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Capital Flows and Sovereign Debt Markets: Evidence from Index Rebalancings*

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Abstract

In this paper we analyze how government bond prices and liquidity are affected by capital flows to the sovereign debt market. Additionally, we explore whether these flows spill over to the exchange rate market. To tackle endogeneity concerns, we construct a measure of information-free capital flows implied by mechanical rebalancings (FIR) from the largest local-currency government-debt index for emerging countries. We find that FIR is positively associated with the returns on government bonds and with the depth of the sovereign debt market in the aftermath of the rebalancings. These capital flows also impact on the exchange rate market: larger inflows (outflows) are associated to larger currency appreciations (depreciations).

JEL Classification: F32, G11, G12, G15, G23

Keywords: sovereign debt; international capital flows; index rebalancings; mutual funds; benchmark indexes; exchange rate

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1 Introduction

How do information-free international capital flows affect sovereign debt markets? Economic theory does not provide an unequivocal answer to this question. On the one hand, under the expectation hypothesis of the term structure of interest rates, changes in sovereign bond prices should only reflect changes in the expected default losses.[1] Thus, uninformative international capital flows should not affect sovereign debt prices. On the other hand, the preferred-habitat view of the term structure of interest rates predicts that changes in the demand for sovereign bonds may affect their prices.[2] Despite these stark theoretical predictions, there is little empirical evidence on the subject. In this paper we fill this gap by studying how international capital flows affect sovereign debt markets and to what extent these flows spill over to the exchange rate market.[3]

Understanding how capital flows affect sovereign debt markets is relevant for at least two reasons. First, sovereign debt markets are central to the macroeconomy of a country. Not only changes in the price and liquidity of sovereign debt securities affect the cost of financing for governments but they can also impact the extension of credit by financial institutions.[4] Second, international capital flows directed to sovereign debt markets have grown importantly in the last decade. Figure 1 depicts the cumulative gross inflows to emerging markets divided by the type of assets in both absolute and relative terms. Portfolio debt flows have overtaken portfolio equity flows in importance in the last decade, and their median growth rate has been higher than the growth of foreign direct investment inflows.[5]

In spite of its relevance, there has been little evidence on the relationship between capital flows

[1]Since in our paper we focus in emerging markets, we are adapting the notion of the expectation hypothesis of the term structure of interest rates for this type of countries. See for instance Broner et al. (2013).

[2]See for example Vayanos and Vila (2009) and Greenwood and Vayanos (2010).

[3]Since this paper is concerned with sovereign debt markets, we use the term international capital flows to refer to net purchases of government debt securities by foreigners.

[4]See among others Adelino et al. (2017) for evidence on how changes in the cost of financing for governments affect economic activity. There is also a large literature on the relationship between sovereign debt and financial institutions. A theoretical contribution on this relationship is provided by Gennaioli et al. (2014). There are plenty of empirical studies on this topic such as Acharya et al. (2014), Becker and Ivashina (2014), Altavilla et al. (2015), and Williams (2017).

[5]Portfolio debt gross inflows include capital flows going to both government and private debt. However, in emerging markets government debt is a much more important and liquid market than the one for private debt securities. See for instance Avdjiev et al. (2017).

and sovereign debt markets. This can be attributed in large part to the difficulty in testing this relationship empirically since capital flows, sovereign debt prices and the economic conditions of a country are jointly determined. For instance, when the economic conditions of a country improve, this is likely to increase the foreign demand for government debt while at the same time reducing the probability of default of that country. In this case, one would observe capital inflows to the sovereign debt market and an increase in sovereign debt prices. However, this correlation between capital flows and sovereign debt prices would not imply any causal relationship.

The main contribution of this paper is to provide a novel identification strategy to tackle this endogeneity concern. We use monthly index rebalancings in a major local currency sovereign debt market index constructed by J.P. Morgan for emerging markets. This index has a noticeable feature that is crucial for our identification strategy: the relative importance - *i.e.*, the *benchmark weight* - of any single country can not exceed 10% of the index at the beginning of each month. This induces important monthly rebalancings for a purely mechanical reason. For instance, if a country that at the beginning of a month is at the 10% cap overperforms the rest of the countries in the index, its benchmark weight at the end of the month will exceed 10%. As the rule establishes that no country can go above the aforementioned threshold, at the beginning of the subsequent month its weight in the index will be brought back to 10%. Moreover, as weights have to sum to 100%, the weights of the other countries in the index will also be adjusted. This index is also the most widely used benchmark by mutual funds that invest in sovereign debt in emerging markets. These funds tend not to deviate too much from the composition of their benchmark index in order to have a low tracking error.[6] Therefore, any rebalancing of the index is closely matched by a rebalancing in the portfolio of these funds. This feature, along with the mechanical rebalancings due to the 10% cap rule, potentially trigger information-free capital flows across countries at the end of each month.

To construct a measure of these information-free flows, we multiply the mechanical changes in benchmark weights and the amount of assets under management benchmarked against this index, normalized by the size of the market of each country. We call this measure "Flows Implied by the Rebalancings" (FIR). We use FIR to estimate the impact of information-free capital flows on

[6] Raddatz et al. (2017) document this fact at the international level for both equity and bond funds.

sovereign debt markets - using bond level data on prices and bid-ask spread - and exchange rates.

