Preferential Treatment in the Sovereign Debt Market: Evidence from Bond Mutual Funds *

Nathan Converse† **Enrico Mallucci**‡

February 15, 2019

Abstract

How does sovereign risk affect investors' behavior? We answer this question analyzing a novel database that combines sovereign default probabilities for 27 advanced and emerging economies with monthly data on the portfolios of bond mutual funds. We find that investors' response to sovereign risk is highly heterogeneous, with some countries receiving preferential treatment. When default risk increases fund managers reduce their exposure to emerging markets, high-debt countries, high-risk countries. However, fund managers do not significantly alter their exposures to advanced economies, low-debt countries, and low-risk countries when default risk increases in those countries. Additionally, we find evidence that international mutual funds contribute to cross-country contagion. Fund managers rebalance their portfolios away from risky countries and toward low-risk advanced economies when default risk increases in other countries in their portfolio. These findings are in stark contrast with the predictions of standard sovereign default model that assume risk-neutral investors with deep pockets.

JEL classification: F3, F32, F36, G1, G11, G15, G2, G23.

Keywords: Capital Flows, Sovereign Risk, Mutual Funds.

*The views in this paper are solely the responsibility of the authors and should not be interpreted as representing the views of the Board of Governors of the Federal Reserve System or any other person associated with the Federal Reserve System. We would like to thank Sebnem Kalemli-Ozcan, Matteo Maggiori, and Wenxin Du for their very helpful feedback, as well as seminar participants in the International Finance Division of the Federal Reserve Board.

†Board of Governors of the Federal Reserve System

‡Board of Governors of the Federal Reserve System, Washington, D.C. 20551 U.S.A.. E-mail: enrico.mallucci@frb.gov.

1 Introduction

How do investors respond to changes in sovereign risk? Surprisingly this basic and fundamental question has received relatively little attention.[1] In this paper, we analyze investors' responses to sovereign risk by constructing a new database of sovereign default probabilities extracted from CDS contracts and then combining this information with micro-level data on the portfolio allocations of international bond mutual funds at the monthly frequency.[2] The extensive country coverage and high frequency of our CDS dataset along with the the granularity of our mutual fund data enables us to build a more detailed picture of investors' response to sovereign risk than has previously been available. While we find that portfolio allocations do vary with sovereign risk for many countries, we also find evidence that advanced economies enjoy preferential treatment in the bond market. Specifically, advanced economies' weights in the portfolios of bond mutual funds is little affected by sovereign risk.

We use our novel dataset to address two basic questions. First, how do mutual fund managers adjust the weight assigned to a country in their portfolio when that country's sovereign risk changes? We find that when the country in question is an emerging market, has a default probability that is high relative to other countries, or has a relatively high debt-to-GDP ratio, investors respond to an increase in the country's sovereign risk by cutting their exposure. By contrast, fund managers do not react to changes in default risk in advanced economies, low debt countries, and countries with low sovereign risk. Contrary to what papers focusing on the portfolio holdings of banks have found, we do not find evidence that mutual funds significantly increase their holdings of bonds issued in their home country when risk of a sovereign default increases.

Second, we assess whether mutual fund managers act as a channel for contagion, spreading financial stress from one country to another. In particular, we test whether fund managers change a country's portfolio weight in response to changes in other countries' sovereign risk. We find that fund managers do indeed cut their allocation to relatively risky when the sovereign default probability of the other countries in the fund's portfolio increases. This implies that mutual funds do indeed act as a conduit for contagion across bond markets, but

[1]Two notable exceptions are Broner et al. (2014) and Andritzky (2012), which analyze the behavior of domestic and foreign investors in the sovereign debt market using aggregate data and find that foreign investors cut their holdings of a countries sovereign bonds when default risk increases, while domestic investors increase them.

[2]Throughout the paper, we define *international* mutual funds as those funds which own assets from more than one country.

only for the riskiest borrowers. Relatedly, we find that fund managers engage in the "flight home" behavior that has been previously documented for banks (Giannetti and Laeven, 2012), boosting their home portfolio share when sovereign risk increases elsewhere in the portfolio.

In order to analyze the responses of sovereign risk, we combine a unique dataset of sovereign default probabilities with data on mutual funds' asset allocations. Using the method developed by Pan and Singleton (2008) we extract risk-neutral default probabilities from CDS contracts written on sovereign bonds from 13 advanced economies and 14 emerging markets for the period 2002 to 2018. This represents a major expansion of the original Pan and Singleton (2008) dataset, which included data on only three emerging markets (Mexico, Turkey, and Korea) from 2001 to 2006. This measure of sovereign risk has several appealing features. First, the default probabilities are extracted from CDS contracts which are traded daily, and thus unlike credit ratings are available at a frequency such that they incorporate information about sovereign risk as soon as it is revealed. Second, the Pan and Singleton (2008) methodology that we use ensures that changes in our measure of sovereign risk is not the result of changes in risk appetite or liquidity in the CDS market. Third, CDS are traded in separate markets from those in which the bond funds in our dataset purchase securities, so we are not simply regressing quantity on price.

We merge the sovereign default probabilities that we have extracted with a fund-level dataset on the cross-country portfolios of 460 bond mutual funds that we obtain from the commercial data provider EPFR Global. The EPFR country allocations dataset provides us with the value of each fund's assets in each of the countries in its portfolio each month, as well as a host of other information such as the domicile of the fund and the fund's performance each month. The dataset thereoffre allows us to evaluate how international investors, in this case managers of bond mutual funds, modify the cross-country allocation of their assets when sovereign risk changes. Moreover, bond mutual funds have become an important class of cross-border investment over the last two decades. For example in 2000, international bond funds domiciled in the U.S. held $32 billion in assets, under 6 percent of total U.S. holdings of foreign bonds. By 2017 U.S.-based international bond funds held nearly $500 billion in assets, or 20 percent of total U.S. holdings of foreign bonds (ICI, 2018).

To understand how mutual fund portfolios change when the sovereign risk of the countries in which they invest changes, we regress the portfolio weights of the funds in our sample on the default probabilities that we extracted from CDS contracts. In these regressions we employ a modified version of the specification used in the literature (e.g. Raddatz and Schmukler, 2012; Camanho et al., 2017) in which portfolio weights depend on the previous period's weights as well as relative returns. To our knowledge ours is the first paper to study how fund portfolios relate to an explicit measure of soveign risk.

Our first set of results concerns the relationship between a country's sovereign default probability and mutual funds' allocations to that country. Overall, we find that higher soverign risk is associated with a lower portfolio weight. However, when we allow the coefficient on the sovereign default probability to vary across country groups, we find that the negative relationship is driven by fund managers' treatment of peripheral advanced economies (Spain, Portugal, and Italy) and emerging markets. When sovereign risk increases in a core advanced economy such as the U.S., Germany, or Japan, mutual funds do not significantly alter the share of their portfolios allocated to that country. To understand what lies behind this differential response, we first conduct our estimation separately for countries with relatively high and relatively low sovereign default probabilities. The relationship between portfolio weights and sovereign default risk is only significant for relatively risky countries. Going a step further, we test whether the differential response can be attributed to countries' debt burden, and find that it is indeed high debt countries where higher sovereign risk is associated with a lower portfolio share. For low debt countries, there is essentially no relationship.

Our second set of results focuses on how fund managers' allocations to each country relates to sovereign risk in *other* countries. In general, we find that allocations to a given country are higher when the average level of of default risk in the rest of the portfolio is higher, meaning fund's reallocate away from risk. However, we do find one exception to this pattern: for the riskiest countries in a given time period, higher risk elsewhere in the fund's portfolio is associated with lower portfolio allocations to the risky country. We interpret this as evidence that for those countries with the highest level of sovereign risk, mutual funds can act as a channel of contagion. We also find that mutual fund managers engage in so-called flight home behavior, increasing the portfolio share allocated to their home country when default risk abroad increases.

This paper contributes three main areas of research. First, we make a direct contribution to the literature on the determinants of mutual fund portfolios. This literature has tended to focus on how funds respond to changing returns. For example, (Broner et al., 2006) show that when funds under-perform they shift their portfolio weights to more closely resemble the average weight of all funds. Raddatz and Schmukler (2012) find that bond fund managers rebalance in response to changes in returns, dampening the changes in weights due to asset price fluctuations, but slash portfolio weights when a country enters a crisis. And in a recent paper, (Camanho et al., 2017) show that funds rebalance their portfolios to offset changes in foreign share due to valuation gains and losses. To our knowledge, we are the first to evaluate how bond mutual funds portfolio weights change in response to sovereign risk, one of several determinants of the returns studied in the literature.

