result is that equity markets that are more sensitive to global market conditions are considered riskier due to reduced diversification benefits of the fund managers, a majority of which are located in advanced countries.

4. Theoretical interpretation of empirical results

In this section, we present a minimal model to explore the theoretical implication of the effect of a country's equity market correlation with the global market on the optimal asset allocation decision. In our mean-variance portfolio balance model, a representative fund manager holds equity mutual funds that are invested in multiple countries with uncertain returns.[19]

[17] The exact start and end dates of the recent crisis may be controversial. In our analysis, we consider the years 2008- 2009 because we observe excessive volatility in equity returns during that period.

[18] One could have used equity returns instead of total returns as an explanatory variable in regression model (7). We would get the similar results because indirect evidence in Figure A4 in Appendix shows that correlation of total return with the global equity market comes mostly from the correlated equity markets other than correlated currency markets.

[19] The model can be applied to a case when both equities and bonds are available as an asset class. Since our empirical procedure is based on the equity funds data, we assume that fund managers invest only in risky securities.

4.1. Optimal portfolio weight determination

We assume that fund managers are risk-averse mean-variance investors whose utility function takes the following quadratic form:

$$\max_{w} L = \boldsymbol{w}'E[\boldsymbol{r}] - \frac{\lambda}{2}\boldsymbol{w}'\boldsymbol{\Sigma}\boldsymbol{w} \quad \text{s.t. } \boldsymbol{w}'\boldsymbol{I} = 1 \tag{8}$$

where $\boldsymbol{w}$ is a ($J \times 1$) vector of country weight where w_j is the j^{th} element, $E[\cdot]$ is the standard expectation operator, $\boldsymbol{r}$ is a ($J \times 1$) vector of country asset returns in an investor's currency, λ is the coefficient of risk aversion, $\boldsymbol{\Sigma}$ is the covariance matrix of expected asset returns, and $\boldsymbol{I}$ is a unity column vector.[20] The constraint means all wealth is allocated in risky securities of J countries. Setting up the Lagrangian and solving the corresponding first-order conditions, the optimal portfolio weight for country j, which represents the investor's optimal allocation of wealth to each of J risky assets, is as follows:

$$w_j = \frac{E[r_j] - E[r_{-j}] + \lambda\{var(r_{-j}) - cov(r_j, r_{-j})\}}{\lambda\{var(r_j) + var(r_{-j}) - 2cov(r_j, r_{-j})\}} \tag{9}$$

where we denote by r_{-j} the weighted average of returns of all other countries in the fund's portfolio other than country j. Equation (9) implies that the optimal portfolio weight of country j increases when its return is expected to be higher than the average return of other countries or its equity market is expected to involve less risk, given other things constant. By linking our empirical results in favor of portfolio rebalancing (i.e., excess return coefficient $\beta_1 < 0$) in section 3 with equation (9), we postulate that the dominating channel for the portfolio reallocation between countries j and $-j$ conditional on the excess return realization is through the variance (or risk) effect rather than the return effect. In other words, higher expected variance of country j's equity return induces the risk-averse fund manager to lower her portfolio weight of

[20] λ is originally from a CARA (constant absolute risk aversion) utility function.

the country whose equity market performs better than the average of other countries in her portfolio to restore the original portfolio allocation.

4.2. Global factor in equity returns

We now assume that country j's total return (r_j) is driven by the global common factor (G), country-specific factor (X_j) and a shock to the country j's equity return (ε_j) that is not explained by G and X_j as follows:

$$r_j = a_j G + b_j X_j + \varepsilon_j \tag{10}$$

where parameters a_j and b_j capture country j's return correlation with the global factor and country-specific factor, respectively. We exclude time subscripts for a notational convenience. Equation (10) attempts to capture that total return r_j is correlated across countries due to the common factor G that has a worldwide impact. We also assume that ε_j is an idiosyncratic shock and uncorrelated among each other. In order for the variable G to fully capture the common factor across countries, X_j is assumed to be uncorrelated across countries as well. Note that since the total return is a combination of equity and currency returns, the global factor may have a common effect on equity or currency market (or both markets) across countries. Nevertheless, we do not separate the total return into those two returns in this section to keep our expressions simple.[21]

4.3. Effect of return correlation with the global market on portfolio allocation

If all countries are equally sensitive to a global return shock (i.e., $a_j = a \ \forall j$), equation (9) is reduced to

[21] One may ask what is a dominating channel through which global factor G influences the country's total return. Empirical evidence is hard to obtain because of the absence of global index for currencies. Nevertheless, we conjecture that it is mainly through the equity return because, on average, about 90 percent of the correlation between a country's total return and global return is explained by the correlation between the underlying equity market return and global return. See Table A3 in Appendix for detail statistics.

$$\left(w_j | a_j = a \ \forall j\right) = \frac{E\left[C_j - C_{-j}\right] + \lambda var(C_{-j})}{\lambda\left\{var\left(C_j\right) + var(C_{-j})\right\}} \tag{11}$$

where $C_j = b_j X_j + \ \varepsilon_j$ from equation (10), which is a pure country-specific component of equity return; and $-j$ refers to the weighted average of all other countries in the fund's portfolio other than country j.