We show that FIR is positively associated with both cumulative returns and changes in the liquidity of sovereign debt securities around the rebalancing dates. Moreover, these flows spill over to the exchange rate market. Figure 2 shows an illustration of our main results. Around the day of the rebalancing there is a clear divergence in the cumulative returns of sovereign debt prices for the most positive and negative FIRs. While more short-lived, something similar happens for the cumulative percentage change in the bid-ask spreads of sovereign bonds. This divergence is also present for the exchange rate. In our main analysis we show systematically these effects, and we show that they are quantitatively important, and consistent with episodes of large capital flows to the sovereign debt market. Importantly, we show that in the days prior to the rebalancing, the relationship between FIR and prices, liquidity and the exchange rate is very close zero, and only becomes statistically significant after the rebalancing dates. This lends important support to our identification strategy.

We contribute to several different strands of literature. First, we contribute to a large literature on how demand shocks affect financial markets. This literature has mostly focused on equity markets at both the domestic or international level.[7] To our knowledge this is the first effort to understand the systematic effect of demand shocks on sovereign debt markets in a large cross-section of countries during several years. More broadly, we also contribute to a large literature on the aggregate effects of institutional investors.[8] We effectively provide evidence that institutional investors in sovereign debt markets affect assets prices through their rebalancings.

Moreover, this paper is broadly related to the empirical literature studying the determinants of government bond yields. There have been several articles analyzing which factors (global and local) affect government bond yields, and thus, their prices. The literature is mostly divided into studies

[7] There is a long standing literature on how index redefinitions affect stock returns, pricing, and liquidity. See among others Harris and Gurel (1986), Shleifer (1986), Chen et al. (2004), Barberis et al. (2005), Greenwood (2005), Hau et al. (2010), Hau (2011), Claessens and Yafeh (2013), Vayanos and Woolley (2013), Chang et al. (2014), Raddatz et al. (2017).

[8] See among others Broner et al. (2006), Jotikasthira et al. (2012), Levy-Yeyati and Williams (2012) and Raddatz and Schmukler (2012).

focusing on emerging and advanced economies.[9] More closely related to ours, there have been some studies focusing on how changes in the foreign investor base of government debt affect government bond yields. For instance, Arslanalp and Poghosyan (2016) show that positive (negative) changes in the foreign investor base decrease (increase) government bond yields for advanced economies.[10] For emerging economies, there are a number of articles with evidence in the same direction, with a somewhat stronger effect.[11] Our contribution to this literature is to provide plaussibly causal evidence that capital inflows (outflows) increase (decrease) sovereign debt prices, with a novel identification strategy.

We also contribute to the literature on how capital flows affect market liquidity. Economic theory offers very different predictions: on the one hand, foreign investors may deepen the market by increasing the probability for market makers and local investors of executing their orders; on the other hand, they might withdraw liquidity if their presence increases the volatility of the market and generates order imbalances. Also the empirical evidence regarding this topic is mixed.[12] We present evidence that capital inflows (outflows) improve (deteriorate), at least temporarily, liquidity in sovereign debt markets. Additionally, we contribute to the literature studying how flows from other asset markets affect the exchange rate market.[13] We show that flows from the sovereign debt market are transmitted to the exchange rate market.

More broadly, this paper contributes to the literature studying whether capital flows are expansionary or contractionary. There are several studies analyzing whether capital inflows lead to higher credit growth and an increase in economic activity.[14] Most of these studies have problems addressing endogeneity issues, since capital flows are almost always related to local economic conditions.

[9]See for example Gonzalez-Rozada and Yeyati (2008) for evidence on emerging markets. For advanced economies, the European Sovereign Debt Crisis started a number of papers in this topic. See for example Afonso et al. (2015) and the references therein.

[10]See Warnock and Warnock (2009) for similar evidence on the United States.

[11]See among others Peiris (2013) and Erba et al. (2013).

[12]See Vagias and Van Dijk (2011) for a detailed literature review on theory and evidence on this topic.

[13]See Hau et al. (2010) and references therein.

[14]For instance, Mendoza and Terrones (2012) find that credit booms are positively correlated with net capital inflows. Calderon and Kubota (2012) suggest that private capital inflows are good predictors of credit booms. In a more granular approach, Lane and McQuade (2014) argue that only net debt inflows generate domestic credit growth in European countries. In a related theoretical and empirical work, Blanchard et al. (2015) find that only equity inflows are correlated to credit expansions.

In this paper we show that capital flows to sovereign debt markets - even when information-free and purely driven by mechanical rebalancings - increase bond prices and liquidity. This evidence supports the hypothesis according to which capital flows are expansionary, at least in emerging countries.

The rest of the paper is structured as follows. Section 2 presents our empirical strategy based on index rebalancings. Section 3 details the data, results and robustness tests. Section 4 discusses the potential implication of our results. Section 5 concludes.