Second, our research informs the literature on cross-country financial contagion. Whereas much this work has focused on *whether* market comovements increase during periods of financial stress (see Forbes, 2012, for an overview), we shed light on *how* (if at all) bond mutual funds play a role in generating elevated comovement. There have long been concerns that delegated portfolio management of the type offered by bond mutual funds may create incentives for contagion, as in the model of Calvo and Mendoza (2000). Kaminsky et al. (2004) provide empirical evidence on this question by examining the portfolios of 13 Latin America equity funds. They find that mutual fund managers do contribute to contagion, selling assets in one country when returns on assets in the other countries to which they are exposed fall. We expand on this work by studying a much larger sample of mutual funds which invest in nearly all regions of the world.

Finally, our work informs the growing body of research on reach-for-yield behavior. This literature has demonstrated that investors, including as U.S. insurance companies (Becker and Ivashina, 2015) and foreign investors in the U.S. bond market (John Ammer, 2018), increase the portfolio weights of high-yielding assets relative to other assets with the same credit rating, taking the credit rating as an indicator of default probability. Our paper confirms this result, in that we show that higher yields are associated with a larger portfolio share, conditional on default probability. However, the focus of this paper is different. The reach-for-yield literature focuses on investors' decisions around changes in the risk premium component of CDS spreads. We examine how portfolios change with the the risk neutral default probability, stripped of the risk premium.

Another paper in the reach for yield literature, Choi and Kronlund (2017) analyzes reach-for-yield behavior by managers of U.S. bond mutual funds. They find that fund managers reduce the share of their portfolio allocated to risky assets when an aggregate measure of corporate default probability (the Baa-Aaa spread) increases. Our evidence on the relationship between portfolio shares and default probabilities is more general, in that we analyze the behavior of bond funds all over the world, investing in more than two dozen countries, and our measure of default risk is asset-specific rather than aggregate.

In the next section, we discuss in detail the novel dataset we construct. Section 3 describes our econometric framework, while Section 4 presents the results regarding the relationship between a country's sovereign risk and the portfolio weight that fund managers assign to that country. In section 5 we offer evidence on the role of bond mutual funds in cross-country financial contagion. Section 6 explores the robustness of our results along a number of different dimensions, and Section 7 concludes.

2 Data

To evaluate the influence of sovereign risk on fund managers' portfolio allocation decisions we create a database that merges information on sovereign default risk with data on the country weights of bond mutual funds. To measure default risk, we extract the default probability embedded in credit default swaps (CDS). CDS contracts provide insurance against a sovereign borrower defaulting on its debt. For example, consider the case of a 5-year CDS contract that trades at 10 basis points. This means that a buyer of the credit protection would pay 10 basis point every year to insure against the risk of default. If there is no default, the buyer will pay this amount to the protection seller till the end of the 5-year contract. If instead there is a default, the CDS issuer will purchase the defaulted bond from the the CDS buyer at the bond's par value of 100, after which the contract is terminated.

The main advantage of using CDS spreads as opposed to alternative measures of credit risk, such as credit ratings issued by rating agencies, is that information on CDS spreads is available at high frequency. CDS spreads are continuously traded and their price immediately reflects changes in default risk. This is very important for us as mutual funds are likely to adjust quickly to changes in sovereign risk.

We follow the methodology proposed by Pan and Singleton (2008) to extract the risk-neutral default probability embedded in five-year CDS contracts. This method uses the term structure model for defaultable sovereign debt developed by Duffie et al. (2003) along with data on CDS spreads for bonds of different maturities to strip out the effects of changing risk premia and market liquidity on CDS spreads and isolate risk-neutral sovereign default probabilities.[3] Consequently we collect data on one-, three- and five-year CDS spreads for a sample of 27 countries from Markit and calculate daily frequency default probabilities for the period 2002

[3]We refer the reader to Pan and Singleton (2008) and Longstaff et al. (2011) for the details of the estimation method.

to 2018.[4]

Summary statistics for the default probabilities we extract from CDS spreads are presented in Table 1. Argentina, which was in default for a substantial portion of our sample period, has the highest average default probability at 43.9 percent. The next closest average default probabilities are Brazil and Turkey, at around one percent. In general, the countries with the highest default probabilities are emerging markets, with the exception of Portugal, Italy, and Spain. Figure 1 plots the default probabilities that we have calculated, and makes clear the significant variation in these probabilities within countries over time.

For data on the the portfolio allocation decisions of investors we rely on the country allocations data set published by EPFR Global. The dataset contains information on the cross-country asset allocations of just over 700 bond mutual funds at the end of each month beginning in July 2002.[5] Importantly, the EPFR dataset is free of survivorship bias. This is important for our analysis, since for example fund that increase their holdings of a country's bonds when the sovereign default probability increases might be more likely to fail. We drop from our dataset funds that report allocations for less than 12 months as well as funds with less than $10 million in assets. We also exclude from our analysis funds with extremely high or low values for monthly inflows or aggregate fund returns (specifically we drop funds in the top and bottom one percent of the distribution for either of these variables). After this data cleaning we are left with 460 funds domiciled in 21 different countries.

Figure 2 provides an overview of the aggregate portfolio of the bond funds in our dataset. In the left panel, we see that roughly half of the assets held by the funds in our dataset are bonds issued in the U.S. and Europe, while bonds issued in emerging markets account for a further one third of the fund assets in the sample. Note that on average six percent of the fund assets in our sample are held in cash, with the cash share increasing in times of financial stress such as during the global financial crisis and following China's surprise currency devaluation in the summer of 2015.

The right panel of Figure 2 plots the assets of the funds in our sample broken down according

[4] To estimate the default probability we also need values for the zero-coupon bonds. We take them from the Treasury constant maturity curve published by the Federal Reserve. We follow Pan and Singleton (2008) in assuming a recovery rate of 25 percent in the event of a default, bearing in mind their finding that allowing recovery rates to vary across countries or over time in practice has little effect on the default probabilities generated by their methodology.

[5] Note that EPFR also provides data on the assets, flows, and returns of roughly 7,200 bond mutual funds which have a mandate that restricts their investment portfolio to a single country. Since the managers of these funds do not face an international portfolio choice problem, we do not include them in our analysis.

to the legal domicile of the funds. Around 45 percent of the funds in the sample are domiciled in the U.S. Unsurprisingly given their role as international financial centers, Luxembourg and Ireland account for a combined 40 percent of fund assets. Note that the sharp 2014 increase in the fund assets invested in European bonds along with a similar jump in the assets of funds domiciled in Europe represents an improvement in the coverage of the EPFR dataset. Complete summary statistics on the portfolio shares of the funds in our sample are provided in the Appendix.

We subsequently merge the portfolio allocations dataset with our data on sovereign default risk in 27 countries, 13 of which are advanced economies and 14 of which are emerging markets. In analyzing this dataset we must decide how to treat zero values for funds' country portfolio weights. While some of these zero weights do represent an actual decision on the part of the fund manager, the majority of zeros in the sample simply reflect restrictions imposed by the fund's mandate. For example, most Latin America funds have zero portfolio weights on Asian countries. Consequently we treat zeros as "true" zeros only if the country has has a non-zero portfolio weight at some point during the life of the fund. If the fund has never had a non-zero portfolio weight for a country, we drop the associated zero weights from the dataset. Thus, our final dataset is a three-way fund-country-month panel with 686,892 individual observations.

3 Econometric Framework

To empirically study how fund managers react to sovereign risk, we begin with identity that defines the law of motion of the portfolio weight w_{ijt} that fund i assigns to country j at time t:

$$w_{ijt} = w_{ijt-1} \frac{R_{ijt} + f_{ijt}}{R_{it} + f_{it}}. \tag{1}$$

The portfolio weight assigned to country j will increase if R_{ijt}, the gross returns on fund i's assets in country j, is larger than R_{it}, the gross return on the fund's total portfolio, or if f_{ijt}, the net flow of money from fund i to country j, is larger than the net flow of money into the fund from end investors.