In practice, local equity returns are highly correlated with the global return and the size of this correlation varies across countries as reported in Table A3 in Appendix. To reflect this observation in our model, we now allow different sensitivity (a_j) to the global common factor across countries. Then, equation (9) becomes

$$\left(w_j | a_j \neq a_{-j}\right) = \frac{\left(a_j - a_{-j}\right)E[G] + E\left[C_j - C_{-j}\right] + \lambda\left\{a_{-j}\left(a_{-j} - a_j\right)var(G) + var(C_{-j})\right\}}{\lambda\left\{\left(a_j - a_{-j}\right)^2 var(G) + var\left(C_j\right) + var(C_{-j})\right\}} \tag{12}$$

Equation (12) shows that the optimal portfolio allocation also depends on the degree of a country's return correlation with the global factor. Suppose county j's return is more sensitive to the global factor than that of other countries included in the fund's portfolio, that is, $a_j > a_{-j} > 0$. Since $a_j > a_{-j}$, global uncertainty $var(G)$ has a stronger negative effect on the optimal weight for country j due to the negative term, $a_{-j}\left(a_{-j} - a_j\right)var(G)$, in the numerator. On the other hand, $\left(a_j - a_{-j}\right)^2 var(G)$ in the denominator does not influence the reallocation between countries j and $-j$ because it would also appear in country $-j$'s optimal weight with exactly the same magnitude and the same sign.[22]

Our simple model shows that the global common factor generates heterogeneous effect on the portfolio reallocation across countries depending on the host country's equity market sensitivity to the global return shocks. In particular, a fund manager has an incentive to reallocate further away from a country whose equity market exhibits a stronger co-movement with the global market. This theory view is consistent with our empirical results presented in section 3.

[22] We focus on the variance channel here because, as mentioned earlier, the risk rebalancing requires the variance effect outweigh the return effect in making a portfolio allocation decision.

5. Conclusion

The main purpose of this paper is to provide a finer understanding of international equity fund managers' portfolio management and the motive behind their actions. To this end, we examine the impact of time-varying country-specific stock market risks and the underlying equity market return's correlation with the world market on portfolio reallocation decisions using the fund-level equity portfolio allocation data covering a large number of countries. Our empirical results confirm risk-rebalancing behavior of international equity fund managers and demonstrate the importance of the underlying equity market risk, rather than exchange rate risk, as a main motive of portfolio rebalancing behavior. In addition, global fund managers tend to have the higher degree of rebalancing in equity markets that are more strongly correlated with the global market. Taken together, these results suggest the need to look into both the local equity market risk and covariance risk arising from the underlying market's correlation with the global market to understand the motive behind mutual funds' portfolio allocations.

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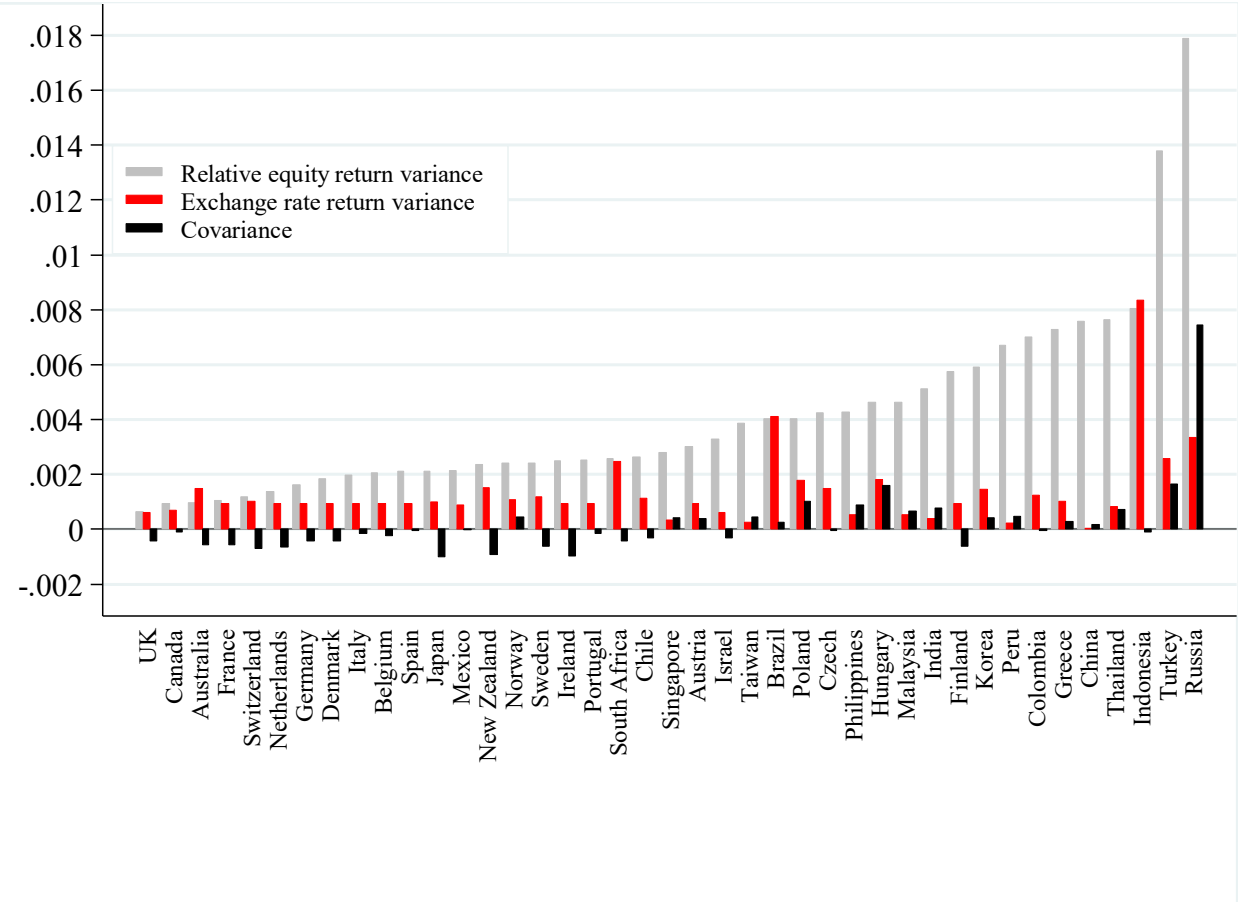
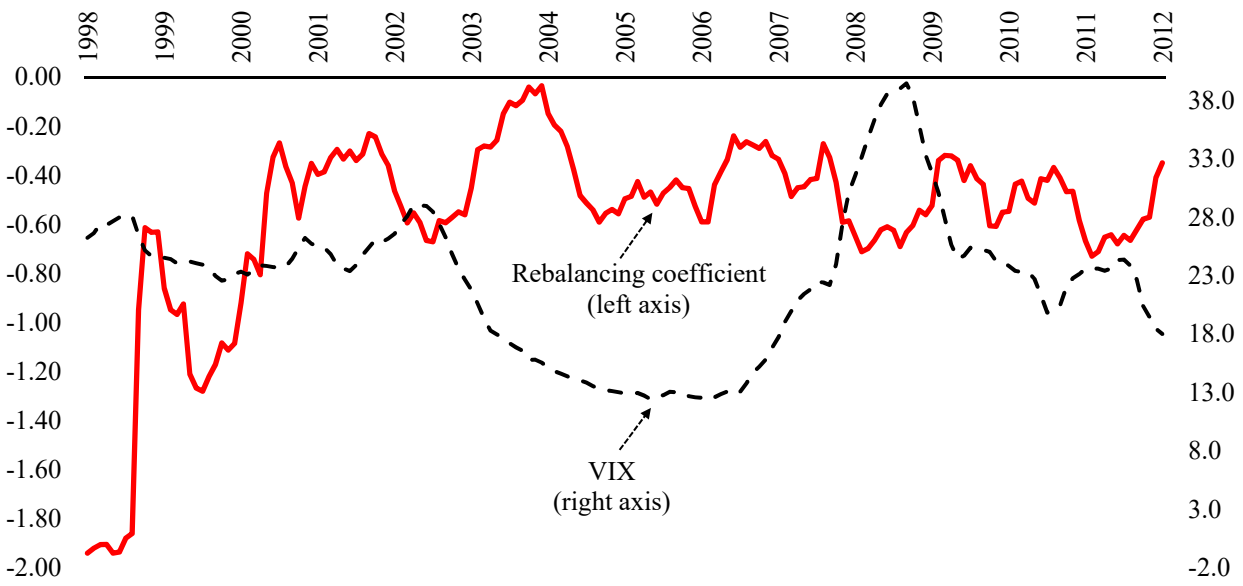
Figure 1. Variance of equity and currency returns and their covariance, 1998-2012