2 Index Rebalancings and Empirical Strategy

2.1 J.P. Morgan Government Bond Index EM Global Diversified

Our empirical strategy relies on the use of the most important local currency government debt index in emerging markets.[15] This index is constructed by J.P. Morgan and is named Government Bond Index EM Global Diversified (from here onward GBI-EM Global Diversified). The GBI-EM Global Diversified is part of the GBI-EM family of indexes. These indexes are constructed using a bottom-up approach and consist of local currency government debt securities in emerging markets. J.P. Morgan decides which countries are included in each of the indexes of the family, and then decides which securities of each country are part of each index. After this, they construct the *benchmark weight* (w_{ct}^{B}). This is the relative importance of each country in an index. In most of the indexes of the GBI-EM family, this is simply the total market capitalization of securities from country c at time t - all of these indexes are rebalanced on a monthly frequency - included in benchmark B, divided by the total market capitalization of all securities included in benchmark B.[16]

In this paper, we use the rebalancings of the GBI-EM Global diversified to identify information-free flows to sovereign debt markets. We focus on this index for two different reasons. First, this

[15] In this paper we use the terms index and benchmark interchangeably.

[16] Before October 2013, the rebalancing took part the first weekday of each month. After this date, it takes place on the last weekday of each month.

is the most important index for emerging markets sovereign debt in local currency. The assets under management benchmarked against this index as of the end of 2016 were 186 billions dollars, compared to only 20 billions dollars for the rest of the indexes in the GBI-EM family of indexes.[17] Second, the GBI-EM Global Diversified has limits to the benchmark weight established to preserve the diversification of the index. Countries in this index cannot have a benchmark weight higher than 10%. This generates important periodical rebalancings at the monthly level that can are in principle uninformative and unrelated to the economic conditions in a given country.[18]

We use such rebalancings alongside a documented feature of mutual funds largely documented by the finance literature: most international mutual funds track their performance against this type of benchmark indexes. A large portion of these funds have portfolios that closely resemble the composition of the benchmark index that they declare to follow.[19] Since these funds do not want to move away from their benchmark index, the monthly rebalancings potentially create capital flows across countries. Exploiting these features of the GBI-EM Global Diversified, we construct a measure to capture this notion of implied capital flows across countries.

2.2 Flows Implied by the Rebalancings (FIR)

To construct our measure we start from the following identity that captures the relation between benchmark weights and capital flows by international mutual funds:

$$F_{ict} = w_{ict} F_{it} + \tilde{A}_{it} \left(w_{ict} - w_{ict}^{BH} \right), \tag{1}$$

where F_{ict} is the net flow (in dollars) from fund i in country c at time t. w_{ict} is the portfolio weight the fund decides to have in that country at time t, $\tilde{A}_{it} = R_{it} A_{it-1}$ is the value of the fund's assets

[17] The assets benchmarked to the Barclays Emerging Markets Local Currency Government Index and the Citi Emerging Markets Government Debt Index are estimated to be much smaller than the ones benchmarked against the J.P. Morgan GBI-EM Global Diversified.

[18] This is one of the reasons we do not focus on EMBI, which is the most important foreign currency government debt index for emerging markets. This index does not have any limit on benchmark weights, and the rebalancings for most of the countries are relatively small.

[19] See Cremers and Petajisto (2009) for evidence on the U.S. equity mutual fund industry. Cremers et al. (2016) and Raddatz et al. (2017) document this pattern at the international level.

at the beginning of time t, and w_{ict}^{BH} is the fund's buy-and-hold weight in that country resulting from movements in total and relative returns. F_{it} is the net flow (in dollars) to fund i at time t, also known as injections or redemptions.

We make three simplifying assumptions. First, we assume that $F_{it} = 0$ since we look at very short windows of time around each rebalancing. Second, we assume that all international mutual funds act like passive funds and thus $w_{ict} = w_{ict}^{B}$ and $w_{ict}^{BH} = w_{ict}^{BH,B}$. While extreme, we base this assumption on the documented feature that a large portion of mutual funds act as passive funds. Third, we assume $\tilde{A_{it}} = A_{it}$ for simplicity since it is difficult to get aggregate data on $\tilde{A_{it}}$. We sum across funds and normalize by market size to get our measure of flows implied by the rebalancings (FIR), that is therefore given by the following equation:

$$FIR_{ct} = \frac{A_t \lambda_{ct}}{MV_{ct-1}}, \tag{2}$$

where $\lambda_{ct} = (w_{ict}^{B} - w_{ict}^{BH,B})$ is the reallocation implied by the rebalancings. A_t is the total amount of dollars that are benchmarked against the GBI-EM Global Diversified, and MV_{ct-1} is the previous period market value of government debt securities in local currency (i.e. the size of the market). Intuitively, our measure captures the implied dollars that should enter or leave a country, at the time of each rebalancing, as a percentage of market size.

Figure 3 shows the distribution of FIR across countries. There are two things to notice from this picture. First, altough most of the rebalancings are small in size, some of them can be quite large, as there many implied rebalancings that in absolute value can be between 2 and 6 percent of the market value of a given country (left panel). Furthermore, most of the countries have an average FIR centered around 0, implying that FIR is not persistently positive or negative within each country.[20]

[20] In our database we drop the months of big rebalancing events in the J.P. Morgan GBI-EM Index such as the upgrade of Colombia, Nigeria and Romania, and the downgrade of Nigeria. This rebalancings are usually announced in the middle of the month, and generate large prices effects around these announcements. An example of this is documented for Colombia in Williams (2017). Since our identification strategy relies on the fact that all the rebalancings are done at month end, we drop these episodes.