Following Raddatz and Schmukler (2012), we log-linearize equation (1) to obtain:

$$\omega_{ijt} = \omega_{ijt-1} + (r_{ijt} - r_{it}) + (f_{ijt} - f_{it}) + \epsilon_{ijt}. \tag{2}$$

The log portfolio weight ω_{ijt} is a function the previous period's portfolio weight as well as a "passive" portfolio-growth component $\Delta\omega^{pass} \equiv (r_{ijt} - r_{it})$ reflecting relative returns and an "active" reallocation component $\Delta\omega^{act} \equiv (f_{ijt} - f_{it})$ that reflects decision-making by fund managers. The term ϵ_{ijt} captures the second-order approximation error from the log linearization.

Our goal is to examine how fund managers respond to changes in the probability of sovereign default. Consequently, we augment the specification employed by Raddatz and Schmukler (2012), in which relative flows $(f_{ijt} - f_{it})$ depend on lagged portfolio weights and relative returns, to allow flows to also depend on λ_{jt}, the default risk of country j, relative to λ_{it}, the average default risk of all the countries in fund i's portfolio:[6]

$$f_{ijt} - f_{it} = \delta\omega_{ijt-1} + \phi\,(r_{ijt} - r_{it}) + \gamma(\lambda_{jt} - \lambda_{it}) + \psi_{ij} + \theta_t + \nu_{ijt}. \tag{3}$$

The term ψ_{ij} is a destination country-fund fixed effect, capturing the fact that a particular fund manager may on average have a preference for investing in certain countries. θ_t is time fixed effect and ν_{ijt} is an error term.

Plugging equation (3) back in (2), we obtain our regression equation:

$$\omega_{ijt} = \beta\omega_{ijt-1} + \zeta\,(r_{ijt} - r_{it}) + \gamma(\lambda_{jt} - \lambda_{it}) + \psi_{ij} + \psi_t + \nu_{ijt}, \tag{4}$$

where $\beta \equiv 1 + \delta$, and $\zeta \equiv 1 + \phi$. Using our data on fund portfolios we estimate equation (4). Our main coefficient of interest is γ, which measures how fund managers modify their exposure to country j when the default risk increases in country j relative to the rest of the portfolio. While we would ideally conduct our estimation using the return r_{ijt} on each fund's particular bond holdings in each country. However, our dataset does not provide information at the security level. Consequently, throughout the paper we approximate r_{ijt} with a measure of r_{jt}, average returns on the bonds issued in each country. Specifically, we use the JPMorgan EMBIG Total Return Index to approximate the fund's country-specific returns.

[6] λ_{it} is formally defined as $\lambda_{it} \equiv \sum_{ik \neq j} \hat{\omega}_{ikt}\lambda_{kt}$, where $\hat{\omega}_{ikt}$ is country k weight in portfolio i at time j when weights calculating excluding j from the portfolio.

4 Sovereign Risk and Portfolio Weights

Table 2 reports the results we obtain estimating equation (4) using our database. All regressions in Table 2 include time fixed affects and destination country-fund fixed effects.[7] We correct for heteroskedasticity clustering the error terms at the fund level. Number reported in parntheses in Table 2 are t-tests.

Column (1) reports our estimates for equation (4) computed over the entire sample. We find that the coefficient for lagged weights and relative returns are positive and significant. Meaning that weights are serially correlated and positively correlated with relative returns. Raddatz and Schmukler (2012) also run a similar regression using monthly data of bond funds. Their point estimates for the coefficient of lagged weight and relative returns are very close to ours, thus confirming the validity of our results.

Turning to the coefficient for relative default risk, which is our main variable of interest, we find that fund managers signifcantly reduce their exposure toward riskier countries. When the probability of default in country j is 10% higher than in the rest of the portfolio, country j's share declines roughly 1.1%.

In columns (2)-(10) we investigate whether fund managers respond differently to sovereign risk according to country characteristics.

4.1 Heterogenous Effects

We first distinguish between Core Advanced Economies (CAEs), Peripheral Advanced Economies (PAEs), and Emerging Market Economies (EMEs).[8] Column (2) reports results obtained estimating equation (4) using only information on fund positions in CAEs. Results for PAEs and EMEs are reported in column (3) and (4) respectively. We find that fund managers'

[7]Because fund's portfolio weights are correlated with unobservable manager preferences omitting the fund-country fixed effect or estimating the the model in differences would generate inconsistent estimates. However, because equation (4) is a dynamic panel model estimating the fixed effects using least squares is also asymptotically biased, with the bias or order $1/T$, where T is the time-series length of the typical fund. In our database T is relatively large: 40 observations for the average fund. Hence least squares estimation of equation (4) performs well relative to alternatives such as GMM (Judson and Owen, 1999).

[8]Core Advanced Economies are: Australia, Belgium, Canada, Switzerland, Germany, France, the United Kingdom, Japan, Sweden, and the US. Peripheral Advanced Economies are Spain, Italy, and Portugal belong to the second group. Emerging Market Economies are: Argentina, Brazil, Chile, China, Colombia, Hong Kong, Indonesia, Korea, Mexico, Poland, Russia, Thailand, Turkey, and South Africa.

response to sovereign risk is different in the three groups. Fund managers reduce their exposure to PAEs and EMEs when sovereign risk increases, while they do not adjust their holdings in CAEs. Fund managers appear to be especially sensitive to sovereign risk in PAEs as it is suggested by the size of the coefficient γ in column (3). A possibility is that this result is driven by investors' behavior during the euro-area sovereign debt crisis. To test this hypothesis we interact our coefficient of sovereign risk with a dummy variable that is equal to one in the months between January 2010 and July 2012.[9] Results (not reported in the paper but available upon requests) show that investors' sensitivity to sovereign risk was indeed stronger during the sovereign debt crisis. Yet the sovereign risk coefficient remains negative and significant also outside the crisis period.

Second, we check whether fund managers are more sensitive to sovereign risk when they invest in countries perceived as riskier. To this end we rank countries according to their default probability in each of the months in our dataset. Argentina is the riskiest country according to this measure, in that it falls in the top decile of the distribution more than 89% of the time. Brazil, Portugal, and Turkey also frequently fall in the top decile of the default-risk distribution. Germany, on the contrary is the safest country as it falls in the lowest decile more than 73% of the times. Column (5) reports results obtained estimating regression (4) on the subsample of countries that are in the lower half of the default-risk distribution. Column (6) then reports results for countries that are in the top half of the distribution. Results show that fund managers response is strongly heterogeneous. The coefficient γ measuring fund managers' response to sovereign risk is only significant for countries in the top half of the default-risk distributions (Column 6). That is, fund managers retrench from risky country when default risk increases further. The sign of the γ coefficient remains negative for countries in the bottom half of the distribution, but the significance level drops below 10%, suggesting that fund managers adjust their exposure to low-risk countries less aggressively, if at all.

Third, we evaluate whether fund managers response is different when they invest in countries with higher debt-to-GDP ratios. Once again we rank countries according to their debt-to-GDP level in every period and we split our sample in two. Italy, Japan and Portugal are the countries that are most frequently found in the top decile of the distribution. Conversely Australia, Chile, Hong Kong, and Russia are most frequently found at the bottom of the distribution. Column (7) reports reports our estimates for the subsample of countries that are in bottom half of the debt-to-GDP distribution. Column (9) reports our estimates for

[9] The July 26, 2012 speech in which ECB President Mario Draghi vowed to do "whatever it takes" to save the euro is generally seen as the end of the euro-area crisis.

countries that are in the top half of the distribution. Once again we find evidence of an heterogeneous response to sovereign risk. Fund managers significantly reduce their exposure to countries with high debt-to-GDP ratios when sovereign risk increases. The impact of sovereign risk on the portfolio weights of countries with low debt-to-GDP ratios is not only not statistically significant, but the point estimate is in fact small.

Finally, we evaluate whether fund managers' response to sovereign risk is different when funds are investing in the economy in which the fund is legally domiciled. Column (9) reports coefficients estimated using only each fund's foreign holdings, meaning the subsample of fund-countries pairs in which the fund domicile and the country where the assets were issued are not the same. When it comes to foreign holdings, funds significantly reduce their holdings when sovereign risk increases. Column (10) reports estimates for domestic holdings: the subsample of fund-countries pairs in which the fund domicile and the country where the assets were issued are the same. The coefficient on relative default risk is large and negative, but imprecisely estimated and thus not statistically significant.[10] The lack of significance may well reflect the fact that the sample of domestic holdings is necessarily very small relative to the full sample, since each fund has only one domestic portfolio weight. While we are therefore cautious in interpreting this result, it does suggest that the behavior of banks documented by Broner et al. (2014) and Andritzky (2012) does not occur for mutual funds. Managers do not appear to boost their domestic portfolio share in times of stress.