Note: Exchange rate is defined as the value of local currency against the U.S. dollar. Covariance for all countries in the graph is multiplied by two to illustrate its actual contribution to the overall variance. Sample period covers from 1998 to 2012.

Figure 2. Degree of rebalancing and global risk indicator



Note: Rebalancing coefficients (β_1) are estimated from a rolling regression ($\Delta w_{ij,t} = \alpha_{ij} + \beta_1 \Delta r_{ij,t} + u_{ij,t}$) with a window size of 12 months. For example, the estimate as of Jan. 2005 includes the data from Jan. 2005 to Dec. 2005. Accordingly, the VIX index is measured as a 12 month moving average and normalized using the sample average.

Table 1. Number of equity mutual funds and total net assets by target region, 1998-2012

Target region	# of funds	Total net assets in Dec., 2012
Asia excluding Japan	142	72
BRIC	15	10
Emerging Europe, Middle East, Africa	98	14
Europe	139	74
Global	160	226
Global Emerging	153	196
Latin America	58	22
Pacific	34	10
Total	799	624 billion US dollars

Source: Emerging Portfolio Fund Research; Note: Europe, Global and Pacific include both developed and emerging markets while all other regions include emerging markets only. Europe funds invest most of their assets in Germany and U.K., Global funds mostly in the U.S., U.K., Japan and Germany, Global Emerging funds mostly in Brazil, China, India, and Russia, Latin America funds mostly in Brazil, and Pacific funds mostly in Japan, China, and India.

Table 2. Investment host countries in our sample

Region	Developed markets	Emerging markets
Americas	Canada, United States	Brazil, Chile, Colombia, Mexico, Peru
Europe, Middle East & Africa	Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Israel, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom	Czech Republic, Greece, Hungary, Poland, Russia, South Africa, Turkey
Asia & Pacific	Australia, Hong Kong, Japan, New Zealand, Singapore	China, India, Indonesia, Korea, Malaysia, Philippines, Taiwan, Thailand

Note: Countries are sorted based on the 2015 MSCI (Morgan Stanley Capital International) market classification.

Table 3. Time varying variance shock and rebalancing

	Advanced countries	Emerging markets	All countries (full sample)	
Dependent variable: $\Delta w_{ij,t}$	(1)	(2)	(3)	(4)
$\Delta r_{ij,t}$	-0.88***	-0.55***	-0.62***	-0.61***
	(0.041)	(0.021)	(0.019)	(0.019)
$\Delta r_{ij,t} \times \Delta V_{ij,t}$				-1.96***
				(0.165)
$\Delta V_{ij,t}$				-0.14***
				(0.032)
F-statistics				632.95***
Observations	229,107	333,494	562,601	559,151

Note: $\Delta r_{ij,t}$ is defined as a deviation of country *j*'s total return from fund *i*'s average return $(= r_{jt} - r_{it})$ and the relative variance shock $\Delta V_{ij,t}$ is defined as a deviation of country *j*'s variance shock $V_{jt}\left(= var(r_{jt}) - \left(\{\sum_{k=1}^{3} var(r_{j,t-k})\}/3\right)\right)$ from the fund average variance shock V_{it} $\left(= \sum_{j=1}^{J} w_{ij,t-1} V_{jt}\right)$. All specifications include fund-country fixed effects. Newey-West standard errors are reported in parentheses. *F*-statistic and its significance level are reported to test the joint significance of coefficients for $\Delta r_{ij,t}$ and interaction terms. *** indicates statistical significance at the 1% level.

Table 4. Rebalancing coefficients for Eurozone funds

Dependent variable: $\Delta w_{ij,t}$	Eurozone funds' allocation
$\Delta r_{ij,t}$	-0.61***
	(0.207)
$\Delta r_{ij,t} \cdot D$	-0.01
	(0.248)
F-statistics	14.17***
Observations	26,803

Note: $\Delta r_{ij,t}$ is defined as a deviation of country j's total return from fund i's average return ($= r_{jt} - r_{it}$) and D is a binary variable taking the value of unity for non-Eurozone host countries. Eurozone host countries include Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Portugal and Spain. Fund-country fixed effect is included. Newey-West standard errors are reported in parentheses. *** indicates statistical significance at the 1% level.

