Cost of sovereign debt and foreign bias in bond allocations

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Abstract

Finance theory suggests that markets where foreign bond portfolio investors overweight their portfolio relative to the prescribed theoretical benchmark should experience higher international risk sharing. Correspondingly, the cost of debt in such markets should be lower compared to markets facing a lower degree of international risk sharing. We empirically examine this prediction using a panel data set of sovereign bond yield spreads and a measure of suboptimal foreign bond portfolio allocations for 50 emerging and ten developed markets. Consistent with theory, our results show higher levels of foreign bond allocations – relative to the theoretical benchmark – are negatively related to the cost of debt. These results have important policy implications as a country's cost of debt could potentially be lowered by encouraging foreign portfolio investors to hold their optimal allocation.

JEL Classification: E43, G12, G15

Key Words: cost of debt; international risk sharing; foreign bias; Eurozone sovereign debt crisis; natural experiment

1 Introduction

In this study we investigate whether the investment preferences of foreign bond portfolio investors, relative to the theoretical prescription, influence the host country's cost of debt. Finance theory suggests that foreign portfolio investors should follow the benchmark country allocation prescribed by the International Capital Asset Pricing Model (ICAPM). However, it is well established in the literature that barriers to international investments induce portfolio investors to ignore the normative prediction of the ICAPM and discriminate between countries by either under-weighting or over-weighting their investments relative to the prescribed optimal benchmark (see Cooper et al., 2012 for a review). With respect to foreign investments, such suboptimal allocation is known as foreign bias. Theory further notes that varying degrees of foreign biases should differentially affect market integration and thus international risk sharing (Stulz, 1999; Bekaert and Harvey, 2000).

The theoretical framework relating sub-optimal foreign investments and cost of capital is well established (Lewis, 1999). It states that when markets are perfectly integrated and barriers to international investments are absent, a country's expected return on a portfolio of tradeable assets is determined by the covariance between its return and that of the world market portfolio (Adler and Dumas, 1983). At the other extreme, for a severely segmented market, the expected return of a portfolio is a function of the covariance between the portfolio return and the local market return. Investors investing in a highly segmented local market require a higher return to compensate for the lower level of global risk sharing between domestic and foreign investors (for a mathematical derivation see Lau et al., 2010). When a market is partially integrated with the world market, the country's expected return on a portfolio is determined by the weighted average of the covariance of the portfolio with the local market and the covariance of the portfolio with the world market, the weight being the level of market integration with the world market (Bekaert and Harvey, 1995). Consequently,

it follows that higher levels of foreign bias (i.e. over-allocation relative to benchmark) towards the domestic market should enhance global risk sharing (higher integration) of domestic assets, which in turn should lower the cost of capital (Stulz, 1999). However, empirical studies investigating the implications of suboptimal foreign allocations are scarce, and mainly limited to equity. To the best of our knowledge, no prior study examines the impact of suboptimal foreign investments (i.e. foreign bias) on the cost of debt. We address this gap by examining whether biases observed by foreign bond portfolio investors, compared to the theoretical prescription, have any implication for the host country's cost of debt. Specifically, we argue that a higher level of foreign bond bias (relatively higher weighting against the prescribed weight) should result in lower cost of debt.

Our study on the implication of foreign bias on cost debt is also motivated by the importance, development[1] and characteristics[2] of the bond market that are differenent from equity market. Comparatively, the size of global bond markets is roughly twice the size of equity market.[3] The bond market has significantly grown in the past decade since debt financing has become one of the important sources of funding for governments, financial institutions and corporations. However, despite such substantial growth increases in cross-border bond investments studies reveals that bond investors are sub-optimally diversifying

[1] The examination of debt is economically important due to the size of global bond markets which is nearly twice the size of equity markets with steady growth in the past decade. Data from the Bank for International Settlements (BIS) show that bond market size increased from USD 35.5 trillion in 2001 to USD 97.8 trillion in 2013. During the corresponding period, cross-border holdings of long-term debt (excluding money market instruments) grew from USD 6.4 trillion to USD 24.2 trillion, as reported by International Monetary Fund (IMF) in Coordinated International Portfolio Survey (CPIS).

[2] Myers and Majluf (1984) highlight the relative attractiveness of debt over equity to firms in their seminal study. Bonds also have unique characteristics relative to equity as asset class. For example, relative to equities, bonds exhibit lower volatility returns with a higher degree of relative safety.[2] Studies also show that government bond returns are not influenced by the same factors that impact equity returns (Elton, 1999). Further, Campbell and Taksler (2003) document that the price of bonds significantly diverges from that of equities, suggesting that different factors could drive the attractiveness of equities and bonds asymmetrically. Further, there is evidence that investors do not avoid volatility in equity markets but do so from volatility in bond markets (Burger and Warnock, 2003).

[3] See McKinsey Global Institute (2011) for comparative size of equity and debt markets.

(Fidora et al., 2007). Our study provides implication of such sub-optimal diversification on the cost of debt.

We test our research question using panel data sets from multiple sources reflecting suboptimal foreign bond allocations, and sovereign debt yield spread[4] as a proxy of cost of debt. Specifically, we use the yield spread, over US Treasury bonds, of the comparable sovereign debt of emerging markets. We also use the sovereign bond yield spread, over similar German bonds, for Eurozone (economic and monetary union (EMU)) countries as a measure of cost of debt for developed European markets. Consistent with theory, we find that the cost of debt across our sample countries is strongly and negatively related to foreign bond portfolio investors' foreign bias. Our results provide evidence that varying degrees of foreign bias have significant implications for the cost of debt in a host country.

This key result remains qualitatively unchanged when we address the issue of endogeneity using different robustness tests, including vector auto-regressive models and instrumental variables. Our results are also consistent when we use data from different sources such as JP Morgan Emerging Market Bond Indices (EMBI) series, Thomson Reuters, Coordinated International Portfolio Survey (CPIS) and EPFR Global Inc. Further, the recent Eurozone sovereign debt crisis offers an ideal experimental set-up to observe whether any difference in foreign bias observed between the group comprising the five most affected countries (i.e. Greece, Ireland, Italy, Portugal and Spain, hereafter referred to as GIIPS) and the group constituting five relatively less affected Eurozone countries differentially impacts the cost of debt.

[4] Borensztein et al. (2013) show that sovereign ratings represent a strong upper bound assigned to corporate bonds. They conclude that sovereign risk is a significant factor in the pricing of corporate debt.

Our study contributes to two different strands of the finance literature. First, we add to the limited but growing literature that investigates the implications of suboptimal international allocations. To the best of our knowledge, this is the first study which investigates the link between the theoretically inconsistent phenomenon of foreign bias and cost of debt. This study has similarities to that of Lau et al. (2010) who examine the effect of suboptimal international equity allocations on cost of equity capital; however, we differ in a number of important areas. The cost of equity is only one part of the overall cost of capital and it is important to understand whether foreign bond holders' deviation from the theoretically prescribed benchmark affects the cost of debt. Also, rather than investigating how home investors' suboptimal investments in their home market affect cost of debt, we examine how foreign investors' theoretically biased investment decisions influence the cost of debt.[5] Finally, we also apply a more rigorous research approach by addressing the possibility of endogeneity using country fixed effects, vector auto regression, instrumental variable estimation and by exploiting a quasi-natural experimental set-up.[6]

Second, our study also adds to the finance literature investigating the determinants of sovereign bond spreads, i.e. credit risk (Longstaff et al., 2011; Cruces and Trebesch, 2013; Bekaert et al., 2014). Our paper differs from these studies by considering the idea that suboptimal foreign bond allocation (i.e. foreign bias) is also related to the cost of sovereign debt. A number of existing studies also explore the relation between foreign bond investments and spreads.[7] Our study is conceptually different from this strand of work as we

[5] Sub-optimal investments in domestic market is referred to as home bias, which relates to the phenomenon in which local investors over-weight their domestic market relative to the prescribed theoretical benchmark, thereby leaving significantly lower share of the country's wealth to be held by foreign investors. The presence of foreign bias indicates that foreign investors either overweight or underweight foreign markets relative to the benchmark. However, Cooper et al. (2012) show that home and foreign biases are inversely related.
[6] Lau et al. (2010) use pooled ordinary least squares (OLS) regressions and the Fama-Macbeth approach.
[7] See Peiris (2010), Andritzky (2012), Jaramillo and Zhang (2013), and Arslanalp and Poghosyan (2014).

focus on the role of theoretically inconsistent foreign bias phenomena rather than the absolute value of foreign holdings.

The rest of the paper is structured as follows: Section 2 describes the data used in this study. Section 3 discusses the empirical results and robustness checks, and section 4 offers some concluding remarks.

2 Data

First, we describe the two sources of data that we use to obtain the sovereign debt yield spreads (our proxy for cost of debt). Second, we explain the construction of foreign bias measure reflecting the cross-country allocation preferences of foreign bond portfolio investors relative to that prescribed by finance theory (Chan et al., 2005; Cooper et al., 2012). Finally, we briefly describe the control variables we use in our analyses. In this study we use quarterly frequency and annual frequency data. These choices are constrained by the availability of data on the benchmark portfolio as discussed below.

2.1 Sovereign bond spreads – cost of debt

The varying characteristics of bonds as asset class complicate the comparability of cross-country cost of debt. Thus, we focus mainly on the yield spreads of long-term dollar denominated sovereign bonds issued by emerging markets because the availability of this data set allows for a meaningful comparison across countries.[8] These spreads are the yield to maturity (YTM) of emerging market sovereign bonds in excess of the YTM of US Treasuries with comparable maturities. As an additional test to extend our examination to more

[8] Sovereign yields also proxy the cost of cross-country corporate debt, given the strong evidence that corporate spreads are generally positively correlated with sovereign spreads (Durbin and Ng, 2005). Further, as noted earlier, Borensztein et al. (2013) suggest that sovereign rating represents a strong upper bound rating assigned to corporates. They empirically show that sovereign risk is a significant factor in the pricing of corporate debt.

developed markets, we include ten EMU members. The choice of these countries is dictated by the availability of comparable bond data.