4.2 Preferential Treatment in the Sovereign Market

In Section 4.1 we noted that fund managers do not significantly alter their exposure to CAEs in response to sovereign risk. An interesting question is whether this results still applies after we control for the other factors shaping mutual funds portfolio: debt-to-GDP ratios and country riskiness. To this end, we run again regression (4) on the subsample of risky and high-debt countries adding an interaction to check for the differential response to sovereign risk in CAEs. Let $dummy_{CAE}$ be a dummy which is equal to one when the

[10] As a robustness check we run a similar regression containing a new term which defined as the interaction between our default risk measure and a dummy that is equal to one when the fund is investing in the domestic economy. We find that the coefficient associated with the interaction term is positive, albeit not significant. We interpret this result as additional weak evidence that domestic investors reduce their exposures less aggressively when sovereign risk increases.

destination country is a CAE, equation (4) becomes:

$$\omega_{ijt} = \beta\omega_{ijt-1} + \zeta\left(r_{jt} - r_{it}\right) + \gamma(\lambda_{jt} - \lambda_{it}) + \delta(\lambda_{jt} - \lambda_{it}) * dummy_{CAE} + \psi_{ij} + \psi_t + \nu_{ijt}.^{11} \quad (5)$$

Table 3 reports results obtained estimating equation (5) on the subsample of high-risk countries (column 1) and the subsample of high-debt countries (column 2). The coefficient for the interaction term is positive in columns (1) and (2) and significant in column (2). These results suggest that core advanced economies benefit from a preferential treatment in the sovereign market. Fund managers are less prone to reduce their exposure to core advanced economies even when these countries have a high debt-to-GDP ratio and their default risk is relatively high.

5 Cross-Country Contagion

In this section, we ask whether mutual fund portfolios act as a channel of contagion. More specifically, we test whether investors' exposure to a generic country j is affected by the default risk in the other countries in the portfolio.

To evaluate the existence of contagion we rearrange equation (4) breaking up the default risk in its two components: Country j default risk component λ_{jt} and the (average) default risk in other countries in the portfolio λ_{it}. The estimable regression equation becomes:

$$\omega_{ijt} = \beta\omega_{ijt-1} + \zeta\left(r_{jt} - r_{it}\right) + \gamma_1\lambda_{jt} + \gamma_2\lambda_{it} + \psi_{ij} + \psi_t + \nu_{ijt}. \quad (6)$$

Our coefficient of interest to measure contagion is γ_2 as it measures how fund managers modify their exposure to country j when the default risk increases in other countries in the portfolio.

Column (1) in Table 4 reports estimates obtained estimating equation (6) on the entire sample. We do not find any significant evidence of contagion. Rather, the sign of the coefficient γ_2 for the average default risk in other countries in the portfolio is positive as expected.[12] Yet the significance is below 10%, suggesting that bond mutual funds to not act

[11] As we already included fund-country fixed effects we do not need to include $dummy_{CAE}$ in the set of regressors

[12] We expected a positive coefficient here for the mechanical effect implied by the results presented in Section 3. When default risk increases in country k, investors reduce their exposure to country k. It is therefore natural to expect that the weight of the generic country j increases, after controlling for its credit

as a channel for financial contagion.

We next examine whether bond mutual funds transmit contagion to some countries and not others. As in the previous section we first check whether fund managers' behavior differs in Advanced Economies (AEs) and Emerging Market Economies (EMEs). To this end we restrict the analysis to those funds that invest in both AEs and EMEs and estimate equation (6) for AEs (column 2 in Table 4) and EMEs (column 3 in Table 4) separately. We find that on average the weight of advanced economies increases when default risk increases in other countries in the portfolio as shown by the sign of the coefficient γ_2. We interpret this result as evidence of flight-to-safety behavior on the part of fund managers, in that they appear to increase their exposure to AEs when the portfolio become riskier. Turning to EMEs, we find that on average the weight of a generic emerging economies does not change significantly when default risk increases in other countries in the portfolio. It is worth highlighting though that the regression coefficient in column (3), albeit insignificant, is negative. Thus providing weak evidence that fund managers reduce their exposure to emerging market when the portfolio becomes riskier.

Second, we check whether investors' behavior differs in low- and high-risk countries. We split again the sample in two separating low-risk economies (column 4) from high-risk economies (column 5) as we did Section 4.1. The positive and significant coefficient for λ_{it} in column (4) suggests that investors increase their exposure to low-risk economies when default risk increases in other countries in the portfolio. The coefficient for λ_{it} turns negative, albeit non significant, in column (5) suggesting that the opposite is true for high-risk economies. In column (6) we report results obtained estimating our model on the subsample of economies that are in the top decile of the risk distribution. We find that the coefficient γ_2 become negative and significant. Fund managers reduce their exposure to the most risky economies when the default risk increases in other countries in the portfolio.

Third, we check whether investors' behavior changes in low- and high-debt countries. To this end, we split the sample separating low-debt countries from high-debt countries as we did in Section 4.1. Results for low debt countries are reported in column (7), while results for high-debt countries are reported in column (8). We do not find significant evidence of contagion in either of the two subsamples.

Finally, we investigate whether the the relationship between a country's portfolio weight and sovereign risk in the rest of the investor's portfolio varies depending on whether the country

risk as we do with the term λ_{jt}

in question is the fund's home economy. Column 9 presents the results for the subsample in which the economy is foreign vis-a-vis the mutual fund. Here the estimated coefficient on λ_{it} is less then half the size when estiamted on the full sample and not statistically significant. This is not surprising given the heterogeneity we just discussed.

However when we run our regression looking only at the portfolio share of each fund's home country (column 10), we find that the coefficient on sovereign risk in the rest of the portfolio is dramatically larger than for the full sample or any of the other subgroups we study. And despite a relatively small sample size, the estimate is significant at the 10 percent level. Hence, investors tend to increase their holdings of domestic bonds when sovereign risk increases in other countries. This finding suggests that managers of bond mutual funds engage in the "flight home" behavior that has been documented in the syndicated loan market by Giannetti and Laeven (2012). Moreover, our findings regarding the relationship between the fund's home portfolio share and sovereign risk in the rest of the fund's portfolio provide micro-level evidence on the drivers of the "retrenchment" documented at the aggregate level by Forbes and Warnock (2012) that has been identified in the literature on international capital flows

6 Robustness Exercises

In this section we present the result of a number of additional regressions that we run to evaluate the robustness of our results. In short, we find that our results are remarkably stable and robust to different specifications.

6.1 Active Shares

In Section 3 we showed that the change in portfolio weight $\Delta\omega_{ijt}$ can be decomposed in a "passive" component and in an "active" component in line with the work of Kraay and Ventura (2000) and Tille and van Wincoop (2010):

$$\Delta\omega_{ijt} = \Delta\omega^{pass} + \Delta\omega^{act}. \tag{7}$$

The focus on this paper is on the active component of portfolio weights. This is why in equations (4) and (6) we control for excess returns: to separate the active component from the passive one. In this section we take an alternative approach to separate the two components. Following the methodology proposed by Ahmed et al. (2016), we construct a measure of "active" portfolio weights and we run the following regression:

$$\omega_{ijt}^{act} = \omega_{ijt-1}^{act} + \gamma(\lambda_{jt} - \lambda_{it}) + \psi_{ij} + \psi_t + \nu_{ijt}. \tag{8}$$

Equation (8) is obtained plugging the definitions for $\Delta\omega^{pass}$ and $\Delta\omega^{act}$ in equation (7) and substituting it back in (4).[13]

Regression estimates for equation (8) are reported in Panel A of Table 5. All the results presented in Section 4 still hold: Investors reduce their exposure to countries with higher default risk; Investors respond aggressively to default risk in EMEs, PAEs high-risk countries, and high-debt countries, while they do not respond to default risk low-risk countries, and low-debt countries. Additionally, coefficient estimates for our default probability measure are similar, albeit a little smaller, to the ones estimated in Section 4. Coefficients for the contagion regression are also little changed when active shares are used as shown in the Appendix.