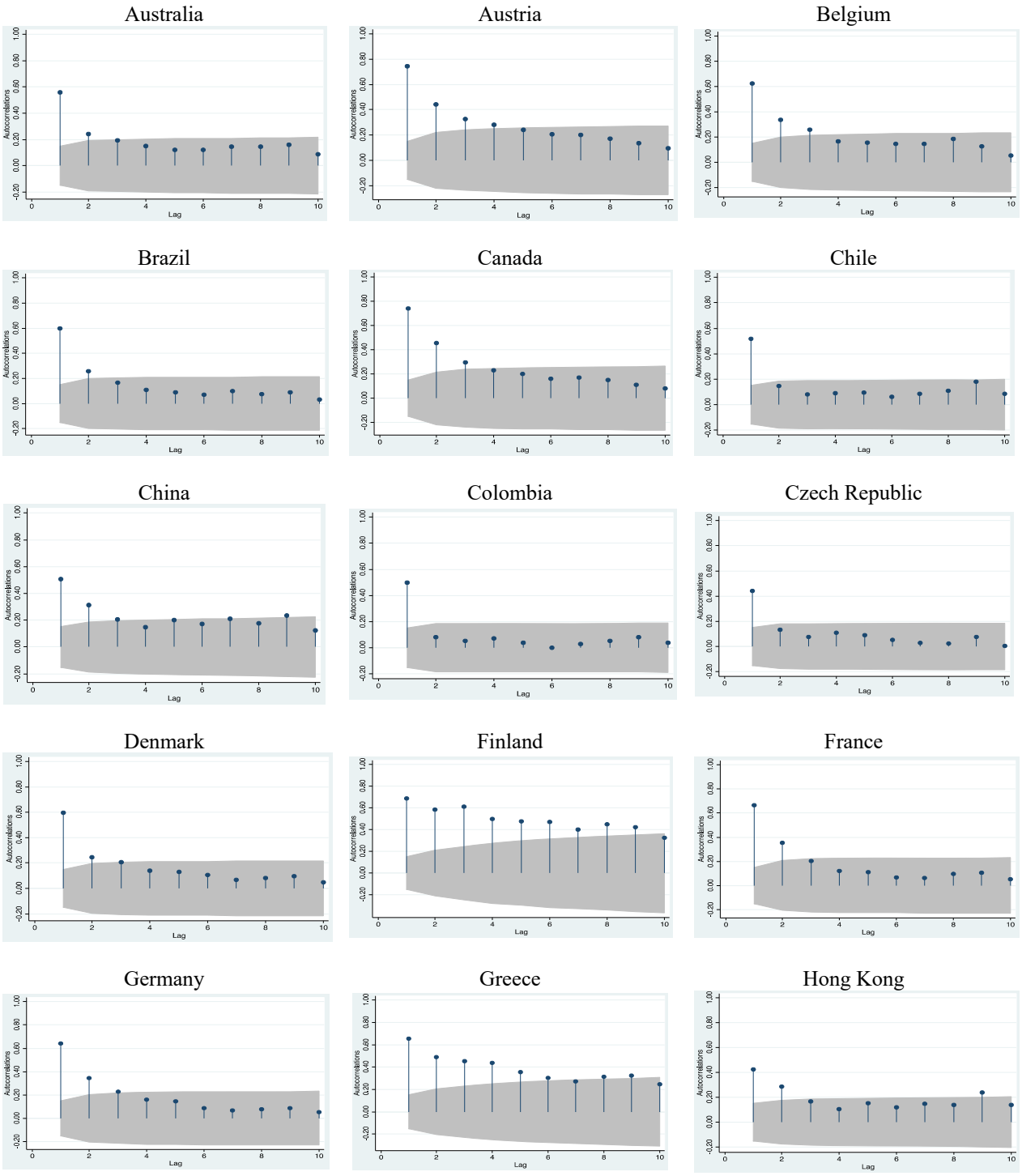
Table 5. Global risk and rebalancing

Dependent variable: $\Delta w_{ij,t}$	(1)	(2)	(3)	(4)
$\Delta r_{ij,t}$	-2.37***	-2.27***	-2.37***	-2.28***
	(0.084)	(0.084)	(0.084)	(0.084)
$\Delta r_{ij,t} \cdot X_t$		-2.64***		-2.67***
		(0.550)		(0.600)
$\Delta r_{ij,t} \cdot G_{1t}$	1.41***	1.37***	1.43***	1.37***
	(0.097)	(0.098)	(0.098)	(0.098)
$\Delta r_{ij,t} \cdot G_{2t}$	1.66***	1.61***	1.66***	1.61***
	(0.089)	(0.089)	(0.089)	(0.089)
$\Delta r_{ij,t} \cdot G_{3t}$	2.12***	2.08***	2.13***	2.08***
	(0.088)	(0.054)	(0.088)	(0.088)
X_t		0.09		-0.66***
		(0.060)		(0.142)
G_{1t}		-0.15***		-0.15***
		(0.014)		(0.014)
G_{2t}		-0.14***		-0.14***
		(0.014)		(0.014)
G_{3t}		-0.11***		-0.11***
		(0.014)		(0.014)
Crisis dummies	No	No	Yes	Yes
F-statistics	444.60***	349.02***	433.20***	350.25***
Observations	562,601	562,601	562,601	562,601

Note: $\Delta r_{ij,t}(= r_{jt} - r_{it})$ is country *j*'s excess equity market return over fund *i*'s portfolio average return. X_t measures variance of MSCI world returns. Groups are classified by the degree of correlation of local equity market with the global market. Correlations are calculated recursively using monthly data from January, 1998 with initial time coverage of 12 months and a wider range thereafter. Dummy variable $G_{1t} = 1$ for top 33% countries whose equity markets show the strongest correlation with the global market; $G_{2t} = 1$ for countries whose correlation with the global market ranges between 34 and 66%; and $G_{3t} = 1$ for bottom 67-100% countries whose equity markets are least correlated with the global market. Crisis time dummies control the peak of recent global crisis periods between January, 2008 and December, 2009. All specifications include fund-country fixed effects. Newey-West standard errors are reported in parentheses. *** indicates statistical significance at the 1% level.