Sovereign bond yield spreads (SPRD) are obtained from two different sources. First, the emerging market spreads are from the EMBI database on a quarterly basis (from 2002 to 2014). The EMBI data set includes EMBI Plus (EMBIP) and EMBI Global (EMBIG). EMBIP is available for a smaller number of emerging countries (17 countries as at December 2014) and consists of bonds which meet strict criteria in terms of comparable liquidity, size, currency, maturity and other characteristics. One of the advantages of using EMBI data is the availability of "stripped spreads" which is the excess basis points (bps) over US Treasuries of similar maturity and net of a collateralized portion of payments on such bonds (which are mostly Brady bonds). EMBIG incorporates less liquid instruments than EMBIP, but is available for a wider number of countries (60 as at December 2014). For most of our analyses we use *SPRD* from the EMBIG database. However, we also use *SPRD* from EMBIP as an additional robustness test in Section 3.7 to address concerns related to country-specific bond market liquidity (the EMBI data set is also used by a number of papers including Cruces and Trebesch, 2013 and Bekaert et al., 2014).

For EMU countries, we source the benchmark 10-year government bond index from Thompson Reuters on a quarterly basis and compute the yield spread over the benchmark German Bund, a practice consistent with existing studies (Ebner, 2009; Favero et al., 2010). These YTMs on Euro-denominated bonds are available for 11 EMU countries only.[9] The average maturity for the constituent bonds in these indices is close to 10 years for all countries (including Germany).

[9] GIIPS (Greece, Italy, Ireland, Portugal and Spain) and non-GIIPS (Austria, Belgium, Finland, France, Germany and the Netherlands).

2.2 Independent variable – foreign bias

As noted in the literature (Chan et al., 2005; Cooper et al., 2012), for a foreign investor domiciled in country *i* investing in bonds of host country *j* at time *t*, the deviation from optimal ICAPM allocations for the entire host market can be shown by equation (1):

$$FBIAS_{ijt} = \ln(w_{ijt} / w^*_{jt}) \quad (1)$$

where $FBIAS_{ijt}$ denotes foreign bias exhibited from investors in country (*i*) towards bonds of host country (*j*) for time period *t* (quarter-end in the case of EPFR Global and year-end in the case of CPIS data).[10] w_{ijt} is the weight of bond holdings of host country (*j*) in the portfolio of investors from country (*i*) and w^*_{jt} is the share of country (*j*) in the world bond market, used as the ICAPM benchmark.

We use data from two different sources to construct measures of w_{ijt} for emerging and EMU host markets. For emerging markets (which is our main data set), data are from EPFR Global, which provides monthly bond allocations (from 2002 to 2014) of funds that have a strategic focus of investing across emerging markets.[11] As of December 2014, this database includes 78 funds with a combined fund size of USD 80.6 billion allocated across emerging

[10] As we are interested in the overall foreign bias in a given country, the measures we have constructed takes into account funds' investment in the whole of the bond market in that emerging market including corporate bonds, municipal bonds, sovereign bonds etc. The implied assumption is that this measure is very close to the actual aggregate market level investments, theoretically needed to construct foreign bond bias measure for a country. Limiting the allocation to only a selection of bonds (e.g. only sovereign or high yield) would be very restrictive and not consistent with the theoretical argument of market level foreign bias puzzle (Fidora et al., 2007; De Moor and Vanpée, 2013).

[11] The full database as at December 2014 additionally contains 56 international funds focusing globally, five funds focusing on Latin America, 70 focusing on Europe (available only for 2014), two focusing on Emerging Europe, and 20 focusing on Asia, except Japan. We only include emerging market funds as our main data for bond spreads covers emerging markets only.

markets. These funds are domiciled in eight developed markets[12] and w_{ijt} is the share of each fund's allocation domiciled in country *i* for the host country *j* for the period *t*. Given the fact that our benchmark allocation measures, discussed below, are only available at quarterly frequency, we take the funds' quarter-end allocations instead of month-end allocations. For EMU host markets, we compute the foreign allocations to these countries using the yearly foreign holdings data provided in CPIS.[13]

Next, the benchmark weight of country j in the world bond market is calculated as shown in equation (2):

$$w_{jt}^{*} = V_{jt} \Big/ \sum_{j=1}^{n} V_{jt} \tag{2}$$

where w_{jt}^{*} is the share of country j in the world bond market and V_{jt} is the bond market outstanding of country j at the end of period *t* as obtained from BIS.[14] When calculating benchmark weights for emerging markets, *n* in equation (2) equals 50 since the EPFR funds' allocations are strategically focussed across the 50 most investable emerging markets in our dataset and are specifically known as emerging markets' global funds. However, in the case of EMU markets, *n* includes the entire number of countries in the world for which bond market outstanding data are available on BIS (i.e. 110 countries). This is because bond

[12] Canada (1), Denmark (2), Germany (1), Ireland (9), Japan (1), Luxembourg (30), United Kingdom (6), and United States (28).

[13] A few caveats need to be noted in using the CPIS data set. For example, investment from some countries, (notably China) are not reported; some investments are shown as negative values; a small sample is reported as unallocated; some data are reported as confidential and investments from 'international organizations' are also reported. We ignore the negative and unallocated cross-border investments. Following Cooper et al. (2012) we replace all zero international investment as USD 1 to ensure that complete underinvestment in host markets are not ignored.

[14] This is consistent with Fidora et al. (2007). An alternative option would be to use country weights from indices such as MSCI or JP Morgan bond indices. This is not desirable in our study because funds are known to closely follow such indices while making country-wise allocations (Raddatz et al., 2014). Our interest is in finding out how the deviation of foreign allocation, vis-a-vis a country's share in world market capitalization, impacts on spread. Using such bond indices (that are tracked by funds) as a benchmark defeats this purpose.

allocation to EMU host markets is computed from CPIS which provides cross-border bond holdings across the world. Theoretically, this does not affect the construction and use of benchmark portfolio.

For each period *t* (again quarter-end in the case of using EPFR Global and year-end in the case of CPIS data), we take the average foreign bias ($AFBIAS_{jt}$) that is computed by taking the average across all source country investors ($i=1.....k$) towards the host country *j* for each period *t* as shown below:

$$AFBIAS_{jt} = \frac{\sum_{i=1}^{k} FBIAS_{ijt}}{k} \quad i \neq j \tag{3}$$

2.3 Control variables

One important characteristic of sovereign bonds that constitute the EMBI series is that time remaining to maturity is different in each country index. This can influence variations in the spreads. Following Bekaert et al. (2014), we control for this disparity by including average remaining years to maturity (*LIFE*) in our model. *LIFE*, as reported by JP Morgan and used in our analyses in natural log form, is expected to be positively associated with bond spread.

Spreads in sovereign debts can be a function of country-specific macroeconomic factors such as level of indebtedness, foreign exchange reserves, debt service burden etc. (Boehmer and Megginson, 1990). However, more recent evidence (Longstaff et al., 2011; Afonso et al., 2015) highlights the importance of global economic factors as the driving force behind sovereign spreads. Accordingly, we include both global macroeconomic factors and country-specific macroeconomic conditions as additional control variables.

For a measure of global macroeconomic factors (*GBL*), we follow Cruces and Trebesch (2013) and Bekaert et al. (2014) and take the yield spread between Barclays US Corporate High Yield and Barclays US Treasury bonds (sourced from Thomson Reuters).

GBL is used in its natural logarithmic form and we anticipate it will have a positive association with bond yield spread. To capture various aspects of country-specific macroeconomic conditions, we use data from the International Country Risk Guide (ICRG) on economic risk, financial risk, and political risk ratings (provided by The PRS Group). For economic and financial risks, the ICRG provides measures of each of these risks as an aggregate of five different components at country level on a scale of 0–50 with higher scores denoting lower potential risk.[15] Following Bekaert et al. (2014), we aggregate the economic and financial risk scores for each country and subtract them from 100 to equate higher score to higher potential risk (*EFRisk*).

We also control for country-specific political risk drivers by including the composite political index of the ICRG, consisting of 12 different risk factors,[16] measured on a scale of 0-100 with a higher score implying lower potential political risk. We similarly subtract each country's score from 100 to obtain our measure of political risk (*PRisk*). Both *EFRisk* and *PRisk* are used in natural log form of each country, less that of the US rating, and are expected to have a positive association with bond spreads.

Liquidity is also clearly an important element in security value (Amihud and Mendelson, 1986). The use of *EFRisk* captures variations in cross-country liquidity to a certain extent. For example, one of the sub-components of *EFRisk* is foreign debt scaled by GDP which itself reflects the depth and breadth of the foreign bond market relative to the size of the economy. To address any remaining concerns related to country-specific bond market

[15] ICRG Economic risks include i) GDP per capita, ii) real GDP growth, iii) annual inflation, iv) budget balance to GDP ratio, and v) current account to GDP ratio. ICRG Financial risks include i) foreign debt to GDP, ii) foreign debt service to exports, iii) current account to exports, iv) international reserve as months of import cover, and v) exchange rate stability. See http://www.prsgroup.com for further details.

[16] ICRG Political risks include i) government stability, ii) socioeconomic conditions, iii) investment profile, iv) internal conflict, v) external conflict, vi) corruption, vii) military in politics, viii) religious tensions, ix) law and order, x) ethnic tensions, xi) democratic accountability, and xii) bureaucracy quality.

liquidity, we use the yield spread from EMBIP, which includes highly comparable bonds with respect to liquidity than that of EMBIG (see additional robustness test in section 3.7). In the case of regression using EPFR data, all the controls are at a quarterly frequency (averaged over three months); and for CPIS data, the controls are at an annual frequency (averaged over 12 months).