6.2 Additional Regressors

As a second robustness exercise we check if our estimates remain stable when we add regressors that may be correlated with default risk and returns. Fiscal and growth measures are the natural candidates to run this robustness exercise.[14] To this end we collect data on expected growth rates, expected fiscal surplus, and expected inflation next year from the Consensus Economics databse of forecasts. The Consensus data have two features that are especially appealing to us. First, data are reported at the monthly frequency as the other variables in our database are. Second, Consensus data are informative about market expectations about the future. This is particularly important as we expect fund managers to be

[13]Similarly we use the equation:

$$\omega_{ijt}^{act} = \omega_{ijt-1}^{act} + \gamma_1\lambda_{jt} - \gamma_2\lambda_{it} + \psi_{ij} + \psi_t + \nu_{ijt}$$

to evaluate the existence of contagion using active share.

[14]Time fixed effects take already care of global factors such as global risk, and global stock market performance

forward looking.[15]

Panel B of Table 5 reports estimates obtained enriching our regression with variables from Consensus database. The comparison with results in Table 4 shows that our coefficient of interest γ is little changed after the introduction of the additional regressors. Our estimate γ on the entire sample (Column 1) is -0.108 compared to -0.109 in the regression without the additional regressors.

6.3 Correlation between Relative Returns and Relative Risk

As a third robustness exercise we check for the existence of collinearity between the relative returns and relative default risk. Return on government bonds also depend on default risk. Hence, coefficients for relative returns and relative default risk may not be precisely estimated.

A quick inspection of the simple correlation between the two variables already gives some reassuring results. The correlation is low–just 0.04–suggesting that multicollinearity should not be a main concern. To further address the issue, we take a two-step approach. We first estimate relative default risk using all the right-hand-side variables in equation (4) and we then replace the relative return variable in the regression with the residuals obtained from the first step. Results are reported in Table A7 in the Appendix.

The first-step equation reported in column (1) shows that excess return and default risk are positively correlated as suggested by the positive and significant coefficient for relative returns. Yet, the R^2 of the regression is fairly low: 0.49 despite the introduction of fund-country fixed effects and time fixed effects. In column (2) we report estimates for equation (4) when we replace our relative default risk variable with the errors of the first-stage regression. Results are almost identical to those reported in Table 2, thus confirming that our estimates are not biased by the existence of correlation between regressors

[15]Note that default probabilities are forward looking too as they indicate the probability that investors assign to a default event in the next five years.

7 Conclusions

We investigate how investors react to sovereign risk analyzing micro-level data from a novel database that combines sovereign default probabilities extracted from CDS spreads with monthly data on the portfolios of bond mutual funds. We find evidence that investors respond to sovereign risk and that investors' response is highly heterogeneous. Fund managers reduce their exposure to emerging markets, high-risk countries, and high-debt countries when sovereign risk increases. Fund managers, however, do not modify their exposure to advanced economies, low-risk countries, and low-debt countries when sovereign risk increases. Interestingly, we find evidence that advanced economies are perceived as "safe heavens" and enjoy a preferential treatment in the sovereign debt market: Fund managers do not modify their exposure to advance economies when sovereign risk increases even in the subsample of advanced economies with high default risk and high debt-to-GDP ratio.

Additionally, we find evidence of cross-country contagion through the portfolios of mutual funds, but only for a specific subset of countries. In general, fund managers increase a country's portfolio weight when other countries' sovereign risk increases, meaning that mutual funds do not act as a conduit for contagion. This is true for low-risk countries and advanced economies. However, fund managers actuall cut a country's portfolio weights when default risk increases in other countries if the country is among the riskiest.

Sovereign default models typically assume that international investors are risk-neutral and have deep pockets. These assumptions imply that investors response to sovereign risk should be similar across countries and that we should not observe cross-country contagion. Our results are in sharp contract with these predictions. Fund managers behavior is complex and we find clear evidence of contagion. Altogether, our analysis suggest that standard assumptions on investors' behavior should be carefully revisited to replicate patterns observed in the data.

References

Ahmed, Shaghil, E. Stephanie Curcuru, Francis E. Warnock, and Andrei Zlate, "Decomposing International Portfolio Flows," Technical Report June 2016.

Andritzky, J., "Government Bonds and Their Investors: What are the Facts and do they Matter?," Technical Report, International Monetary Fund 2012.

Becker, Bo and Victora Ivashina, "Reaching for Yield in the Bond Market," *The Journal of Finance*, 2015, *70* (5), 1863–1902.

Broner, Fernando A., R. Gaston Gelos, and Carmen M. Reinhart, "When in peril, retrench: Testing the portfolio channel of contagion," *Journal of International Economics*, 2006, *69* (1), 203 – 230. Emerging Markets.

Broner, Fernando, Aitor Erce, Alberto Martin, and Jaume Ventura, "Sovereign Debt Markets in Turbulent Times: Creditor Discrimination and Crowding-Out Effects," *Journal of Monetary Economics*, 2014, *61* (C), 114–142.

Calvo, Guillermo A. and Enrique G. Mendoza, "Rational contagion and the globalization of securities markets," *Journal of International Economics*, 2000, *51* (1), 79 – 113.

Camanho, Nelson, Harald Hau, and Helene Rey, "Global Portfolio Rebalancing Under the Microscope," August 2017. Mimeo.

Choi, Jaewon and Mathias Kronlund, "Reaching for Yield in Corporate Bond Mutual Funds," *The Review of Financial Studies*, 11 2017, *31* (5), 1930–1965.

Claessens, Alexandra Tabova Caleb Wroblewski John Ammer Stijn, "Searching for Yield Abroad: Risk-Taking through Foreign Investment in U.S. Bonds," Technical Report 1224, Board of Governors of the Federal Reserve System 2018.

Duffie, Darrell, Lasse Heje Pedersen, and Kenneth J. Singleton, "Modeling Sovereign Yield Spreads: A Case Study of Russian Debt," *The Journal of Finance*, 2003, *58* (1), 119–159.

Forbes, Kristin, "The Big C: Identifying Contagion," Working Paper 18465, National Bureau of Economic Research October 2012.

Forbes, Kristin J. and Francis E. Warnock, "Capital flow waves: Surges, stops, flight, and retrenchment," *Journal of International Economics*, 2012, *88* (2), 235–251.

Giannetti, Mariassunta and Luc Laeven, "The flight home effect: Evidence from the syndicated loan market during financial crises," *Journal of Financial Economics*, 2012, *104* (1), 23 – 43.

ICI, *Fact Book*, Investment Company Institute, 2018.

Judson, Ruth A and Ann L Owen, "Estimating dynamic panel data models: a guide for macroeconomists," *Economics Letters*, 1999, *65* (1), 9 – 15.

Kaminsky, Graciela, Richard K. Lyons, and Sergio L. Schmukler, "Managers, investors, and crises: mutual fund strategies in emerging markets," *Journal of International Economics*, 2004, *64* (1), 13–134.

Kraay, Aart and Jaume Ventura, "Current Accounts in Debtor and Creditor Countries," *The Quarterly Journal of Economics*, 2000, *115* (4), 1137–1166.

Longstaff, Francis A., Jun Pan, Lasse H. Pedersen, and Kenneth J. Singleton, "How Sovereign Is Sovereign Credit Risk?," *American Economic Journal: Macroeconomics*, April 2011, *3* (2), 75–103.

Pan, Jun and Kenneth J. Singleton, "Default and Recovery Implicit in the Term Structure of Sovereign "CDS" Spreads," *Journal of Finance*, October 2008, *63* (5), 2345–2384.

Raddatz, Claudio and Sergio L. Schmukler, "On the international transmission of shocks: Micro-evidence from mutual fund portfolios," *Journal of International Economics*, 2012, *88* (2), 357–374.

Tille, Cedric and Eric van Wincoop, "International capital flows," *Journal of International Economics*, March 2010, *80* (2), 157–175.