Appendix

Figure A1: Autocorrelations of monthly variance of contemporaneous returns[23]



[23] Daily MSCI indexes (in U.S. dollars) from 2000 to 2013 are used to calculate the monthly variance in each market. 95% confidence bands are obtained from the Bartlett's formula for MA(q) processes.

Figure A1 (continued): Autocorrelations of monthly variance of contemporaneous returns

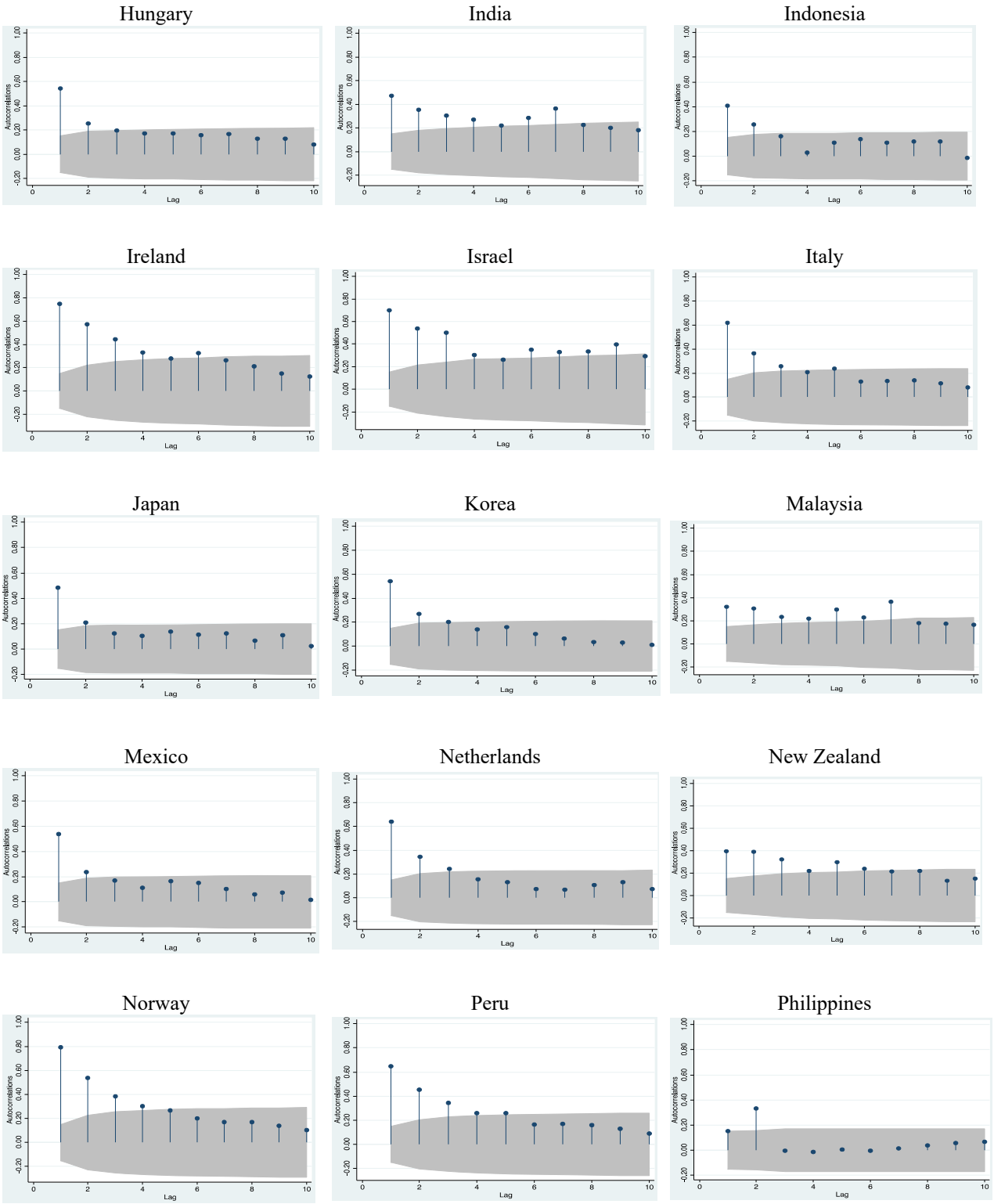
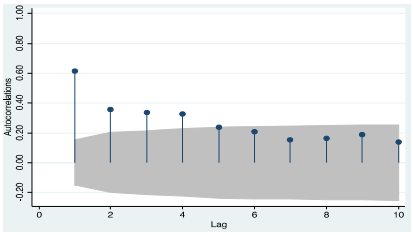
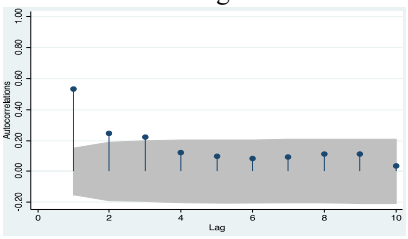


Figure A1 (continued): Autocorrelations of monthly variance of contemporaneous returns