3 Empirical analysis

We begin our empirical analysis by briefly explaining the summary figures of the key variables. Thereafter, we discuss the results of basic regression estimations followed by robustness tests.

3.1 Summary statistics and correlation

Table 1 provides the summary statistics of all key variables. *SPRD* in column I is the yield spread over US Treasury bonds (from EMBIG) available for the 50 emerging markets' sovereign bonds that have the most active bond markets. There are wide variations across countries with respect to their spreads. For example, Ivory Coast, Argentina, Ecuador, Venezuela and Belarus are the top five countries with highest level of spreads and China, Chile, Malaysia, Poland and Slovakia have the lowest spreads.

To show the temporal variation in *SPRD*, we provide additional data in Appendix A with the average *SPRD* during four sub-periods within our sample. Appendix A shows that countries such as Argentina, Brazil, Dominican Republic, Georgia, Ivory Coast, Nigeria, Uruguay etc. have witnessed a decline in their spreads during the sample period. On the other hand, Egypt, Hungary, Ukraine, Venezuela etc. have witnessed increasing spreads during this period.

Column II (of Table 1) shows the $AFBIAS_{jt}$ measure for host countries. Some countries that exhibit low average yield spreads also have relatively low levels of foreign bias

(see Slovakia and China). In contrast, Belarus, Ivory Coast, Ukraine, Venezuela etc. have high levels of average yield spreads and high levels of foreign bias. Apart from indicating possible panel effects, this suggests that other important country-specific factors could also play important roles in explaining the varying degrees of yield spread observed across the cross-section of countries and thus the importance of incorporating controls.

[….Insert Table 1 here….]

Time remaining to maturity (*LIFE*) for the constituent bonds of EMBIG country indices is shown in Column III in Table 1. The average *LIFE* is 9.8 years indicating the long term nature of the constituent bonds in EMBI. Argentina, El Salvador, Jamaica, Peru, and Uruguay, have an average *LIFE* of 15 years or more, but Belarus (3.8 years), Morocco (4.1), Pakistan (4.9), and Ukraine (4.9) are among the countries with the lowest *LIFE* implying a relatively short period of time remaining to pay off their debts. Over time, the underlying trend (not shown for brevity) reveals a gradual decrease in *LIFE* – as would be expected. However, it also shows sharp and sudden increases for most countries, presumably due to the issuance of more long-term debts.

The ICRG risk ratings in columns IV, V and VI in Table 1 show quarterly average Economic Risk (ER), Financial Risk (FR) and Political Risk (PR) ratings of the respective countries, as reported by the ICRG, with a higher score denoting lower risk. There are some significant variations between emerging market countries. The between variations (and within variations) in ER, FR, and PR ratings are 3.1 (2.9), 4.5 (2.8), and 8.9 (2.8) standard deviations respectively (relative to their average ratings). For example, in terms of individual countries, Jamaica and Lebanon have the lowest ER ratings (i.e. highest economic risk). Belarus and Latvia are the countries with lowest FR measures (higher financial risk). Finally,

in terms of the PR scores, Iraq, Nigeria, and Pakistan are among the countries with highest level of political risk (i.e. low PR score).

The correlation matrix for all the key variables is presented in Table 2. The correlation between variables are generally in the expected direction. SPRD is negatively correlated with ER, FR and PR with statistical significance at conventional levels (5% level). SPRD is also negatively correlated with FBIAS.[17] These pairwise correlations provide some evidence on the direction of association and in the next section we use regression analysis to establish credible relations.

3.2 Regression analysis

The general regression specification for assessing the impact of foreign bias on sovereign bond spread ($SPRD_{jt}$) is shown in equation (4):

$$SPRD_{jt} = \beta_1 AFBIAS_{jt} + \beta_2 LIFE_{jt} + \beta_3 Local_{jt} + \beta_4 Global_t + \beta_5 \alpha_t + \beta_6 \alpha_j + \epsilon_{jt} \quad (4)$$

where $AFBIAS_{jt}$ is the average foreign bias registered across all funds (i) towards the host country (j) at time t; $LIFE_{jt}$ is the time remaining to maturity of the constituent bonds; $Local_{jt}$ is the vector of control variables specific to host country (j), and $Global_t$ is the global macroeconomic control. α_t is the vector of time dummies and α_j are host country dummies. Our sample exhibits a substantial level of cross-sectional dependence.[18] To address the spatial dependence (except when stated specifically), we report results with standard errors corrected for within-country heteroscedasticity and cross-sectional dependence.

[17] The total number of observation is 784 due to the unavailability of SPRD (EMBI Plus) for some countries.
[18] Due to the possible presence of common shocks and unobserved variables in the disturbance terms, panel data models are likely to possess elements of spatial dependence, especially when time period lengthens. The absolute correlation of error terms between countries is 0.5 on average for the emerging markets sample.

The results of different specifications of the general Equation (4) are shown in Table 3. Across models I – VI, the foreign bias (*AFBIAS*) coefficients have the expected signs and are statistically significant at the 1% level.[19] Assuming exogeneity,[20] an interpretation of the coefficient of *AFBIAS* in column VI suggests that an increase in *AFBIAS* measure by one unit reduces bond spread by 64 bps. For illustrative purposes, if a country with a median value of *AFBIAS* measure (1.32) could improve its position to 75 percentile (2.25), its bond yield spread would drop by approximately 60 bps [(2.25-1.32) x 64bps]. These results strongly indicate that markets which are successful in attracting higher foreign bond allocations relative to the benchmark are associated with lower cost of debt.

[….Insert Table 3 here….]

In terms of the control variables, time remaining to maturity (*LIFE*) has an unexpected negative sign, but is not statistically significant across the models. The introduction of the global macroeconomic variable (*GBL*) in Column III produces no material change to our key variable (*AFBIAS*).[21] As expected, the *GBL* is positively related to *SPRD* and is statistically significant at the 1% level. This signifies that global macroeconomic shocks adversely affect the cost of debt. The *EFRisk* factor also enters the regression with the expected sign and is statistically significant at the 1% level. This suggests that country economic factors also play

[19] Hausman's specification test justifies the use of fixed effects.

[20] We address the issue of endogeneity in section 3. However, as with any empirical work using non-experimental data, caution should be exercised when evaluating economic significance as it is extremely challenging to fully mitigate the issue of endogeneity. Further, these results are limited to the sample period and data set we use in this study. Despite the obvious limitations of any observational study, we believe the results provide a strong indication of the association as predicted by the theory.

[21] As an alternative, we replace *GBL* by the option-implied volatility on the S&P 500 index (VIX) which serves as a proxy for global risk aversion. The use of VIX leads to no material change in our main results. Note that *GBL* is dropped in column VI due to the introduction of time fixed effects as the latter capture aggregate fluctuations.

an important role in explaining the yield spread. Similarly, we find that political risk (*PRisk*) is significant in determining country yield spread. These results are generally consistent with the evidence reported in the current literature (Bekaert et al., 2014). The significance of *AFBIAS* remains unaltered across all specifications in models I to VI. Further, excluding those countries with less active representation in EMBI does not alter the overall results: when we take into account only those 24 countries for which SPRD is available for the entire 50 quarters in our sample, results (available on request) remain essentially the same; results still remain qualitatively similar when only those 37 host countries with SPRD available for at least 25 continuous quarters are considered. Overall, these results support the negative association of foreign bond bias with sovereign spreads, consistent with the prediction of ICAPM.

3.3 Robustness checks - endogeneity

In this section we outline how we deal with some of the problems in our general econometric modelling, specified in equation (4). Though finance theory, as discussed earlier, leads us to conjecture that sovereign bond spread could be a function of foreign bias, there might be other alternative explanatory factors that could influence bond yield spread. However, provided that such country-specific factors and unobserved factors remain stable over time, the panel data set in our modelling with the inclusion of country fixed effects (Bhattacharya et al., 2003), and more importantly the use of ICRG risk ratings, mitigates the concern of omitted variables to a certain extent (Bekaert et al., 2014). However, our estimates could still be questioned over concerns related to reverse causality. It could be the case that the fall in the country spreads itself motivates investors to invest more. Although it is challenging to fully address the concern of endogeneity in observational studies, we undertake additional robustness tests to mitigate the concern as far as possible.

First, following Carrieri et al. (2013), we replace *AFBIAS* by its single-period lagged values *AFBIAS (lag 1)* as a predetermined variable addressing the potential concern of reverse causality. As shown in Table 4, the results for *AFBIAS (lag 1)* are consistent with our earlier findings.

[….Insert Table 4 here….]

Second, following Gelos and Wei (2005), we estimate a vector autoregresssion (VAR) model. We assume *SPRD* and *AFBIAS* to be endogenously determined variables and all control variables to be exogenous variables. The endogenous variables are modelled as a linear function of one period lagged values of all endogenous variables plus the contemporary values of all exogenous variables as shown in equation (5) and (6):[22]

$$SPRD_{jt} = \beta_1 AFBIAS_{jt-1} + \beta_2 SPRD_{jt-1} + \beta_3 LIFE_{jt} + \beta_4 Local_{jt} + \beta_5 Global_t + \beta_6 \alpha_t + \beta_7 \alpha_j + \epsilon_{jt} \quad (5)$$

$$AFBIAS_{jt} = \beta_1 AFBIAS_{jt-1} + \beta_2 SPRD_{jt-1} + \beta_3 LIFE_{jt} + \beta_4 Local_{jt} + \beta_5 Global_t + \beta_6 \alpha_t + \beta_7 \alpha_j + \epsilon_{jt} \quad (6)$$

Results from the VAR model are presented in Table 5 (using the EMBIG sample). We find that *AFBIAS* Granger-causes *SPRD* (Columns I and II) although the coefficients are smaller in magnitude as compared to our earlier results.[23] However, we do not find that *SPRD* Granger-causes *AFBIAS*.