Figure 1. Risk Neutral Default Probabilities

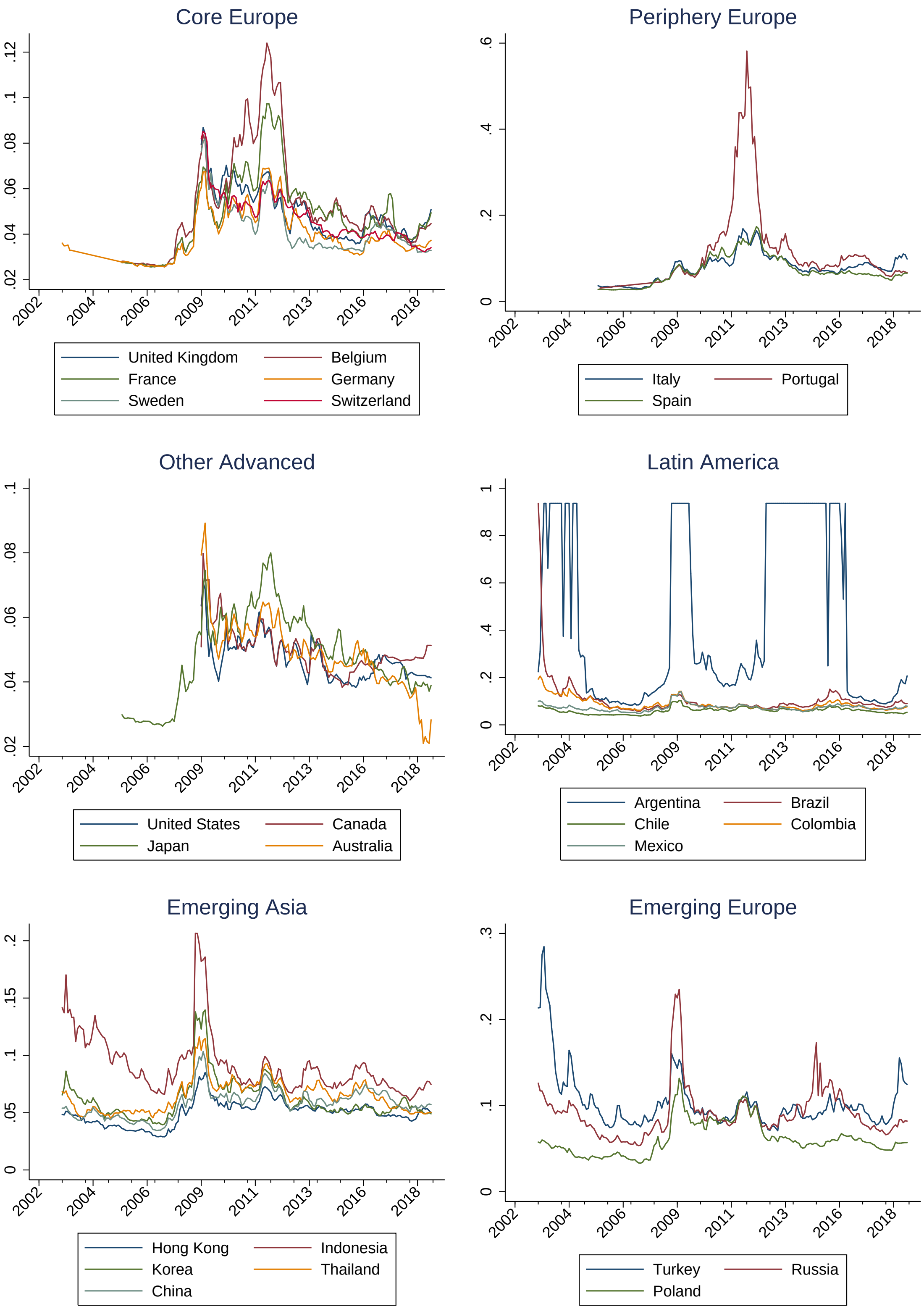
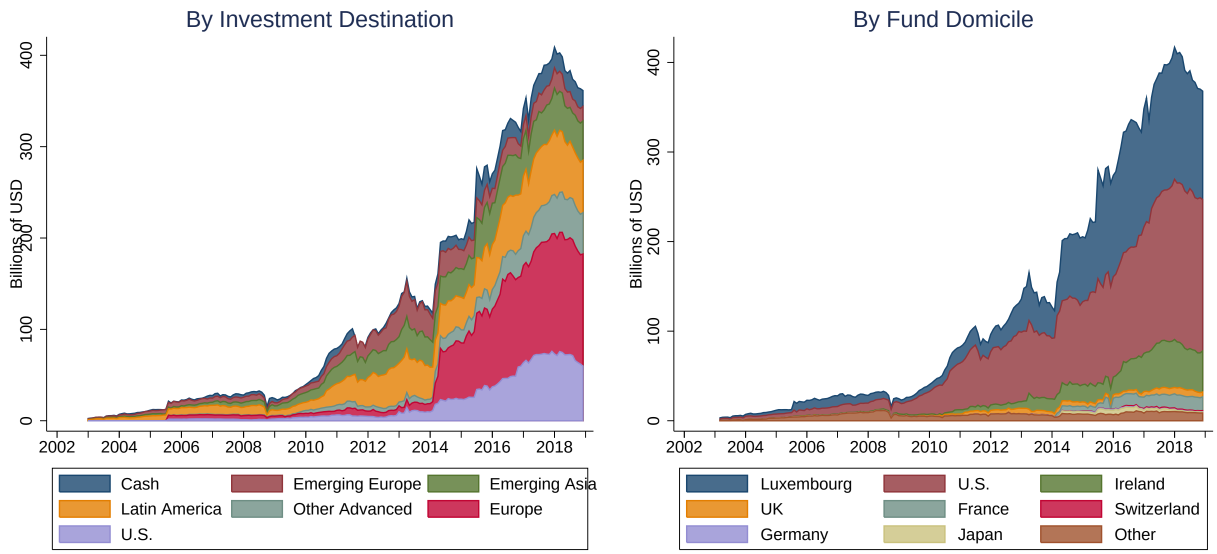


Figure 2. Assets of International Bond Funds



Source: EPFR, authors' calculations

Table 1. Summary Statistics: Sovereign Default Probabilities

	Mean	Median	Min	Max	St.Dev.	N
Argentina	0.437	0.237	0.083	0.936	0.367	192
Australia	0.049	0.048	0.021	0.089	0.011	120
Belgium	0.053	0.047	0.026	0.124	0.023	161
Brazil	0.106	0.086	0.057	0.936	0.087	192
Canada	0.050	0.048	0.038	0.080	0.007	120
Switzerland	0.047	0.045	0.032	0.085	0.011	120
Chile	0.060	0.061	0.038	0.103	0.013	192
China, P.R.: Mainland	0.058	0.058	0.034	0.103	0.013	192
Colombia	0.088	0.079	0.059	0.206	0.026	192
Germany	0.040	0.037	0.026	0.069	0.011	167
Spain	0.073	0.065	0.027	0.174	0.034	161
France	0.049	0.046	0.026	0.097	0.017	161
United Kingdom	0.050	0.047	0.036	0.087	0.011	120
China, P.R.: Hong Kong	0.050	0.051	0.029	0.085	0.011	192
Indonesia	0.091	0.084	0.060	0.206	0.027	192
Italy	0.078	0.078	0.030	0.169	0.031	161
Japan	0.048	0.048	0.026	0.080	0.013	161
Korea, Republic of	0.062	0.056	0.039	0.140	0.018	192
Mexico	0.073	0.072	0.048	0.140	0.015	192
Poland	0.061	0.057	0.033	0.132	0.020	192
Portugal	0.129	0.092	0.031	0.581	0.104	128
Russian Federation	0.091	0.084	0.054	0.235	0.030	192
Sweden	0.043	0.039	0.032	0.082	0.011	120
Thailand	0.064	0.063	0.045	0.116	0.014	192
Turkey	0.104	0.095	0.071	0.285	0.034	192
United States	0.047	0.046	0.038	0.071	0.006	120
South Africa	0.084	0.084	0.044	0.151	0.020	192

Note: This table reports the summary statistics for the sovereign default probabilities extracted from CDS prices using the method detailed in Longstaff et al. (2011).