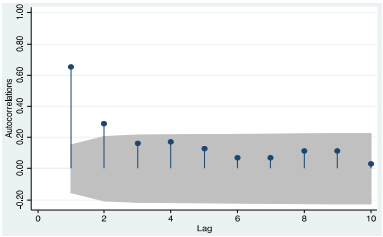
Poland



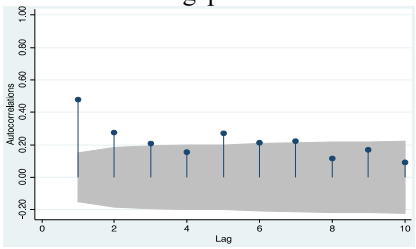
Portugal



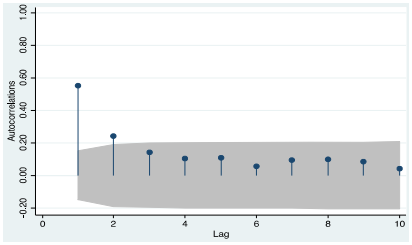
Russia



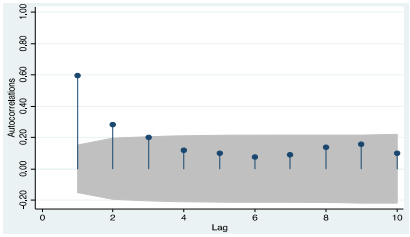
Singapore



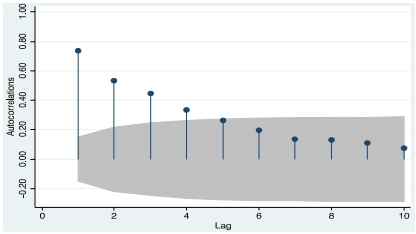
South Africa



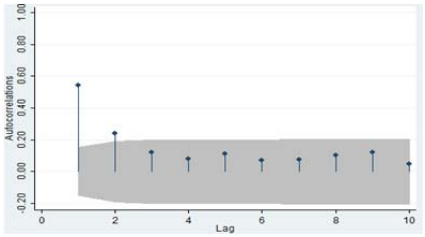
Spain



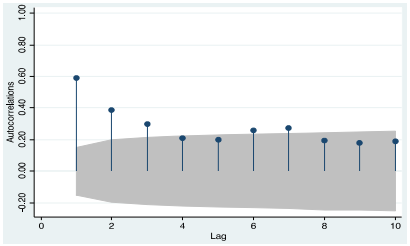
Sweden



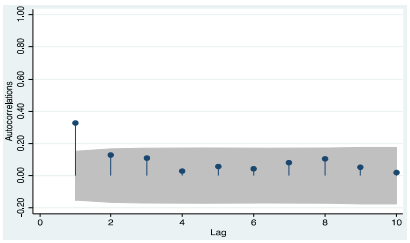
Switzerland



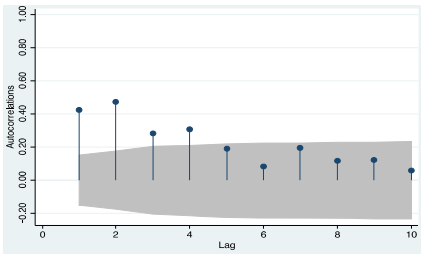
Taiwan



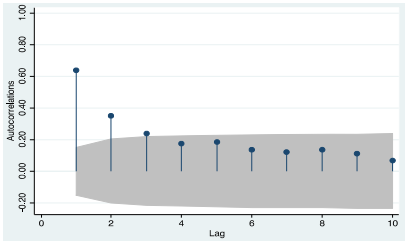
Thailand



Turkey



United Kingdom



United States

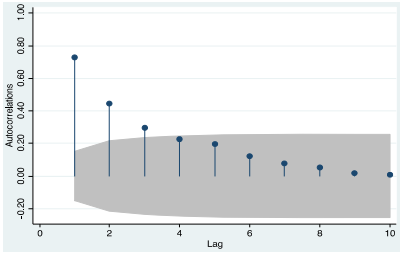
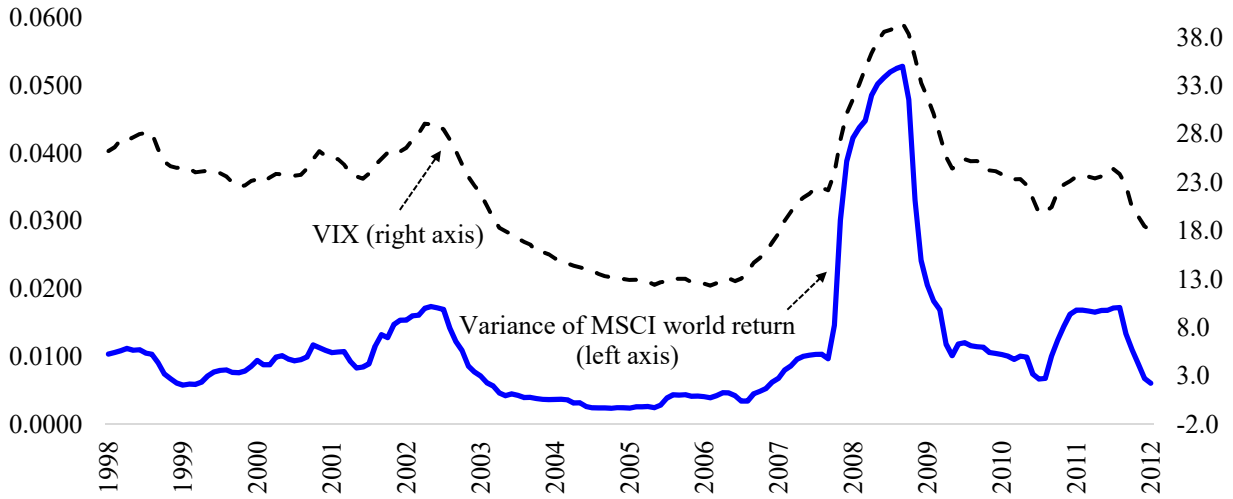


Figure A2: VIX index and variance of MSCI world return



Note: The VIX index (measured on the right axis) is an original series in a 12 month moving average and the variance of MSCI world return (measured on the left axis) is rescaled by multiplying the original series by 100 before taking a moving average.