2.3 Empirical Strategy

We exploit our FIR measure alongside with the fact that the rebalancings are effective at the end/beginning of each month, and we estimate the following specification:

$$\Delta y^z_{jct} = \theta_t + \beta FIR_{ct} + \phi X_{jct} + \varepsilon_{jct}, \tag{3}$$

where $\Delta y^z_{jct} = y_{jct,d+z} - y_{jct,d-5}$ is the change in the log of our dependent variable of interest for bond j, from country c, in month t. The cumulative log change is measured over an interval that goes from 5 days prior to the rebalancing date, d, to z days after it. In our main specifications, $z = [3, 5, 7]$, since we look at the cumulative log change of y - that is either the price or the spread of bonds - 3, 5 and 7 days after the rebalancing. θ_t are time fixed effects indicating the month of each rebalancing, FIR_{ct} is our measure of information-free capital flows, X_{jct} is a vector of potential controls at the bond-time level such as life to maturity, and ε_{jct} is the error term.[21] We also analyze whether these uninformative capital flows spill over to the exchange rate market. In that case since we only have country level data our specification collapses to

$$\Delta y^z_{ct} = \theta_t + \beta FIR_{ct} + \varepsilon_{ct} \tag{4}$$

where y_{ct} is the log of the exchange rate measured as dollars per local currency, and thus an upward (downward) movement signals a depreciation (appreciation). In both specifications, β captures how the flows implied by the rebalancings affect the cross section of returns in the sovereign debt market and in the exchange rate one. Additionally, we look at how it affects the cross section of changes in liquidity for governemnt bonds.

A key part of our identification is the time dimension. If it is true that the flows implied by the rebalancings do not correlate with some country-specific unobservables that also affect

[21] We have only 16 countries in our sample and thus we cannot use clusters at the country level, which would be the ideal clustering for this specification. In the individual bond specification we cluster at the country-time to maturity level. Time to maturity is a dummy indicating whether a bond is maturing in 1 to 3, 3 to 5, 5 to 7, 7 to 10, or more than 10 years. In the exchange rate specification we use robust standard errors.

prices, liquidity and exchange rates - thus being purely information-free and not driven by the macroeconomic conditions of a country - then FIR should not be associated to changes in the three variables of interest in the days immediately prior to the rebalancing. So, we perform a sort of placebo test alongside our main results and we look at how our dependent variables correlate with FIR in a day by day basis, before and after the rebalancing dates. Under our indentification strategy we should observe that this relationship becomes significantly important only in the days strictly equal or after the rebalancing dates. Moreover, these tests do not only confirm the goodness of our measure as a measure of rebalancing-driven information-free flows, but also provide evidence of the aforementioned fact that international mutual funds do not want to deviate far away from the benchmark weights, thus rebalancing their portfolios contemporaneously to the rebalancings of the index.

3 Data and Results

3.1 Data

The dataset used to conduct the empirical analysis is obtained combining information from multiple data sources: firstly, we obtain monthly data on *benchmark weights* and rebalancing events from the "Index Composition and Statistics" reports published on the J.P. Morgan Markets' website, from which we also get the value of the assets benchmarked against the Government Bond Index EM Global Diversified; then, the list of ISIN of sovereign debt bonds issued in any of the countries included in the Index come from Bloomberg; finally, static data on bonds, as well as daily data on both bonds and exchange rates relative to the countries in the sample are from Datastream.

Starting from the reports on Index Composition - where J.P. Morgan conveys information on *benchmark weights* and market capitalization for each of the country in the GBI EM Global Diversified - we construct a dataset containing the time-series - from September 2009 to March 2016 - of the weights assigned to each of the 16 emerging countries that are included in the Index, namely: Brazil, Chile, Colombia, Hungary, Indonesia, Malaysia, Mexico, Nigeria, Peru, Philippines, Poland, Romania, Russia, South Africa, Thailand and Turkey. After merging this information with the data on the value of the assets benchmarked to the Index, we use the methodology described in the previous section to calculate the monthly, country-specific, time-series of Flows Implied by Rebalancing (FIR), that is, our main independent variable.

For each of country in the Index, we search Bloomberg to collect the ISIN of all the bonds issued before or during the sample period. Starting from the list of ISIN, we download from Datastream the static information relative to each bond, that is, the issuance and the maturity dates, the issuance price, the currency, the issuer type and the bond type. We use such information to identify all sovereign debt straight bonds in local currency with at least one year of life to maturity at issuance. For these bonds, we then collect the time-series of bid, ask and mid prices.

As regards prices, Datastream provides two distinct ask, bid and mid quotes: the *Thomson Reuters Composite* price and the *Thomson Reuters Pricing Service (TRPS)* one. While the first is an average price from all the available key market contributors, the second one is the price as evaluated by the Fixed Income Pricing Service team at Thomson Reuters.[22] To summarize the information conveyed by each of the two sources in a single variable, we compute the average between the daily Composite and TRPS mid-prices and we label this variable "Price". Similarly, after computing the absolute spread as the difference between the ask and the bid quote, for each of the two price sources, and after replacing with *missing* all those observations with negative absolute bid-ask spread or with relative spread larger than 20%, we take the average between the TRPS and the Composite absolute spread and we define it as our "Spread", that is, our measure of the liquidity of the sovereign debt markets.