[….Insert Table 5 here….]

[22] Gelos and Wei (2005) and Statman et al. (2006) amongst others use VAR models to examine endogeneity.
[23] This is expected as the model specification has completely alternated to address the endogeneity issue.

We further use the two-stage least square (2SLS) technique using an instrumental variable for *AFBIAS*. Empirical evidence shows that investors tend to invest more in familiar assets, ignoring optimal asset allocation to some extent (Huberman, 2001). We represent familiarity by the first principal component of three variables: mobile usage per 100; broadband usage per 100; and telephone usage per 100. For all the host countries, these three variables are sourced from the World Development Indicators of the World Bank. The intuition is that having higher usage of digital information and communication would lead to higher informational linkage, thus enhancing familiarity of the host markets (Portes et al., 2001; Forbes, 2010, amongst others). Based on this familiarity literature, we argue that having higher scores on these aspects makes a country more familiar to the rest of the world, encouraging more foreign bias. Results from the 2SLS regression, presented in Table 6, show that *AFBIAS* is still negatively significant, consistent with our overall results.[24]

[….Insert Table 6 here….]

As a final step to address endogeneity, we undertake a shock-based natural experiment exploiting the recent Euro debt crisis as an exogenous shock. Given the nature of shock affecting Eurozone countries (see sections 3.5 and 3.6), we conduct this experiment only for EMU markets. The experiment and results are discussed in section 3.6.

3.4 Alternative data source – CPIS

We use alternative cross-border holdings of long-term debt data from CPIS to obtain a measure of foreign bias for global markets. As of December 2014, CPIS provides cross-

[24] The Sargan test does not reject the null of correlation between the instrument and the error term with a p-value of 0.35.

border bond holdings from 80 source countries into roughly 240 host countries. The country benchmark from BIS is available on a quarterly basis, but bond holding figures from CPIS are available only on an annual basis.[25] Therefore we have to construct the CPIS-based *AFBIAS* measure annually for this alternative test.

We repeat our baseline regression (specification 4) with the measure of *AFBIAS* constructed using data from CPIS. The results (not shown for brevity but available on request) support our key finding that *AFBIAS* is negatively related with *SPRD*.[26]

3.5 Spread and foreign bias using developed market data (EMU markets)

AFBIAS constructed from CPIS also allows us to extend empirical analysis to developed markets. As EMBIG/EMBIP data are available only for emerging markets, we use the YTM of euro-denominated debt available for 11 EMU countries including Germany. Using Germany as the yardstick, we calculate the spread (*SPRD_EMU)* for the 10 remaining EMU countries by subtracting the YTM of Germany from that of the respective countries (Ebner, 2009). By using just the euro-denominated bonds for the YTM, we are able to exploit a relatively cleaner measure of spread devoid of exchange rate volatility and inflation. Focusing just on the EMU market also carries additional benefit by allowing us to conduct a quasi-natural experiment, as discussed in section 3.3. We re-run specification (4) by using *SPRD_EMU* and *AFBIAS* for 10 EMU members only (excluding Germany). As such, both *EFRisk* and *PRisk* scores are taken as the differences from those of Germany (instead of the US).

[….Insert Table 7 here….]

[25] CPIS data are available on a half-yearly basis from 2013 onwards.
[26] We correct standard errors using the Newey-West method.

The results presented in Table 7 are consistent with our main results. A strict interpretation of Model VI suggests that a unit increase in *AFBIAS* measure is associated with a reduction of 378 bps in *SPRD_EMU*. This is high compared to our earlier results. This could possibly be attributed to significant movement in *AFBIAS* and *SPRD_EMU* measures in different directions, especially for GIIPS countries after the Eurozone debt crisis, as can be seen in Figure 1 and 2. These two figures show that the GIIPS countries experienced a dramatic increase in their spread compared to non-GIIPS euro countries. This is also accompanied by a significant drop in the measure of foreign bias for GIIPS countries. The average 378 bps coefficient is thus capturing the covariation between *AFBIAS* and *SPRD_EMU*.

[….Insert Figure 1 and 2 here….]

We note in passing that the *SPRD_EMU* of EMU countries in our sample is strongly linked to economic and financial risk (*EFRisk*) but less so to global factors (*GBL*) and political risk (*PRisk*). We run further robustness tests for these results for EMU markets by replacing *AFBIAS* by its lagged value by one period in specification (4) and also by running a VAR model as shown in specifications (5) and (6). The results are not shown for brevity (but are available from the authors on request) are consistent with our key findings.

3.6 Difference in differences (DID) analysis

Reporting interesting developments in the sovereign debt crisis in Europe, Acharya et al. (2016) note that the stress-test held in 2010 of 91 European banks reveals evidence of significant home bias, i.e. lower foreign bias, in that local banks held a substantial portion of their own government bonds. Such suboptimal investments were highest for countries with greatest risk of government debt default, i.e. Greece, Ireland, Italy, Portugal and Spain (GIIPS). Thus, the Eurozone debt crisis provides an excellent set-up to conduct a quasi-

natural experiment using the DID technique to investigate whether the exogenous shock, which triggered changes in foreign bias, had any impact on cost of debt. We choose 2009 as the start of the Eurozone debt crisis due to the fact that the global financial crisis had already peaked and started to transform into sovereign debt crisis in the EMU countries by mid-2009 (Afonso et al., 2015). We treat the Eurozone crisis as an exogenous shock that impacted on the *AFBIAS* of two different sets of EMU countries in different ways. As evident from Figure 2, the GIIPS countries were more severely affected by the crisis and witnessed a significant drop in *AFBIAS* measures after the start of the crisis whereas the *AFBIAS* of the other five EMU countries (control countries) in our sample remained relatively steady, even after the onset of the crisis (see Figure 2). Following theoretical prediction, this decline (change) in the *AFBIAS* trend of GIIPS should lead to higher spread for GIIPS after controlling for any other factors that might affect *SPRD_EMU*. To put this argument to the test, we run the regression as shown in specification ((7):

$$SPRD\_EMU_{jt} = \beta_1(Giips * Post) + \Omega_1\, Giips + \Omega_2\, Post + \beta_2 LIFE_{jt} + \beta_3 Local_{jt} + \beta_4 Global_t + \beta_5\alpha_t + \beta_6\alpha_j + \epsilon_{jt} \quad (7)$$

where *Giips* is a dummy variable equalling one for GIIPS, also known as "treated" (0 otherwise), and *Post* is a dummy equal to one for time periods starting from 2009 (0 otherwise). If the exogenous shock in the form of crisis subdued the *AFBIAS* measures in the most affected countries (i.e. GIIPS), it would lead to higher *SPRD_EMU* in such treated countries relative to the "control" countries. In equation ((7), since *Giips* is the treatment, we expect β_1 to be positive to indicate that *SPRD_EMU* increased relatively more for the GIIPS countries' debt as a result of the exogenous shock that reduced the *AFBIAS* measure.

[….Insert Table 8 here….]

Results from specification ((7) are presented in Table 8. As expected, the coefficient for the DID effect (i. e. $Giips * Post$) is positive and statistically significant even after controlling for a range of country-specific and global variables that might affect *SPRD_EMU*. Our results provide support to the notion that the decline in *AFBIAS*, due to the Eurozone crisis, led to an increase in bond spread for GIIPS countries more than for the control countries. In quantitative terms, we find that the DID effect is roughly 433 bps for the GIIPS countries, reflecting the severity of the effect of the crisis on these countries' bond spreads.

3.7 Country-specific liquidity effects

Finally, we consider the effect of market-specific liquidity in our basic regression model by replacing the EMBIG spread in our baseline regression by spread from the EMBIP series, which is composed of homogeneously more liquid bonds. Results (not shown but available from the authors on request) show that the overall finding in this step-wise regression is consistent with our results in Table 3. Due to the availability of EMBIP across a narrower set of countries, the number of observation decreases substantially (compared to Table 3). The influence of *AFBIAS* on *SPRD* is in the expected direction and similar to our main result but the degree of impact is much more pronounced in comparison to Table 3.

We also test the spreads from EMBIP with the same robustness tests, as discussed in Section 3.3. These results show that our key findings remain essentially the same (not shown for brevity, but available from the authors on request). These findings alleviate any concerns that may arise due to the difference in bond market liquidity among our sample countries.

3.8 Other robustness tests [27]

We note that periods of sovereign defaults can also have a substantial impact on the spreads of defaulting countries. Recent evidence shows that the intensity of default and associated cost to investors, rather than just default *per se*, impacts on the cost of capital for emerging market governments (Cruces and Trebesch, 2013). In our sample, six countries have defaulted during the sample (for a total of eight times).[28] Therefore we include a dummy variable for periods of default as a control variable in equation (4). This does not lead to any significant change in our main results in Table 3 (the results are available from the authors on request).

So far, we have used data from ICRG for *EFRisk* and *PRisk* in our analysis. We now use alternative dataset to capture economic and political risk. We take GDP per capita growth (annual %) as a measure of economic risk from World Bank Development Indicators and subtract the measures from corresponding US figures for that year to get a measure of difference in growth of GDP per capita (*GDPph*). We replace political risk by governance index constructed as the aggregate of six different risks, namely i) Control of Corruption, ii) Government Effectiveness, iii) Political Stability and Absence of Violence/Terrorism, iv) Regulatory Quality, v) Rule of Law, and vi) Voice and Accountability taken from World Bank Governance Indicators (WBGI). All these measures are provided on a scale of (approximately) -2.5 to +2.5 with higher score denoting more favourable measure. These aggregate figures are then subtracted from the US aggregate figure for the year to get our measure of governance index (*Gov Indx*) for a country for a given year. We replace *EFRisk*

[27] We thank anonymous referees for these suggestions.