Figure A3: Rolling-window rebalancing coefficients from unbalanced vs. balanced panel

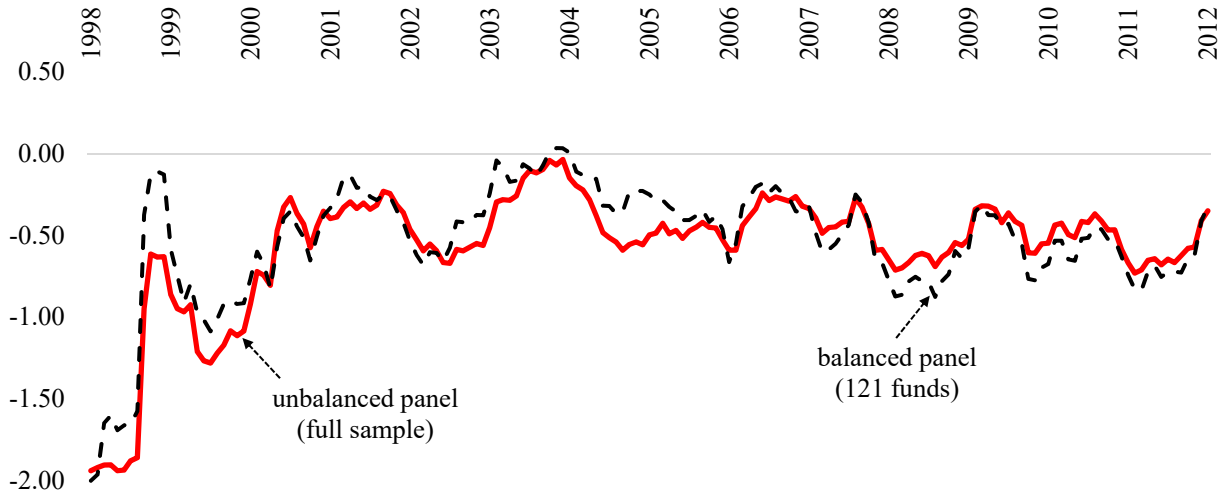
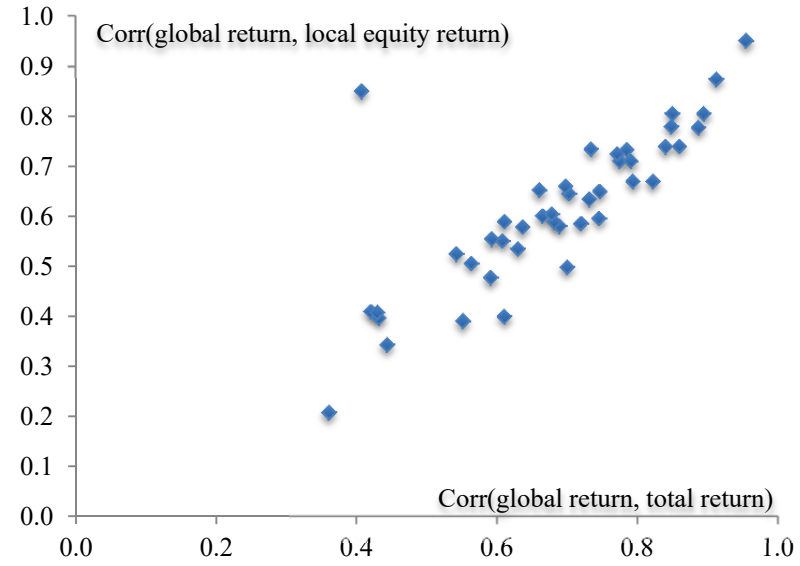


Figure A4. Strong correlation between global and local equity returns



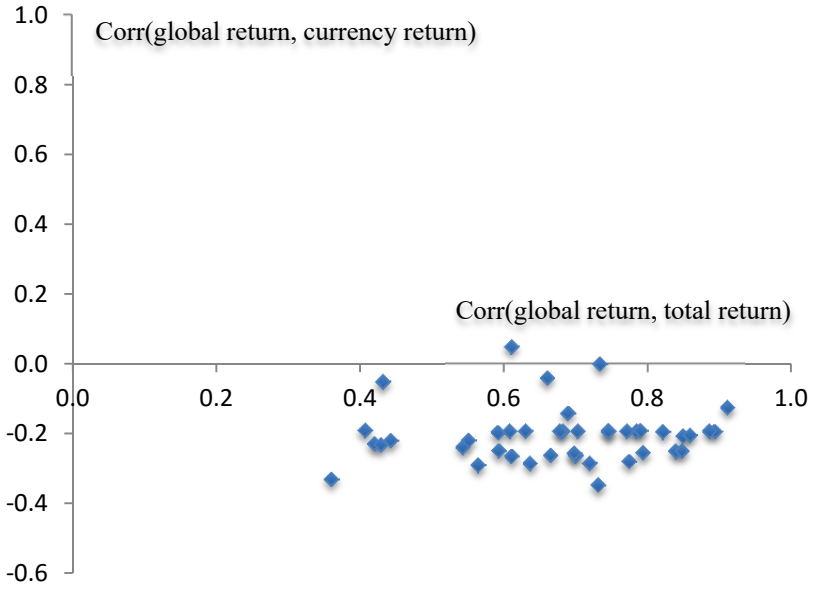


Table A1. AR(1) coefficient for total returns

Developed economies		Emerging economies	
Country	Coefficient (SE)	Country	Coefficient (SE)
Australia	0.116 (0.075)	Brazil	-0.007 (0.077)
Austria	0.321*** (0.071)	Chile	-0.006 (0.075)
Belgium	0.321*** (0.07)	China	0.074 (0.073)
Canada	0.228*** (0.073)	Colombia	0.150** (0.074)
Denmark	0.092 (0.075)	Czech Republic	0.041 (0.075)
Finland	0.206*** (0.074)	Greece	0.147* (0.072)
France	0.159** (0.074)	Hungary	0.126* (0.075)
Germany	0.111 (0.075)	India	0.114 (0.074)
Hong Kong	0.180** (0.073)	Indonesia	0.163** (0.073)
Ireland	0.229*** (0.073)	Korea	0.092 (0.072)
Israel	0.038 (0.075)	Malaysia	0.223*** (0.074)
Italy	0.042 (0.075)	Mexico	-0.021 (0.074)
Japan	0.239*** (0.073)	Peru	-0.065 (0.075)
Netherlands	0.148** (0.074)	Philippines	0.139* (0.074)
New Zealand	-0.073 (0.075)	Poland	-0.052 (0.076)
Norway	0.159** (0.074)	Russia	0.194*** (0.073)
Portugal	0.128* (0.074)	South Africa	-0.035 (0.076)
Singapore	0.1 (0.073)	Taiwan	0.058 (0.075)
Spain	0.081 (0.075)	Thailand	0.053 (0.072)
Sweden	0.082 (0.075)	Turkey	-0.148** (0.075)
Switzerland	0.238*** (0.072)		
United Kingdom	0.07 (0.074)		
United States	0.149** (0.075)		