Starting from this panel containing for each bond a time-series of prices and bid-ask spreads, we compute cumulative returns around each rebalancing date, *i.e.* d, by taking the difference between the log of Price in $d-5$, that is, five days before the rebalancing date, and the log of Price z days

[22] The composite price is exactly equal to the average quote when contributors are 1 or 2. With 3 contributors, the contributor with the most extreme quote is excluded and the composite price equals the average between the two remaining quotes. Finally, when there are more than 4 contributors, the highest and the lowest quotes are excluded before calculating the average one. As regards TRPS prices, these are provided daily by the Reuters Evaluated Pricing Service through evaluation models combining bond characteristics, pricing models and real-time dealer quotes, electronically obtained from market contributors.

after the rebalancing date.[23] Similarly, we measure the percentage change in the liquidity of the market z days after the rebalancing as the difference in the log of Spread in $d+z$ and $d-5$. To clean our dataset, we finally exclude from the analysis: i) bonds with more than 90% of zero-changes in the price from one day to the subsequent one since these are mainly bonds that were never traded; ii) bonds maturing in less than one year, since these are also excluded from the Index; iii) bonds traded after the maturity date.

As a result, we end up with a panel containing data on 623 bonds issued by the governments of 15 countries and around 19K bond-month specific observations. In particular, the final dataset has the following structure: for each of the bond in the sample, we have, for each rebalancing date, many variables each of them equal to the change in the log of the price (or the spread) between $d-5$ and $d+z$ where $z \in [-4;+9]$ is the number of trading days after (or before, if negative) the rebalancing date, d. The summary statistics relative to the bonds in our sample are reported in Panel A of Table 1, as well as in Panel A of Table 2, where means are computed for each of the 15 countries in the sample, separately.[24]

Finally, we retrieve from Datastream also the time-series of daily exchange rates, for each of the 16 countries in the sample. The exchange rate is the amount of local currency needed to buy a US dollar, so that a decrease in the exchange rate reflects an appreciation of the local currency. As with the price information, we define the log change in the exchange rate z days after (or before) the rebalancing as the difference between the log of the exchange rate in day $d+z$ and the one in $d-5$. Summary statistics on exchange rates, as well as on Market capitalization and FIR - that also vary at the country level - are reported in Panel B of Table 1 and Table 2.

Finally, we exclude from the analysis those months in which there were extremely large rebalancing events, as for instance the upgrades of Colombia, Nigeria and Romania, and the downgrade of Nigeria.[25] Indeed, when rebalancings are particularly relevant, J.P. Morgan already announces

[23]The rebalancing date in a given month coincides with the last trading day of the month until October 2013 and the first day of the subsequent month afterwards.

[24]In the regressions on Price and Spread, we only have 15 of the 16 countries in the Index since we could not get daily prices for Chilean bonds.

[25]Similarly, we exclude the top and the bottom 1% in the distribution of FIR.

them in the middle of the month, or even before, and - given our identification strategy - we only focus on cases in which the rebalancing takes place at the end of the month and is contemporaneous to the announcement made by J.P. Morgan.

3.2 Main Results

Table 3 presents our main results for sovereign bond prices. Columns 1 to 3 (with time fixed effects) show that FIR is positively associated with the cross section of cumulative returns of government bond prices, and this is statistically significant at the 1 percent level. We start by estimating this relationship for cumulative returns from $d-5$ to $d+3$ (Column 1) and then we extend it to $d+5$ (Column 2) and $d+7$ (Column 3). In all of these cases, the coefficient is relatively stable, and is statistically significant even 7 days after the day of the rebalancing. The results are very similar when we control for the years to maturity of the bonds in the sample (Columns 4 to 6), and when we include country fixed effects (Columns 7 to 9), thus showing that FIR not only explains the across-country variation of returns, but also the within-country one.

Quantitatively, these results in line with some of the big episodes of rebalancings in the J.P. Morgan GBI-EM Global Diversified. A one standard deviation increase in FIR (increasing FIR by 0.875 percentage points) leads to an average increase in sovereign debt prices of 8 basis points in the symmetrical window from $d-5$ to $d+5$. While this number seems low, it is consistent with large episodes of rebalancings, as for instance the inclusion of five colombian treasury securities in March 2014. The estimated FIR for that episode was around 22.3 percent.[26] Multiplying this number by the coefficient in Table 3, Column 2, we have an estimated average cumulative return of 2 percent. Actually, the average cumulative returns for sovereign bonds in the local currency bond market in Colombia was 2.2 percent for the window from $d-5$ to $d+5$.[27] Thus, our estimations are consistent with this big rebalancing episodes and can be quantitatively important for different countries.

[26]For this estimated FIR we take the average of the market value before and after the rebalancing because of the large differences in market value after the inclusion of the colombian sovereign bonds in the index.

[27]For more details on this inclusion episode, see Williams (2017).