[28] Defaulting countries are Argentina (once in 2005), Dominican Republic (twice in 2005), Ecuador (once in 2009), Ivory Coast (2010 and 2012), Iraq (2006) and Uruguay (once in 2003). Data are from Cruces and Trebesch (2013) with the updated file available at https://sites.google.com/site/christophtrebesch/data

and *PRisk* by *GDPph* and *Gov Indx* in our baseline regression of specification (4) and provide the results in Table 9.

In column I, *GDPph* enters the regression in the expected direction with statistical significance denoting that the lower the *GDPPh* is for a country compared to USA, the higher the SPRD tends to be. *Gov Indx* in column II also exhibits statistically significant impact in the expected direction. Introduction of time dummies in column III does not lead to any material change in the overall results. In column IV, we re-introduce *EFRisk* and *PRisk* along with the GDPph and WBGI variable. The results yield insignificant *GDPph,*[29] however the variable of interest *AFBIAS* is consistent with earlier findings.

Further, as mentioned in Section 2.2, most of the funds used in our data for emerging markets are domiciled in USA and Luxembourg; thus our measure of *AFBIAS* and the results so far could be influenced by the strategies adopted by the funds domiciled in these two countries. To mitigate this concern, we recalculate measure of *AFBIAS* by excluding all the funds domiciled in USA and Luxembourg and re-run (specification 4). The results (available on request) remain essentially the same.

For EMU countries, we further use data from CPIS and BIS to construct home bias measure in line with Chan et al. (2005). Home bias is expected to be positively associated with cost of capital (Adler and Dumas, 1983; Lau et al., 2010; Lewis, 1999). Untabulated results (available on request) support this notion and show that home bias (for the 10 EMU countries in our sample) is economically and statistically associated with cost of debt. However, when we use home bias measure for emerging markets to conduct a similar test, we do not find statistically significant results. This is because the home bias measure constructed

[29] One possible reason is because *EFRisk* also captures the potential macro-economic and financial risks and hence the effect of *GDPph* is captured in this measure.

using CPIS data is possibly noisier for emerging markets than developed markets. Specifically, CPIS provides data for cross-border holdings only; and domestic bond holdings by domestic investors – which is needed to construct the measure of home bias – have to be derived using the cross-border allocation figures.[30] This introduces noise at various levels. This phenomenon is arguably less severe in case of developed markets (and the EMU markets in our sample) who may have a better reporting standards, more uniform approach in reporting investment figures to IMF, and have a better chance of their debt instruments (owned by non-residents) being reported correctly in CPIS owing to their relatively better-developed bond markets.

4 Conclusion

It is well recognized in the finance literature that barriers to international investments compel portfolio investors to deviate from the normative prediction of optimal allocation in a foreign country (known as foreign bias). Theory further notes that varying degrees of foreign biases differentially affect the degree of market integration and thus international risk sharing. This suggests that higher levels of foreign bias (i.e. over-allocation relative to benchmark) towards a host market should boost global risk sharing, which should further lead to a lower cost of capital. However, studies examining the implications of such suboptimal allocations are scarce and focus mainly on equity investments. This paucity of studies in the literature, along with room for methodological improvements, motivates us to examine whether foreign biases

[30] It is mandatory for participating countries to report their foreign holdings (assets issued by non-residents but held by domestic residents) in long-term bonds and equities separately, while reporting of liabilities held by domestic investors is optional. It is however not necessary for all countries to use the same data collection systems, which can be customized to suit their own needs. For details, see http://www.imf.org/external/pubs/ft/cpis/2002/

observed by foreign bond portfolio investors are related to the lower cost of debt for the host market.

We test our research question using sovereign debt yield spread as a measure of cost of debt, and using the standard measure of foreign bias. The results show that a higher degree of foreign bias, i.e. preference to over-allocate relative to the implied benchmark, has significant implications for the yield spreads of sovereign bonds. Specifically, we find that costs of debt across countries are strongly and negatively related to foreign bias. The statistical and economic significance of our results hold even after a number of robustness checks.

The results of our study hold important policy implications, particularly for the capital constrained emerging markets. The negative association between spread and foreign bias suggests that policymakers should strive to reduce barriers to inward foreign portfolio investments which would allow foreign investors to optimally hold the host country's share of allocation in their portfolios. This should help reduce the cost of sovereign debt and that of tradable corporate bonds. Given that the current global bond outstanding stands roughly at USD 100 trillion, reduction of bond spread by even a few bps has the potential to translate into significant savings and encourage capital investments.

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Table 1: Summary Statistics

Country	I SPRD (bps)	II AFBIAS	III LIFE	IV ER (0-50)	V FR (0-50)	VI PR (0-100)
Argentina	1764.71	0.34	18.9	36.68	34.62	65.60
Azerbaijan	283.95	1.76	6.3	37.29	48.18	60.90
Belarus	844.96	2.15	3.8	30.28	29.96	55.25
Bolivia	293.89	1.67	9.1	39.51	45.82	58.02
Brazil	372.93	-0.26	14.0	36.23	36.76	66.86
Bulgaria	187.15	1.74	5.8	34.37	35.11	68.94
Chile	134.63	0.06	9.3	40.15	38.80	77.88
China	118.96	-3.76	6.8	40.02	47.03	65.36
Colombia	274.61	1.16	11.8	35.51	38.15	58.48
Costa Rica	337.40	2.56	13.0	35.14	39.93	72.02
Croatia	211.67	-0.29	5.1	34.70	34.44	73.67
Dominican Republic	542.33	3.07	7.4	34.94	36.89	65.44
Ecuador	963.07	1.77	12.2	35.55	37.62	55.40
Egypt	263.91	1.38	7.3	31.61	40.55	57.71
El Salvador	341.37	2.14	17.0	34.23	37.07	66.64
Gabon	410.63	1.47	7.5	44.01	44.30	58.90
Georgia	551.53	1.23	6.2	n/a	n/a	n/a
Ghana	560.43	3.45	7.1	30.53	36.38	65.74
Guatemala	261.03	2.24	10.7	34.72	39.00	60.44
Hungary	209.06	0.17	7.1	34.55	33.08	77.20
India	223.78	-1.20	6.3	33.04	40.47	59.14
Indonesia	282.09	1.15	13.4	36.78	38.76	58.04
Iraq	549.08	2.58	13.5	34.17	40.72	39.26
Ivory Coast	1948.73	2.03	10.1	35.97	38.60	48.56
Jamaica	593.91	1.29	20.1	27.78	33.44	72.07
Kazakhstan	419.42	3.07	8.2	37.40	34.50	69.79
Latvia	154.70	1.85	5.3	37.95	25.32	71.69
Lebanon	416.19	-1.13	5.4	28.98	30.96	56.73
Lithuania	241.96	2.10	6.5	33.81	33.50	72.14
Malaysia	139.56	-0.23	7.4	40.55	42.60	73.64
Mexico	204.71	0.88	14.5	36.59	39.92	70.38
Morocco	146.81	1.89	4.1	34.91	40.55	69.80
Namibia	259.98	2.17	8.3	33.27	36.30	75.26
Nigeria	532.72	3.09	8.3	35.21	43.86	43.89
Pakistan	612.49	-1.66	4.9	32.57	38.09	46.72
Paraguay	252.13	1.74	12.5	36.02	41.46	58.04
Peru	250.74	1.81	15.0	38.40	40.90	63.02
Philippines	280.44	1.00	12.5	37.50	40.00	62.62
Poland	129.11	-0.47	7.2	36.70	36.38	77.05
Romania	265.07	2.11	10.2	35.53	34.85	65.28
Russia	251.22	1.28	9.3	39.61	43.93	63.35
Slovakia	111.50	-2.38	8.0	39.56	35.52	73.91
South Africa	194.62	-0.15	7.9	35.02	38.33	67.22
Sri Lanka	558.61	2.03	5.4	32.80	36.75	55.91
Trinidad and Tobago	210.67	1.39	5.8	39.18	46.08	69.38
Turkey	333.08	0.79	11.9	32.69	32.57	60.12
Ukraine	654.73	2.37	4.9	32.98	35.88	63.76
Uruguay	377.21	2.28	18.3	35.92	33.85	71.86
Venezuela	880.68	2.25	13.4	32.71	41.61	48.60
Vietnam	301.53	1.51	6.9	32.92	39.57	64.91
Average	**445.63**	**1.06**	**9.8**	**35.33**	**38.02**	**63.96**

Note: This table presents quarterly averages from (3rd quarter of 2002 to 4th quarter of 2014) of key variables for host country *j*. *SPRD* is the measure of sovereign bond spreads obtained from JP Morgan's EMBI Global. Average foreign bias (*AFBIAS)* reflects the deviation of country *j*'s share in bond holdings for emerging-market-focused mutual funds *i* ($w_{i\,j}$, $i \neq j$) from the world bond market capitalization weight of country *j* (w^*_j). AFBIAS is calculated as the natural log of ($w_{i\,j} / w^*_j$). *LIFE* is the average years remaining to maturity for constituent bonds. Economic Risk (*ER*) is the sum of five ICRG components reflecting various economic risks; similarly, Financial Risk (*FR*) is the sum of five components reflecting various financial risks of country *j*; and Political Risk (*PR*) is the sum of 12 components reflecting various political risks.