Note: Monthly returns considered over the period 1998-2012 are total returns from equity holdings in a host country evaluated in an investor currency. Newey-West standard errors are reported in parentheses. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table A2. Global risk and rebalancing: four group approach

Model: $\Delta w_{ij,t} = \alpha_{ij} + \left(\beta_1 + \beta_2 X_t + \sum_{k=1}^{4} \beta_{2+k} G_{kt}\right) \Delta r_{ij,t} + \beta_7 X_t + \sum_{k=1}^{4} \beta_{7+k} G_{kt} + u_{ij,t}$

Dependent variable: $\Delta w_{ij,t}$	(1)	(2)	(3)	(4)
$\Delta r_{ij,t}$	-2.37***	-2.28***	-2.37***	-2.28***
	(0.084)	(0.084)	(0.084)	(0.084)
$\Delta r_{ij,t} \cdot X_t$		-2.56***		-2.53***
		(0.551)		(0.602)
$\Delta r_{ij,t} \cdot G_{1t}$	1.15***	1.11***	1.16***	1.11***
	(0.108)	(0.109)	(0.109)	(0.109)
$\Delta r_{ij,t} \cdot G_{2t}$	1.54***	1.52***	1.56***	1.51***
	(0.093)	(0.094)	(0.094)	(0.094)
$\Delta r_{ij,t} \cdot G_{3t}$	1.80***	1.75***	1.80***	1.74***
	(0.090)	(0.090)	(0.090)	(0.090)
$\Delta r_{ij,t} \cdot G_{4t}$	2.19***	2.15***	2.20***	2.16***
	(0.089)	(0.090)	(0.090)	(0.090)
X_t		0.08		-0.67***
		(0.060)		(0.142)
G_{1t}		-0.15***		-0.15***
		(0.016)		(0.016)
G_{2t}		-0.13***		-0.14***
		(0.014)		(0.014)
G_{3t}		-0.13***		-0.13***
		(0.014)		(0.014)
G_{4t}		-0.12***		-0.12***
		(0.014)		(0.014)
Crisis dummies	No	No	Yes	Yes
F-statistics	452.95***	353.97***	442.56***	355.65***
Observations	562,601	562,601	562,601	562,601

Note: $\Delta r_{ij,t} (= r_{jt} - r_{it})$ is country *j*'s excess equity market return over fund *i*'s portfolio average return. X_t measures variance of MSCI world returns. Groups are classified by the degree of correlation of local equity market with the global market. Correlations are calculated recursively using the monthly data from January, 1998 with initial time coverage of 12 months and a wider range thereafter. Dummy variable $G_{1t} = 1$ for top 25% countries whose equity markets show the strongest correlation with the global market; $G_{2t} = 1$ for upper 26-50% countries; $G_{3t} = 1$ for 51-75% countries; and $G_{4t} = 1$ for bottom 76-100% countries whose equity markets are least correlated with the global market. Crisis time dummies control for the peak of recent global crisis periods between January, 2008 and December, 2009. All specifications include fund-country fixed effects. Newey-West standard errors are reported in parentheses. *** indicates statistical significance at the 1% level.

Table A3. Correlations with the global equity return

Country	Local equity return and global return (1)	Total return and global return (2)	Ratio of (1) to (2) (3)
Australia	0.788	0.881	0.894
Austria	0.762	0.802	0.950
Belgium	0.733	0.812	0.903
Brazil	0.747	0.794	0.941
Canada	0.820	0.873	0.939
Chile	0.531	0.693	0.766
China	0.707	0.718	0.985
Colombia	0.350	0.526	0.665
Czech Republic	0.544	0.669	0.813
Denmark	0.713	0.851	0.838
Finland	0.621	0.725	0.857
France	0.866	0.922	0.939
Germany	0.828	0.910	0.910
Greece	0.634	0.697	0.910
Hong Kong	0.783	0.782	1.001
Hungary	0.717	0.765	0.937
India	0.644	0.684	0.942
Indonesia	0.564	0.586	0.962
Ireland	0.622	0.772	0.806
Israel	0.520	0.630	0.825
Italy	0.781	0.846	0.923
Japan	0.679	0.701	0.969
Korea	0.675	0.784	0.861
Malaysia	0.456	0.553	0.825
Mexico	0.739	0.841	0.879
Netherlands	0.809	0.914	0.885
New Zealand	0.492	0.722	0.681
Norway	0.827	0.860	0.962
Peru	0.533	0.567	0.940
Philippines	0.484	0.514	0.942
Poland	0.675	0.774	0.872
Portugal	0.664	0.748	0.888
Russia	0.679	0.715	0.950
Singapore	0.756	0.789	0.958
South Africa	0.638	0.766	0.833
Spain	0.767	0.817	0.939
Sweden	0.740	0.872	0.849
Switzerland	0.750	0.830	0.904
Taiwan	0.631	0.666	0.947
Thailand	0.617	0.628	0.982
Turkey	0.534	0.637	0.838
United Kingdom	0.884	0.930	0.951
United States	0.959	0.961	0.998
Average	0.681	0.756	0.897

Note: Column (1) measures a correlation between the local equity return and global return. Column (2) measures the correlation between the total return and global return where the total return refers to a combination of the local equity return and currency return (change in the value of local currency against the US dollar). Reported correlations are calculated from the monthly returns between 1998 and 2012.