To estimate the impact of information-free flows on liquidity, we perform an analogous estimation using as our variable of interest the cumulative change in the log of the bid-ask spread of sovereign bonds (Table 4). FIR is negatively associated with the cumulative percentage changes in the bid-ask spread, thus showing that information-free flows are positively associated with sovereign debt liquidity in the cross section (Column 1). This result, however, is statistically significant only in our shorter window. This suggests that the effect on liquidity is more transitory than the one for prices. As regards the magnitude of the estimated coefficient, a one standard deviation increase in FIR leads to a decrease of 1.02 percentage points in the bid-ask spread, thus meaning that a large event as the inclusion of the Colombian bonds in 2014 would produce a decrease in the spread approximately equal to 25 percentage points.

Since our measure FIR captures uninformed capital flows to the local currency sovereign debt market, we are also interested on the potential spillovers to the exchange rate market. If an international mutual fund has to direct capital inflows (outflows) to the this sovereign debt market as a consequence of the rebalancings, it might need to buy (sell) local currency in exchange for foreign currency (more commonly U.S. dollars). Therefore, our FIR measure might also predict the cross section of returns in the exchange rate market. Our results in Table 5 confirm this hypothesis. In this table we regress the cumulative returns of the exchange rate (in local currency per U.S. dollar) on FIR. We show that FIR is negatively associated with the cumulative returns in the exchange rate.[28] The coefficients are stable across the different windows used (Columns 1 to 3), when we add country fixed effects (Columns 4 to 6), and when we cluster standard errors at the country-year level. Furthermore, the results are quantitatively more important than those for sovereign bond prices. A one standard deviation increase in FIR is associated with an appreciation of 32 basis points in the exchange rate, consistently with the higher volatility in the exchange rate market compared to the sovereign debt market.

[28] As our measure of exchange rate is in local currency per U.S. dollar an increase in it signals a depreciation and a decrease in the measure shows an appreciation of the currency.

3.3 Placebo Tests

Our identification relies on two main hypothesis: i) international mutual funds do not want to deviate far away from the benchmark they track and thus rebalance their portfolio when the index do so; ii) our measure of information-free capital flows is actually capturing flows purely driven by the mechanical rebalancings made by J.P. Morgan to comply with the 10% cap rule and are not driven by the macroeconomic conditions of the countries in the index. To test whether these two hypothesis hold in our dataset, we perform in this section a sort of placebo tests where we look at how our dependent variables correlate with FIR in a day by day basis around the rebalancing dates. Under our identification hypothesis, we should observe that this relationship only becomes significant in the days following the rebalancings. Therefore, we regress FIR on the changes in price, liqudiity and exchange rate from $d-4$ to $d+4$, where d is the rebalancing date. As long as mutual funds following the index do not anticipate rebalancings and FIR is not systematically correlated with unobservables at the country-month level that also affect our dependent variables, we expect the coefficients from $d-4$ to d to be not statistically different from zero.

Our results show that after the rebalancing there is an important increase in the relationship between FIR and the cumulative returns of sovereign bonds (Table 6). The coefficient between $d-4$ and d is very close to zero in magnitude and not statistically significant. In $d+1$ we already observe an increase in the coefficient which increases almost by four times, though it is not statistically significant. from $d+2$ to $d+4$ the β coefficient keeps increasing and is always significant at the 1 percent confidence level. A very similar picture arises when we look at the results for the bid-ask spread (Table 7). The β is statistically (and in magnitude) not different from zero before the date of the rebalancing. This changes importantly both at d and afterwards when we observe an increase in the absolute value of the coefficient. From d to $d+4$, β is negative and statistically significant. This implies that a higher FIR is associated with a higher liquidity in the sovereign debt market after the rebalancing dates. For the exchange rate, the results are qualitatively similar (Table 8). We have very low negative coefficients before d with some values significant at the 5 percent level. But more importantly, from d onwards, the coefficient is much larger in absolute value, double in size than the one before, and significant at the 1 percent level. These placebo tests lend important support to our identification strategy.

3.4 Additional Results

We also conduct additional tests to further explore potential heterogeneity in our results. For instance, we divide our sample into government bonds that are included in the J.P. Morgan GBI-EM Global Diversified versus bonds that are not. Results for sovereign bond prices (Table 9, Columns 1 to 6) show that the impact of FIR is larger both in quantities and statistical significance for bonds that are part of the index. This result is not suprising, since the rebalancings affect these bonds, and thus the higher reaction in prices. Our results are somewhat different for the liquidity of these bonds (Table 10, Columns 1 to 6). In this case, a larger FIR is associated with a higher liquidity, and this relationship is stronger for bonds that are not part of the index. This could be due to the fact that bonds that are not in the index are usually less liquid (that is exactly the reason why they are not included in the index). Thus, the effect of FIR on liquidity might be larger and more long-lasting for bonds that are less liquid, while being only temporary for bonds already characterized by a relatively small spread.

Furthermore, we analyze whether our results hold at the country-maturity level. We collapse both our dependent variables for prices and liquidity at the country-time-to-maturity-level, where time-to-maturity are dummies that indicate whether a bond is maturing in 1 to 3, 3 to 5, 5 to 7, 7 to 10 or more than 10 years. Both for sovereign bond prices and liquidity the results are very similar to our main specification, showing that individual bonds in countries are not distorting our coefficients (Tables 9 and 10, Columns 7 to 9).