Table 2. Sovereign Risk and Portfolio Weights

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}
		$CAEs$	$PAEs$	$EMEs$	$\lambda \leq \lambda_{50}$	$\lambda \geq \lambda_{50}$	$b/Y \leq b/Y_{50}$	$b/Y \geq b/Y_{50}$	F	H
ω_{ijt-1}	0.883***	0.878***	0.873***	0.885***	0.879***	0.877***	0.878***	0.863***	0.884***	0.760***
	(145.48)	(112.22)	(76.63)	(120.23)	(126.08)	(120.62)	(88.26)	(109.07)	(143.84)	(14.79)
$(r_{ijt} - r_{it})$	0.584***	0.224**	0.325**	0.790***	0.384***	0.746***	0.646***	0.539***	0.591***	0.159
	(10.95)	(2.46)	(2.08)	(10.98)	(5.98)	(11.12)	(7.15)	(8.82)	(11.22)	(0.44)
$(\lambda_{ijt} - \lambda_{it})$	-0.109***	-0.180	-0.633***	-0.105***	-0.163	-0.123***	-0.0109	-0.139***	-0.109***	-0.648
	(-6.55)	(-1.30)	(-3.05)	(-6.21)	(-1.38)	(-7.26)	(-0.27)	(-7.11)	(-6.52)	(-1.46)
Fund-Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	165362	109081	36721	19560	64525	100837	53993	111369	163206	2058

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3. Preferential Treatment

	(1)	(2)
	ω_{ijt}	ω_{ijt}
	$\lambda \geq \lambda_{50}$	$b/Y \geq b/Y_{50}$
ω_{ijt-1}	0.875^{***}	0.864^{***}
	(545.32)	(562.54)
$(r_{ijt} - r_{it})$	0.427^{***}	0.403^{***}
	(12.66)	(11.95)
$(\lambda_{ijt} - \lambda_{it})$	-0.114^{***}	-0.138^{***}
	(-11.53)	(-13.47)
$(\lambda_{ijt} - \lambda_{it}) * CAE$	0.392	0.226^{*}
	(0.65)	(1.73)
Fund-Country FE	Yes	Yes
Time FE	No	No
N	98774	115710

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4. Sovereign Risk: Contagion

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}
		AEs	$EMEs$	$\lambda \leq \lambda_{50}$	$\lambda \geq \lambda_{50}$	$\lambda \geq \lambda_{90}$	$b/Y \leq b/Y_{50}$	$b/Y \geq b/Y_{50}$	F	H
ω_{ijt-1}	0.883***	0.880***	0.885***	0.879***	0.876***	0.842***	0.877***	0.862***	0.884***	0.761***
	(144.41)	(113.33)	(602.61)	(456.50)	(552.24)	(186.91)	(86.54)	(108.94)	(143.20)	(14.79)
$(r_{ijt} - r_{it})$	0.375***	0.333***	0.792***	0.382***	0.749***	1.108***	0.627***	0.537***	0.591***	0.192
	(8.71)	(4.22)	(18.61)	(6.29)	(18.07)	(10.90)	(6.91)	(8.82)	(11.23)	(0.54)
λ_{ijt}	-0.127***	-0.543***	-0.134***	-0.359	-0.154***	-0.147***	-0.657***	-0.153***	-0.132***	0.451
	(-6.88)	(-4.36)	(-11.62)	(-1.21)	(-13.67)	(-6.67)	(-3.58)	(-7.52)	(-7.29)	(0.17)
λ_{it}	0.0231	0.390**	-0.0170	0.159**	-0.0243	-0.181*	-0.0312	0.0276	0.0109	0.713*
	(0.77)	(2.59)	(-0.65)	(2.51)	(-0.91)	(-1.70)	(-0.77)	(0.63)	(0.34)	(1.72)
Fund-Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	165362	48822	109081	64525	100837	15791	53993	111369	163206	2058

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5. Robustness Checks

Panel A: Active Weights

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	ω^{act}_{ijt}	ω^{act}_{ijt}	ω^{act}_{ijt}	ω^{act}_{ijt}	ω^{act}_{ijt}	ω^{act}_{ijt}	ω^{act}_{ijt}	ω^{act}_{ijt}	ω^{act}_{ijt}	ω^{act}_{ijt}
		$CAEs$	$PAEs$	$EMEs$	$\lambda \leq \lambda_{50}$	$\lambda \geq \lambda_{50}$	$b/Y \leq b/Y_{50}$	$b/Y \geq b/Y_{50}$	F	H
ω^{act}_{ijt-1}	0.883***	0.882***	0.864***	0.885***	0.872***	0.877***	0.868***	0.863***	0.883***	0.863***
	(142.50)	(113.59)	(92.79)	(114.16)	(112.97)	(485.63)	(85.19)	(507.94)	(143.12)	(29.27)
$(\lambda_{ijt} - \lambda_{it})$	-0.0683***	0.175*	-0.378***	-0.0665***	-0.0754	-0.0798***	0.000530	-0.0843***	-0.0690***	0.0247
	(-3.63)	(1.69)	(-2.68)	(-3.57)	(-0.75)	(-6.92)	(0.01)	(-7.19)	(-3.68)	(0.11)
N	138186	34816	18401	84969	56024	82162	38874	99312	136085	2010

Panel B: Additional Variables

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}	ω_{ijt}
		$CAEs$	$PAEs$	$EMEs$	$\lambda \leq \lambda_{50}$	$\lambda \geq \lambda_{50}$	$b/Y \leq b/Y_{50}$	$b/Y \geq b/Y_{50}$	F	H
ω_{ijt-1}	0.875***	0.873***	0.867***	0.876***	0.877***	0.865***	0.875***	0.853***	0.876***	0.751***
	(117.64)	(87.28)	(66.81)	(90.81)	(107.19)	(96.87)	(67.65)	(88.92)	(114.95)	(14.33)
$(r_{ijt} - r_{it})$	0.567***	0.124	0.346**	0.811***	0.318***	0.775***	0.640***	0.514***	0.575***	0.110
	(9.97)	(1.30)	(2.21)	(10.06)	(4.55)	(10.30)	(6.77)	(7.79)	(10.14)	(0.34)
$(\lambda_{ijt} - \lambda_{it})$	-0.108***	-0.141	-0.792***	-0.101***	-0.121	-0.124***	-0.0226	-0.142***	-0.107***	-0.598
	(-5.58)	(-0.91)	(-3.56)	(-5.07)	(-0.72)	(-6.17)	(-0.53)	(-6.24)	(-5.45)	(-1.38)
y	0.00376***	-0.00256	-0.00578	0.00470***	-0.00254	0.00580***	0.00481***	0.000651	0.00375***	0.0155
	(3.87)	(-0.80)	(-0.74)	(4.07)	(-0.80)	(5.14)	(3.28)	(0.47)	(3.80)	(0.84)
π	0.00316***	-0.00502	-0.000563	0.00370***	-0.00181	0.00345***	0.00291	0.00175**	0.00314***	0.0113
	(6.11)	(-1.10)	(-0.07)	(7.08)	(-0.56)	(6.48)	(1.65)	(2.53)	(5.98)	(0.54)
$fiscal\ bal$	-0.105	0.498**	-0.0270	-0.233**	0.213	-0.237**	0.104	-0.478***	-0.132	1.133
	(-1.16)	(2.26)	(-0.04)	(-2.04)	(1.28)	(-2.52)	(0.52)	(-3.19)	(-1.46)	(1.60)
N	131472	31656	18670	81146	52775	78697	38707	92765	129351	2023

All regressions include Fund-Country FE and time FE.

t statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Appendix

Table A1. Summary Statistics: Portfolio Shares, Global Funds

	Mean	Median	Min	Max	St.Dev.	N
Argentina	0.447	0.000	0.000	13.130	1.224	6,560
Australia	1.824	0.806	-4.921	23.300	2.404	6,560
Belgium	1.081	0.410	0.000	13.737	1.583	6,560
Brazil	1.570	0.000	0.000	21.381	3.230	6,560
Canada	2.780	2.022	-0.975	33.300	3.250	6,560
Cash	4.544	2.372	-43.489	58.020	8.978	6,560
Switzerland	1.445	0.409	0.000	72.450	5.630	6,560
Chile	0.150	0.000	-0.340	4.358	0.440	6,560
China, P.R.: Mainland	0.406	0.000	0.000	11.709	1.136	6,560
Colombia	0.275	0.000	0.000	6.240	0.880	6,560
Germany	5.080	3.816	-13.195	52.824	5.372	6,560
Spain	2.239	1.556	0.000	22.940	2.610	6,560
France	4.483	3.710	0.000	22.810	4.049	6,560
United Kingdom	7.400	6.333	0.000	73.100	7.595	6,560
China, P.R.: Hong Kong	0.140	0.000	0.000	5.000	0.424	6,560
Indonesia	1.044	0.000	0.000	12.570	2.377	6,560
Italy	3.877	2.570	0.000	35.313	4.326	6,560
Japan	5.749	0.540	-0.300	39.884	8.859	6,560
Korea, Republic of	1.689	0.000	0.000	19.870	3.840	6,560
Mexico	2.189	0.800	-11.500	24.874	3.679	6,560
Poland	1.029	0.000	0.000	25.900	2.241	6,560
Portugal	0.383	0.000	0.000	7.259	0.862	6,560
Russian Federation	0.575	0.000	0.000	14.392	1.569	6,560
Sweden	1.236	0.620	0.000	13.530	1.748	6,560
Thailand	0.121	0.000	0.000	7.958	0.588	6,560
Turkey	0.212	0.000	-0.260	12.180	0.682	6,560
United States	34.408	33.126	-0.520	98.900	23.843	6,560
South Africa	0.443	0.000	0.000	10.000	0.956	6,560