Table 2: Correlation of Key Variables

(784 observations)	SPRD (EMBI Plus)	SPRD (EMBI Global)	AFBIAS	LIFE	ER	FR	PR
SPRD (EMBI Plus)	1						
SPRD (EMBI Global)	0.997*	1					
AFBIAS	-0.056*	-0.061*	1				
LIFE	0.061	0.063	-0.067	1			
ER	-0.252*	-0.254*	-0.050	0.253*	1		
FR	-0.405*	-0.408*	0.178*	0.063	0.433*	1	
PR	-0.282*	-0.269*	-0.351*	-0.109*	0.274*	-0.136*	1

Note: This table presents correlation matrix of the key variables used in this study. *SPRD* is the measure of sovereign bond spreads obtained from JP Morgan's EMBI Plus and EMBI Global. Average foreign bias (*AFBIAS)* reflects the deviation of country *j*'s share in bond holdings for emerging-market-focused mutual funds *i* ($w_{i\,j,\ i \neq j}$) from the world bond market capitalization weight of country *j* ($w^*_{\,j}$). AFBIAS is calculated as the natural log of ($w_{i\,j} / w^*_{\,j}$). *LIFE* is the average years remaining to maturity for constituent bonds in the EMBI Index for country *j*. Economic Risk (*ER*) is the sum of five components from International Country Risk Guide (ICRG) reflecting various economic risks of country *j*, namely, i) GDP per capita, ii) real GDP growth, iii) annual inflation, iv) budget balance to GDP ratio, and v) current account to GDP ratio; Financial Risk (FR) is the sum of five components from ICRG reflecting various financial risks of country *j*, namely i) foreign debt to GDP, ii) foreign debt service to exports, iii) current account to exports, iv) international reserve as months of import cover, and v) exchange rate stability; and Political Risk (*PR*) is the sum of 12 components from ICRG reflecting various political risks of country *j*, namely i) government stability, ii) socioeconomic conditions, iii) investment profile, iv) internal conflict, v) external conflict, vi) corruption, vii) military in politics, viii) religious tensions, ix) law and order, x) ethnic tensions, xi) democratic accountability, and xii) bureaucracy quality. Statistical significance, at the minimum conventional level of 5% is denoted by an asterisk (*).

Table 3: Regression of Sovereign Bond Spread on Foreign Bias

	I	II	III	IV	V	VI
AFBIAS	-83.352***	-77.461***	-85.320***	-65.825***	-67.796***	-64.547***
	(-3.12)	(-3.21)	(-3.29)	(-3.45)	(-3.52)	(-3.14)
LIFE		-46.888	-40.813	-26.472	-25.334	-78.032
		(-0.84)	(-0.70)	(-0.48)	(-0.47)	(-1.14)
GBL			337.913***	294.024***	280.818***	
			(5.43)	(7.21)	(6.69)	
EFRisk				793.520***	785.015***	671.309***
				(5.17)	(4.86)	(4.43)
PRisk					186.167**	354.902***
					(2.21)	(5.54)
Country Fixed Effects	YES	YES	YES	YES	YES	YES
Time Fixed Effects						YES
Constant	536.222***	631.421***	648.664***	646.499***	548.909***	171.634
	(9.25)	(5.03)	(3.14)	(3.05)	(3.44)	(0.97)
Adjusted R-square	0.448	0.449	0.497	0.510	0.512	0.544
Number of observations	1737	1736	1736	1678	1678	1644

Note: This table shows regression results in which the dependent variable is sovereign bond spread (SPRD) for country *j*. The key independent variable is average foreign bias (*AFBIAS)* which reflects the deviation of country *j*'s share in bond holdings for emerging-market-focused mutual funds *i* ($i \neq j$) ($w_{i\,j}$) from the world bond market capitalization weight of country *j* ($w^*_{\,j}$). *AFBIAS* is calculated as the natural log of ($w_{i\,j} / w^*_{\,j}$). Control variables include: i) bond-specific time remaining to maturity in years expressed in natural log form (*LIFE*); ii) global macroeconomic variable taken as the difference between Barclays Corporate High Yield and Barclays US Treasury, expressed in natural log form (*GBL*); iii) economic and financial risk of country *j* expressed as the natural log of (100 – ER – FR) less the comparable figure of USA (*EFRisk*); and iv) political risk of country *j* expressed as the natural log of (100 – PR) less the comparable figure of USA (*PRisk*). ER is the raw score from ICRG representing Economic Risk; FR is the raw score from ICRG reflecting financial risk; and PR is the raw score from ICRG reflecting political risk of country *j*. Data are quarterly and are from 3rd quarter of 2002 to 4th quarter of 2014. All models report results with the standard errors corrected for heteroscedasticity, autocorrelation, and spatial dependence using the Driscoll and Kraay (1998) approach. Statistical significance is reported against 10% (*), 5% (**) and 1% (***) significance levels. *t*-statistics are shown in brackets.

Table 4: Regression of Sovereign Bond Spread on Lagged Value of Foreign Bias

	I	II	III	IV	V	VI
AFBIAS (lag 1)	-84.602***	-78.251**	-81.416***	-61.472***	-63.560***	-66.193***
	(-2.70)	(-2.61)	(-2.95)	(-2.78)	(-2.83)	(-2.88)
LIFE		-51.721	-45.684	-29.217	-27.444	-44.956
		(-0.87)	(-0.75)	(-0.49)	(-0.47)	(-0.76)
GBL			342.361***	293.297***	279.637***	
			(5.34)	(7.06)	(6.58)	
EFRisk				802.772***	795.210***	683.409***
				(4.89)	(4.61)	(4.20)
PRisk					188.627**	359.100***
					(2.14)	(5.47)
Country Fixed Effects	YES	YES	YES	YES	YES	YES
Time Fixed Effects						YES
Constant	539.516***	644.601***	516.755***	186.283***	221.409***	132.582
	(8.91)	(4.79)	(3.44)	(3.38)	(3.48)	(1.03)
Adjusted R-square	0.453	0.454	0.503	0.513	0.515	0.548
Number of observations	1693	1692	1692	1635	1635	1603

Note: This table shows the regression results in which the dependent variable is sovereign bond spread (*SPRD*) for country *j*. The key independent variable is the lagged value of average foreign bias (*AFBIAS)* which reflects the deviation of country *j*'s share in bond holdings for emerging-market-focused mutual funds *i* ($i \neq j$) (w_{ij}) from the world bond market capitalization weight of country *j* (w^*_j). *AFBIAS* is calculated as the natural log of (w_{ij} / w^*_j). Control variables include: i) bond-specific time remaining to maturity in years expressed in natural log form (*LIFE*); ii) global macroeconomic variable taken as the difference between Barclays Corporate High Yield and Barclays US Treasury, expressed in natural log form (*GBL*); iii) economic and financial risk of country *j* expressed as the natural log of (100 – ER – FR) less the comparable figure of USA (*EFRisk*); and iv) political risk of country *j* expressed as the natural log of (100 – PR) less the comparable figure of USA (*PRisk*). ER is the raw score from ICRG representing Economic Risk; FR is the raw score from ICRG reflecting financial risk; and PR is the raw score from ICRG reflecting political risk of country *j*. Data are quarterly and are from 3rd quarter of 2002 to 4th quarter of 2014. All models report results with the standard errors corrected for heteroscedasticity, autocorrelation, and spatial dependence using the Driscoll and Kraay (1998) approach. Statistical significance is reported against 10% (*), 5% (**) and 1% (***) significance levels. *t*-statistics are shown in brackets.

Table 5: Vector Autoregression of Sovereign Spread and Foreign Bias

	I SPRD	II SPRD	III AFBIAS	IV AFBIAS
SPRD (lag 1)	0.836***	0.849***	0.000	0.000
	(10.92)	(11.75)	(1.04)	(0.44)
AFBIAS(lag 1)	-27.746**	-19.775*	0.876***	0.870***
	(-2.39)	(-1.90)	(39.60)	(39.36)
LIFE	-23.821	-16.327	0.086**	0.085**
	(-0.92)	(-0.69)	(2.26)	(2.10)
GBL	199.731***		0.024	
	(3.06)		(0.97)	
EFRisk	173.439**	137.078**	-0.112**	-0.115**
	(2.12)	(2.28)	(-2.30)	(-2.09)
PRisk	108.190*	125.321*	-0.025	0.005
	(1.72)	(1.89)	(-0.41)	(0.04)
Country Fixed Effects	YES	YES	YES	YES
Time Fixed Effects		YES		YES
Constant	526.279**	775.305***	0.224	0.473
	(2.08)	(3.18)	(1.09)	(1.69)
Adjusted R-square	0.825	0.862	0.935	0.953
Number of observations	1635	1603	1613	1592

This table presents the results of the Vector Auto Regression (VAR) model to model country *j*'s sovereign spread (SPRD) and average foreign bias (AFBIAS) as endogenously determined dependent variables. *AFBIAS* reflects the deviation of country *j*'s share in bond holdings for emerging-market-focused mutual funds *i* ($i \neq j$) (w_{ij}) from the world bond market capitalization weight of country *j* (w^*_j). *AFBIAS* is calculated as the natural log of (w_{ij} / w^*_j). Exogenous variables include: i) bond-specific time remaining to maturity in years expressed in natural log form (*LIFE*); ii) global macroeconomic variable taken as the difference between Barclays Corporate High Yield and Barclays US Treasury, expressed in natural log form (*GBL*); iii) economic and financial risk of country *j* expressed as the natural log of (100 – ER – FR) less the comparable figure of USA (*EFRisk*); and iv) political risk of country *j* expressed as the natural log of (100 – PR) less the comparable figure of USA (*PRisk*). ER is the raw score from ICRG representing Economic Risk; FR is the raw score from ICRG reflecting financial risk; and PR is the raw score from ICRG reflecting political risk of country *j*. Data are quarterly and are from 3rd quarter of 2002 to 4th quarter of 2014. All models report results with the standard errors corrected for heteroscedasticity, autocorrelation, and spatial dependence using the Driscoll and Kraay (1998) approach. Statistical significance is reported against 10% (*), 5% (**) and 1% (***) significance levels. *t*-statistics are shown in brackets.