Moreover, we analyze three additional dimensions of heterogeneity for our main specifications. First, we look at the potential differences in negative and positive information-free capital flows, by estimating the coefficient of FIR conditional on its sign. (Table 11, top panel). For both sovereign debt prices and exchange rates, there does not seem to be an asymmetry as the coefficients are not statistically different. Instead, for liquidity, only the inflows of capital seems to improve liquidity.

Second, we divide our sample into three different time periods, 2009-2011, 2012-2014, 2015-2016 (Table 11, mid panel). The β for our three dependent variable is much stronger for the middle and (somewhat) later period in our sample. This is consistent with two facts: first, international mutual funds investing in local currency sovereign debt in emerging markets have become larger in size; second, there has been a rise in passive funds, meaning more benchmarking. Third, we split our sample of bonds according to their maturity into short-term (1 to 5 years of maturity), medium-term (5 to 10 years of maturity) and long-term (more than 10 years of maturity (Table 11, bottom panel). The effects from uninformed flows on prices appear to be stronger for long-term government bonds, coherently with the fact the the price of bonds maturing in the short-term is less volatile than the one of long-term bonds. Instead, the effects on liquidity are very similar for the different maturities.

4 Implications

Our results show that capital inflows (outflows), even when uninformative, increase (decrease) the prices of sovereign bonds, improve (decrease) the liquidity in the sovereign debt market, and also appreciate (depreciate) the exchange rate. Given our identification strategy, we can only look at a few days back or after the rebalancings (in our case 5 and 7). Thus, we only capture temporary relationships that are also somewhat small due to our daily frequency. As a result, it is very difficult to gauge the impact of these capital flows (through the sovereign debt market) on real economic activity. However, our results, especially on sovereign debt prices and exchange rates, extend at least to seven days after the rebalancings. In this section we discuss the potential implications of these results, if these effects were to be permanent.

Both sovereign bond prices and the exchange rate are asset prices central to the macroeconomy. The sovereign bond prices are inversely related to government bond yields. Thus, our results suggest that capital flows might affect permanently (or at least for a reasonable amount time) the cost of capital for governments in emerging markets. This might lead to a variation in the amount of debt a government might want to issue, and may end up affecting government expenditure. In the end, one implication of the results in this paper is that even information-free capital flows to the sovereign debt market can have important effects on the economic cycles in emerging markets through government expenditures.

Even if the government did not react to the increase (decrease) of government bond yields due to capital inflows (outflows), there could be other potential channels impacting the real economy. For instance, the transmission mechanism could go through financial institutions. As capital flows have an impact on the price of sovereign debt, they can affect the balance sheet of these institutions as well. In emerging markets, these financial institutions, mainly banks, hold a sizable amount of government bonds. As their price increase, and their balance sheet consequently improves, banks may be able to increase their supply of credit, thus fostering economic activity (and vice versa, in case of capital outflows). This valuation channel might be exacerbated by changes in the exchange rate. As banks hold also a good amount of assets and liabilities denominated in foreign currency, uninformed capital flows might have an impact on the health of the balance sheet through the exchange rate as well.

Finally, the exchange rate (absent any intervention from the central bank or the government) might have an effect on its own on the macroeconomy. As uninformed capital flows affect exchange rates, they consequently have an impact on the competitiveness of the country and therefore on net exports. When this channel is at work, information-free inflows (outflows) might decrease (increase) economic activity.

5 Conclusion

This paper analyze the effect of information-free capital flows on the sovereign bond market in emerging markets, and the spillovers to the exchange rate markets. Theoretically it is not clear whether these flows should affect the prices and liquidity in these markets. To test this, we use a novel identification strategy based on the index rebalancings of a major index of local currency government debt in emerging markets. We construct a measure of the capital flows implied by these rebalancings (FIR) that is in principle uninformative and not driven by the economic conditions in these emerging markets.

Our results show that FIR is positively related to both the returns and the liquidity in the sovereign debt markets of emerging economies. Moreover, the effects of these uninformed capital flows spill over to the exchange rate market. We show systematically these effects, which are consistent with episodes of large capital flows in the sovereign debt market. More importantly, we present evidence that in the days prior to the rebalancing, the relationship between FIR and prices, liquidity and the exchange rate is very close to zero, and only becomes important after the rebalancing dates, thus confirming the information-free nature of our measure of rebalancing-driven flows.

As both the sovereign debt prices and exchange rate are central asset prices for the macroeconomy, our results suggest a broader impact of uninformed capital flows to the sovereign debt market.

References

Acharya, Viral V, Tim Eisert, Christian Eufinger, and Christian Hirsch, "Real Effects of the Sovereign Debt Crisis in Europe: Evidence from Syndicated Loans," CEPR Discussion Papers 10108, C.E.P.R. Discussion Papers August 2014.

Adelino, Manuel, Igor Cunha, and Miguel Ferreira, "The Economic Effects of Public Financing: Evidence from Municipal Bond Ratings Recalibration," *Review of Financial Studies*, 2017, *forthcoming.*

Afonso, Antonio, Michael G. Arghyrou, and Alexandros Kontonikas, "The determinants of sovereign bond yield spreads in the EMU," Working Paper Series 1781, European Central Bank April 2015.