Table A2. Summary Statistics: Portfolio Shares, Global Emerging Market Funds

	Mean	Median	Min	Max	St.Dev.	N
Argentina	3.047	2.130	0.000	39.360	3.944	10,528
Australia	0.007	0.000	0.000	3.750	0.095	10,334
Brazil	11.413	10.099	-0.640	73.000	6.953	10,528
Canada	0.028	0.000	0.000	2.892	0.192	10,334
Cash	2.472	3.245	-56.180	61.120	10.218	10,528
Switzerland	0.007	0.000	0.000	3.450	0.117	10,334
Chile	1.383	0.815	-0.190	16.860	1.928	10,528
China, P.R.: Mainland	2.057	0.000	-0.100	28.831	3.714	10,528
Colombia	3.847	3.586	0.000	17.219	2.585	10,528
Germany	0.004	0.000	-6.139	3.255	0.185	10,528
Spain	0.012	0.000	0.000	4.181	0.147	10,334
France	0.002	0.000	0.000	1.701	0.039	10,334
United Kingdom	0.031	0.000	-0.001	8.592	0.208	10,334
China, P.R.: Hong Kong	0.425	0.000	0.000	13.445	1.359	10,528
Indonesia	5.709	5.430	0.000	21.000	3.589	10,528
Italy	0.021	0.000	0.000	9.930	0.313	10,334
Japan	0.000	0.000	0.000	0.773	0.014	10,334
Korea, Republic of	0.948	0.000	-3.670	22.478	2.437	10,528
Mexico	9.642	9.556	0.000	33.805	4.591	10,528
Poland	2.988	1.200	-0.040	25.630	3.953	10,528
Portugal	0.013	0.000	0.000	2.029	0.105	10,334
Russian Federation	8.500	7.687	0.000	31.600	5.657	10,528
Sweden	0.007	0.000	0.000	1.852	0.072	10,334
Thailand	1.445	0.000	0.000	13.800	2.435	10,528
Turkey	5.999	5.600	0.000	25.700	3.697	10,528
United States	0.040	0.000	-0.571	18.573	0.440	10,334
South Africa	3.955	2.627	0.000	30.920	3.970	10,528

Table A3. Summary Statistics: Portfolio Shares, Latin America Funds

	Mean	Median	Min	Max	St.Dev.	N
Argentina	5.586	2.060	0.000	40.200	8.530	794
Brazil	21.090	19.950	0.000	62.300	16.230	794
Cash	5.876	5.100	-24.937	38.006	7.678	794
Chile	2.961	0.692	0.000	13.462	3.737	794
Colombia	7.177	6.785	0.000	24.220	4.192	794
Germany	0.000	0.000	-0.000	0.013	0.000	794
Mexico	18.311	17.695	1.370	45.380	9.612	794
Poland	0.029	0.000	0.000	12.342	0.572	794
Turkey	0.026	0.000	0.000	10.650	0.510	794
United States	0.032	0.000	0.000	10.203	0.513	777
South Africa	0.006	0.000	0.000	4.420	0.157	794

Table A4. Summary Statistics: Portfolio Shares, Emerging Asia Funds

	Mean	Median	Min	Max	St.Dev.	N
Argentina	0.017	0.000	0.000	4.888	0.199	1,816
Australia	0.697	0.000	0.000	17.240	1.838	1,784
Canada	0.049	0.000	0.000	2.342	0.232	1,784
Cash	4.347	2.300	-15.720	42.840	5.940	1,816
Switzerland	0.015	0.000	0.000	5.975	0.231	1,784
Chile	0.000	0.000	0.000	0.389	0.013	1,816
China, P.R.: Mainland	18.027	12.615	0.000	77.826	18.071	1,816
Germany	0.035	0.000	0.000	12.400	0.575	1,816
France	0.017	0.000	0.000	2.344	0.177	1,784
United Kingdom	0.149	0.000	0.000	4.872	0.590	1,784
China, P.R.: Hong Kong	7.320	6.000	0.000	27.500	6.664	1,816
Indonesia	12.260	11.549	0.000	37.410	6.508	1,816
Japan	0.098	0.000	0.000	4.469	0.463	1,784
Korea, Republic of	13.403	12.895	0.000	43.699	9.483	1,816
Mexico	0.011	0.000	0.000	1.577	0.086	1,816
Russian Federation	0.007	0.000	0.000	2.509	0.115	1,816
Sweden	0.007	0.000	0.000	1.464	0.094	1,784
Thailand	6.420	5.535	0.000	25.430	5.478	1,816
Turkey	0.001	0.000	0.000	1.262	0.032	1,816
United States	0.000	0.000	-8.641	7.524	0.337	1,784
South Africa	0.001	0.000	0.000	0.139	0.008	1,816

Table A5. Summary Statistics: Portfolio Shares, Emerging Europe Funds

	Mean	Median	Min	Max	St.Dev.	N
Belgium	0.016	0.000	0.000	6.900	0.332	431
Cash	4.249	2.980	-7.720	31.080	4.429	445
Germany	0.002	0.000	0.000	0.960	0.046	445
Poland	30.064	28.280	8.720	66.100	9.943	445
Russian Federation	8.084	5.330	0.000	35.231	8.696	445
Turkey	12.266	8.300	0.000	33.875	10.275	445

Table A6. Contagion: Active Shares

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	ω_{ijt}^{act}	ω_{ijt}^{act}	ω_{ijt}^{act}	ω_{ijt}^{act}	ω_{ijt}^{act}	ω_{ijt}^{act}	ω_{ijt}^{act}	ω_{ijt}^{act}	ω_{ijt}^{act}	ω_{ijt}^{act}
		$CAEs$	$PAEs$	$EMEs$	$\lambda \leq \lambda_{50}$	$\lambda \geq \lambda_{50}$	$b/Y \leq b/Y_{50}$	$b/Y \geq b/Y_{50}$	F	H
ω_{ijt-1}^{act}	0.883***	0.879***	0.885***	0.872***	0.877***	0.828***	0.868***	0.863	0.883***	0.863***
	(141.30)	(124.67)	(112.82)	(398.80)	(484.96)	(177.49)	(84.98)	(.)	(141.89)	(29.01)
λ_{ijt}	-0.0866***	-0.165*	-0.0954***	0.159	-0.112***	-0.180***	-0.119	-0.102	-0.0875***	1.377
	(-4.21)	(-1.70)	(-4.58)	(0.54)	(-8.63)	(-7.92)	(-0.46)	(.)	(-4.25)	(0.69)
λ_{it}	-0.0136	0.0370	-0.0640	0.0815	-0.0835***	-0.216	-0.00884	-0.0669	-0.0137	0.0616
	(-0.33)	(0.41)	(-1.47)	(1.30)	(-2.60)	(-1.64)	(-0.13)	(.)	(-0.33)	(0.34)
Fund-Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	138186	45800	84969	56024	82162	18199	38874	99312	136085	2010

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A7. Two Step Regression

	(1)	(2)
	$(\lambda_{ijt} - \lambda_{it})$	ω_{ijt}
ω_{ijt-1}	-0.0181***	0.885***
	(-7.96)	(148.34)
$(r_{ijt} - r_{it})$	0.164***	0.566***
	(6.04)	(10.58)
$\lambda_{ijt} \hat{-} \lambda_{it})$		-0.109***
		(-6.55)
Fund-Country FE	Yes	Yes
Time FE	Yes	Yes
N	165362	165362

t statistics in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$