Table 6: Two-Stage Least Squares Regression of Sovereign Bond Spread on Foreign Bias

	I 1st stage	II 2nd stage
Familiarity	0.134*** (3.34)	
AFBIAS		-94.706*** (-4.82)
LIFE	0.591 (1.37)	359.152*** (5.49)
EFRisk	0.234 (1.47)	1010.092*** (5.82)
PRisk	0.083 (0.41)	376.261*** (3.92)
Country Fixed Effects	YES	YES
Time Fixed Effects	YES	YES
Constant	-0.811 (-1.17)	129.755*** (5.91)
Adjusted R-square	0.837	0.513
Number of observations	1412	1412

Note: This table presents results from two-stage least square (2SLS) regression. The dependent variable is sovereign bond spread (*SPRD*) for country *j*. The key independent variable is average foreign bias (*AFBIAS)* which reflects the deviation of country *j*'s share in bond holdings for emerging-market-focused mutual funds *i* ($i \neq j$) (w_{ij}) from the world bond market capitalization weight of country *j* (w^*_j). *AFBIAS* is calculated as the natural log of (w_{ij} / w^*_j). AFBIAS is instrumented by familiarity level (*Familiarity*) with country *j* which is taken as the first principal component of country *j*'s mobile usage per 100, telephone usage per 100, and broadband usage per 100. Control variables include: i) bond-specific time remaining to maturity in years expressed in natural log form (*LIFE*); ii) global macroeconomic variable taken as the difference between Barclays Corporate High Yield and Barclays US Treasury, expressed in natural log form (*GBL*); iii) economic and financial risk of country *j* expressed as the natural log of (100 – ER – FR) less the comparable figure of USA (*EFRisk*); and iv) political risk of country *j* expressed as the natural log of (100 – PR) less the comparable figure of USA (*PRisk*). ER is the raw score from ICRG representing Economic Risk; FR is the raw score from ICRG reflecting financial risk; and PR is the raw score from ICRG reflecting political risk of country *j*. Data are quarterly and are from 3rd quarter of 2002 to 4th quarter of 2014. All models report results with the standard errors corrected for heteroscedasticity, autocorrelation, and spatial dependence using the Driscoll and Kraay (1998) approach. Statistical significance is reported against 10% (*), 5% (**) and 1% (***) significance levels. *t*-statistics are shown in brackets.

Table 7: Regression of Sovereign Bond Spread on Foreign Bias for EMU countries

	I	II	III	IV	V	VI
AFBIAS	-493.923***	-505.102***	-499.496***	-408.311***	-418.409***	-378.2**
	(-3.86)	(-3.95)	(-4.01)	(-3.85)	(-3.54)	(-3.22)
LIFE		427.621	402.838	118.508	118.635	170.3
		(0.85)	(0.78)	(0.20)	(0.21)	(0.25)
GBL			42.661	18.115	19.678	
			(1.43)	(0.87)	(0.91)	
EFRisk				348.822***	370.217**	188.10**
				(3.89)	(3.25)	(2.59)
PRisk					-53.425	-30.70
					(-0.53)	(-0.28)
Country Fixed Effects	YES	YES	YES	YES	YES	YES
Time Fixed Effects						YES
Constant	-43.083	-519.721	-542.223	-295.310	-303.605	-248.38
	(-1.57)	(-1.00)	(-1.05)	(-0.51)	(-0.54)	(-0.42)
Adjusted R-square	0.424	0.428	0.430	0.486	0.487	0.526
Number of observations	127	127	127	127	127	127

Note: This table shows the regression results in which the dependent variable is 10-year sovereign bond spread (*SPRD_EMU*) for Eurozone country *j* against that of Germany. The key independent variable is average foreign bias (*AFBIAS)* which reflects the deviation of country *j*'s share in the bond holdings of source countries *i* ($i \neq j$) ($w_{i\,j}$) from the world bond market capitalization weight of country *j* ($w^*_{\,j}$). *AFBIAS* is calculated as the natural log of ($w_{i\,j} / w^*_{\,j}$). Control variables include: i) bond-specific time remaining to maturity in years expressed in natural log form (*LIFE*); ii) global macroeconomic variable taken as the difference between Barclays Corporate High Yield and Barclays US Treasury, expressed in natural log form (*GBL*); iii) economic and financial risk of country *j* expressed as the natural log of (100 – ER – FR) less the comparable figure of Germany (*EFRisk*); and iv) political risk of country *j* expressed as the natural log of (100 – PR) less the comparable figure of Germany (*PRisk*). ER is the raw score from ICRG representing Economic Risk; FR is the raw score from ICRG reflecting financial risk; and PR is the raw score from ICRG reflecting political risk of country *j*. Data are yearly and are from 2001 to 2013. Countries include Austria, Belgium, Finland, France, **Greece**, **Ireland**, **Italy**, Netherlands, **Portugal**, and **Spain** with GIIPS countries in bold. All models report results with the standard errors corrected using Newey and West (1987) approach. Statistical significance is reported against 10% (*), 5% (**) and 1% (***) significance levels. *t*-statistics are shown in brackets.

Table 8: Regression of Sovereign Bond Spread on Foreign Bias for EMU countries – Difference-in-Difference

	I	II	III
Giips * Post	429.932***	440.478***	433.379***
	(3.72)	(3.78)	(3.51)
Post	46.714***	-31.842	-133.984
	(5.77)	(-1.08)	(-1.39)
LIFE		-592.804	-237.621
		(-0.92)	(-0.36)
GBL		28.114	
		(0.34)	
EFRisk		319.667**	177.339
		(2.40)	(1.22)
PRisk		-83.883	-26.691
		(-0.92)	(-0.31)
Country Fixed Effects	YES	YES	YES
Time Fixed Effects			YES
Constant	14.402**	351.193	-2.764
	(2.36)	(0.95)	(-0.50)
Adjusted R-square	0.464	0.493	0.534
Number of observations	127	127	127

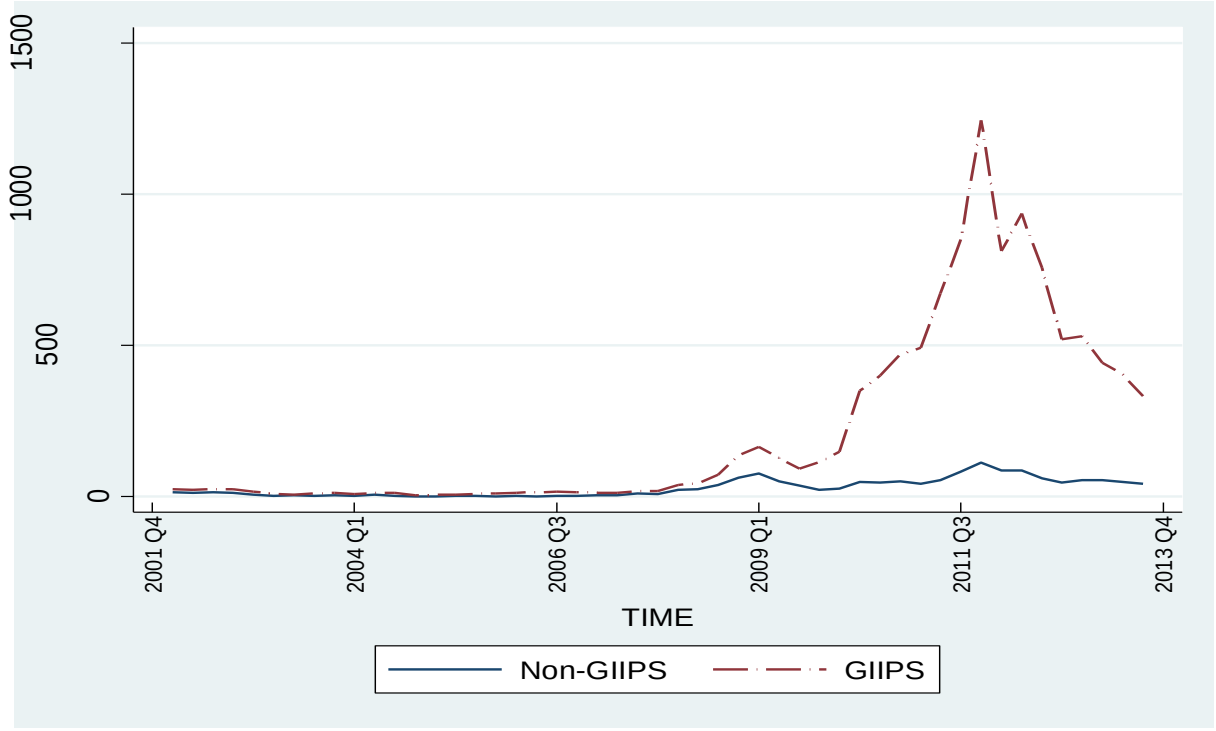
Note: This table shows the regression results in which the dependent variable is 10-year sovereign bond spread (*SPRD_EMU*) for Eurozone country *j* against that of Germany. Variables of interest include *Giips***Post* which is a multiplicative term of *Giips* and *Post*. *Giips* is a dummy of 1 for five GIIPS countries, otherwise 0. *Post* is a dummy equal to 1 if time period ≥ 2009 Q1, otherwise 0. Control variables include: i) bond-specific time remaining to maturity in years expressed in natural log form (*LIFE*); ii) global macroeconomic variable taken as the difference between Barclays Corporate High Yield and Barclays US Treasury, expressed in natural log form (*GBL*); iii) economic and financial risk of country *j* expressed as the natural log of (100 – ER – FR) less the comparable figure of Germany (*EFRisk*); and iv) political risk of country *j* expressed as the natural log of (100 – PR) less the comparable figure of Germany (*PRisk*). ER is the raw score from ICRG representing Economic Risk; FR is the raw score from ICRG reflecting financial risk; and PR is the raw score from ICRG reflecting political risk of country *j*. Data are yearly and are from 2001 to 2013. Countries include Austria, Belgium, Finland, France, **Greece**, **Ireland**, **Italy**, Netherlands, **Portugal**, and **Spain** with GIIPS countries in bold. All models report results with the standard errors corrected using Newey-West (1997) approach. Statistical significance is reported against 10% (*), 5% (**) and 1% (***) significance levels. *t*-statistics are shown in brackets.

Table 9: **Regression of Sovereign Bond Spread on Foreign Bias – Alternative Data Source for Economic and Political Risk**

	I	II	III	IV
AFBIAS	-103.576***	-88.761***	-94.632***	-91.677***
	(-4.14)	(-3.53)	(-3.40)	(-3.54)
LIFE	-126.873	-145.309	-151.748	-165.454
	(-1.20)	(-1.55)	(-1.72)	(-1.42)
GBL	354.294***	342.811***		
	(5.78)	(7.03)		
GDPph	24.396**	22.702**	20.588**	7.918
	(2.27)	(2.28)	(2.21)	(1.18)
Gov Indx		234.140***	199.104***	93.341***
		(6.30)	(6.32)	(5.29)
EFRisk				722.936***
				(2.89)
PRisk				310.101**
				(2.59)
Country Fixed Effects	YES	YES	YES	YES
Time Fixed Effects			YES	YES
Constant	-377.521***	-374.266***	-369.778	118.654
	(-2.82)	(-5.86)	(-1.12)	(0.44)
Adjusted R-square	0.450	0.492	0.517	0.556
Number of observations	1128	1128	1100	1100

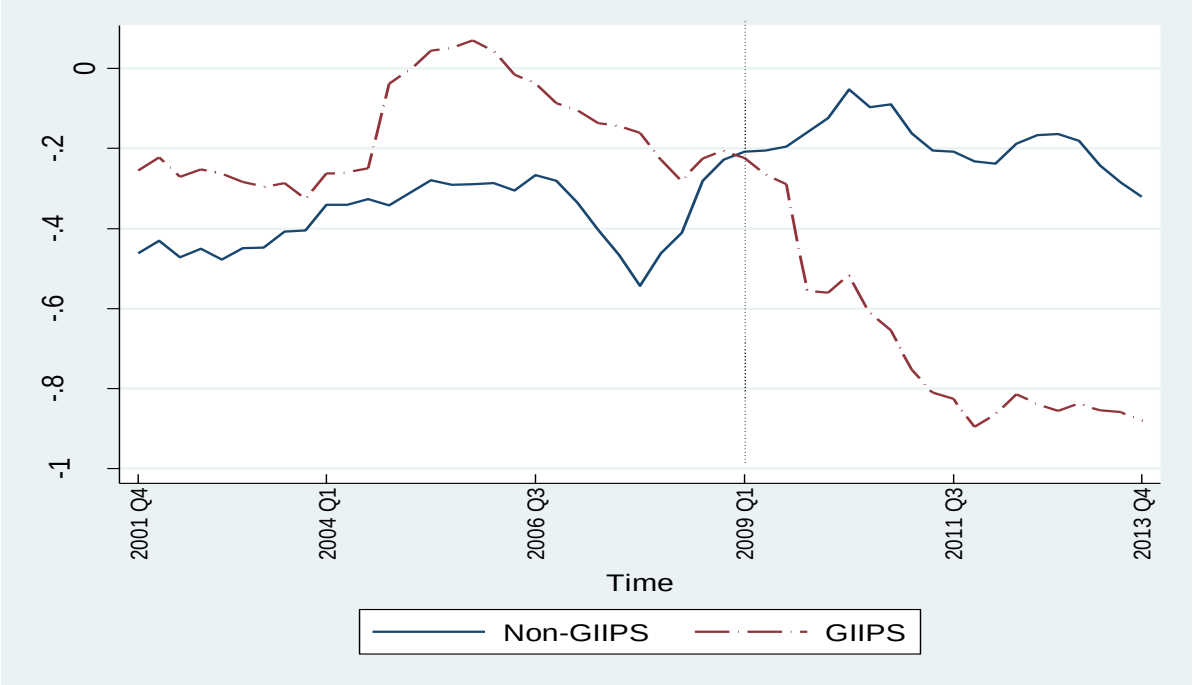
Note: This table shows regression results in which the dependent variable is sovereign bond spread (SPRD) for country *j*. The key independent variable is average foreign bias (*AFBIAS)* which reflects the deviation of country *j*'s share in bond holdings for emerging-market-focused mutual funds *i* ($i \neq j$) (w_{ij}) from the world bond market capitalization weight of country *j* (w^*_j). *AFBIAS* is calculated as the natural log of (w_{ij} / w^*_j). Control variables include: i) bond-specific time remaining to maturity in years expressed in natural log form (*LIFE*); ii) global macroeconomic variable taken as the difference between Barclays Corporate High Yield and Barclays US Treasury, expressed in natural log form (*GBL*); iii) GDP growth rate per capita (annual %) constructed by subtracting the figure for a country from that of US (*GDPph*); iv) governance index from World Bank Governance Indicators taken as a sum of six different risks and subtracted from that of USA (*Gov Indx*); v) economic and financial risk of country *j* expressed as the natural log of (100 – ER – FR) less the comparable figure of USA (*EFRisk*); and vi) political risk of country *j* expressed as the natural log of (100 – PR) less the comparable figure of USA (*PRisk*). ER is the raw score from ICRG representing Economic Risk; FR is the raw score from ICRG reflecting financial risk; and PR is the raw score from ICRG reflecting political risk of country *j*. Data are quarterly (except for *GDPph* and *Gov Indx* which are yearly) and are from 3rd quarter of 2002 to 4th quarter of 2014. All models report results with the standard errors corrected for heteroscedasticity, autocorrelation, and spatial dependence using the Driscoll and Kraay (1998) approach. Statistical significance is reported against 10% (*), 5% (**) and 1% (***) significance levels. *t*-statistics are shown in brackets.

Figure 1: Long Term Sovereign Bond Spread of GIIPS and Non-GIIPS Countries



Note: This figure shows the trend in the soverign spread (over German sovereign bonds) for the GIIPS and non-GIIPS EMU countries. Time 2009 Q1 corresponds to the quarter prior to the start of the Eurozone sovereign debt crisis. Source: Authors' calculation. Raw data obtained from Thompson Reuters.

Figure 2: Foreign Bias of GIIPS and Non-GIIPS Countries



Note: This figure shows the AFBIAS for GIIPS and non-GIIPS countries over time. Time 2009 Q1 corresponds to the quarter prior to the start of the Eurozone sovereign debt crisis. AFBIAS measures other than of year ends are calculated using interpolated (linear) CPIS data. Source: Authors' calculations. Raw data obtained from BIS and CPIS.

Appendix A: SPRD (from EMBIG) Over Different Time Periods

Country	2002-2006 Normal economic period	2007-2008 Global financial crisis	2009 - 2011 Eurozone sovereign debt crisis period	2012-2014 Post sovereign debt crisis period
Argentina	3,432.7	648.6	842.6	928.9
Azerbaijan				284.0
Belarus			994.1	770.4
Bolivia				293.9
Brazil	629.6	248.9	231.3	212.2
Bulgaria	152.6	222.5	287.9	114.6
Chile	98.7	170.1	149.6	149.8
China	63.7	128.1	143.6	171.1
Colombia	401.7	241.6	221.4	159.2
Costa Rica				337.4
Croatia	115.8	111.1	284.7	349.4
Dominican Republic	666.8	513.4	524.9	392.3
Ecuador	925.9	1,197.7	1,153.8	671.6
Egypt	151.3	195.1	264.9	477.7
El Salvador	271.7	309.6	397.5	411.0
Gabon		572.3	446.7	307.2
Georgia		1,009.5	610.2	378.4
Ghana		664.7	561.1	516.3
Guatemala				261.0
Hungary	50.3	159.1	345.3	344.3
India				223.8
Indonesia	252.4	348.6	295.0	252.1
Iraq	494.6	651.3	517.4	526.3
Ivory Coast	2,940.1	2,447.8	1,566.1	511.7
Jamaica		589.9	595.5	594.0
Kazakhstan		550.6	470.0	292.3
Latvia				154.7
Lebanon	424.4	511.3	364.8	392.0
Lithuania			319.1	184.1
Malaysia	115.7	154.5	168.9	136.1
Mexico	204.7	203.1	223.3	187.2
Morocco	189.5	72.4	72.4	206.9
Namibia			337.0	253.6
Nigeria	736.7	16.4	402.3	330.2
Pakistan	262.1	784.5	879.0	756.9
Paraguay				252.1
Peru	344.7	225.2	217.2	160.4
Philippines	396.3	269.8	242.0	152.1
Poland	62.3	119.9	198.3	138.4
Romania				265.1
Russia	174.3	262.0	303.9	268.2
Slovakia				111.5
South Africa	143.2	233.5	216.3	224.2
Sri Lanka		983.4	554.7	385.5
Trinidad and Tobago				210.7
Turkey	425.2	315.3	283.3	256.6
Ukraine	309.4	665.4	893.8	926.6
Uruguay	602.4	316.3	273.7	183.6
Venezuela	592.7	698.0	1,174.9	1,140.2
Vietnam	152.7	298.8	373.9	293.0