Altavilla, Carlo, Marco Pagano, and Saverio Simonelli, "Bank Exposures and Sovereign Stress Transmission," CSEF Working Papers 410, Centre for Studies in Economics and Finance (CSEF), University of Naples, Italy July 2015.

Arslanalp, Serkan and Tigran Poghosyan, "Foreign Investor Flows and Sovereign Bond Yields in Advanced Economies," *Journal of Banking and Financial Economics*, June 2016, *2* (6), 45–67.

Avdjiev, Stefan, Bryan Hardy, Sebnem Kalemli-Ozcan, and Luis ServÃ©n, "Gross Capital Inflows to Banks, Corporates and Sovereigns," NBER Working Papers 23116, National Bureau of Economic Research, Inc January 2017.

Barberis, Nicholas, Andrei Shleifer, and Jeffrey Wurgler, "Comovement," *Journal of Financial Economics*, February 2005, *75* (2), 283–317.

Becker, Bo and Victoria Ivashina, "Financial Repression in the European Sovereign Debt Crisis," Working Paper April 2014.

Blanchard, Olivier, Jonathan D. Ostry, Atish R. Ghosh, and Marcos Chamon, "Are Capital Inflows Expansionary or Contractionary? Theory, Policy Implications, and Some Evidence," Working Paper 21619, National Bureau of Economic Research October 2015.

Broner, Fernando A., Guido Lorenzoni, and Sergio L. Schmukler, "Why Do Emerging Economies Borrow Short Term?," *Journal of the European Economic Association*, 01 2013, *11*, 67–100.

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

Calderon, Cesar and Megumi Kubota, "Gross inflows gone wild : gross capital inflows, credit booms and crises," Policy Research Working Paper Series 6270, The World Bank November 2012.

Chang, Yen-Cheng, Harrison Hong, and Inessa Liskovich, "Regression Discontinuity and the Price Effects of Stock Market Indexing," *Review of Financial Studies*, 2014, *28* (1), 212–246.

Chen, Honghui, Gregory Noronha, and Vijay Singal, "The Price Response to S&P 500 Index Additions and Deletions: Evidence of Asymmetry and a New Explanation," *Journal of Finance*, 08 2004, *59* (4), 1901–1930.

Claessens, Stijn and Yishay Yafeh, "Comovement of Newly Added Stocks with National Market Indices: Evidence from Around the World," *Review of Finance*, 2013, *17* (1), 203–227.

Cremers, Martijn and Antti Petajisto, "How Active Is Your Fund Manager? A New Measure That Predicts Performance," *Review of Financial Studies*, September 2009, *22* (9), 3329–3365.

_ , Miguel A. Ferreira, Pedro Matos, and Laura Starks, "Indexing and active fund management: International evidence," *Journal of Financial Economics*, 2016, *120* (3), 539–560.

Erba, Salvatore Dell, Ricardo Hausmann, and Ugo Panizza, "Debt levels, debt composition, and sovereign spreads in emerging and advanced economies," *Oxford Review of Economic Policy*, AUTUMN 2013, *29* (3), 518–547.

Gennaioli, Nicola, Alberto Martin, and Stefano Rossi, "Sovereign Default, Domestic Banks, and Financial Institutions," *Journal of Finance*, 2014.

Gonzalez-Rozada, Martin and Eduardo Levy Yeyati, "Global Factors and Emerging Market Spreads," *Economic Journal*, November 2008, *118* (533), 1917–1936.

Greenwood, Robin, "Short- and long-term demand curves for stocks: theory and evidence on the dynamics of arbitrage," *Journal of Financial Economics*, March 2005, *75* (3), 607–649.

_ **and Dimitri Vayanos**, "Price Pressure in the Government Bond Market," *American Economic Review*, May 2010, *100* (2), 585–590.

Harris, Lawrence and Eitan Gurel, " Price and Volume Effects Associated with Changes in the S&P 500 List: New Evidence for the Existence of Price Pressures," *Journal of Finance*, September 1986, *41* (4), 815–29.

Hau, Harald, "Global versus Local Asset Pricing: A New Test of Market Integration," *Review of Financial Studies*, 2011, *24* (12), 3891–3940.

_ **, Massimo Massa, and Joel Peress**, "Do Demand Curves for Currencies Slope Down? Evidence from the MSCI Global Index Change," *Review of Financial Studies*, April 2010, *23* (4), 1681–1717.

Jotikasthira, Chotibhak, Christian Lundblad, and Tarun Ramadorai, "Asset Fire Sales and Purchases and the International Transmission of Funding Shocks," *Journal of Finance*, December 2012, *67* (6), 2015–2050.

Lane, Philip R. and Peter McQuade, "Domestic Credit Growth and International Capital Flows*," *The Scandinavian Journal of Economics*, 2014, *116* (1), 218–252.

Levy-Yeyati, Eduardo and Tomas Williams, "Emerging economies in the 2000s: Real decoupling and financial recoupling," *Journal of International Money and Finance*, 2012, *31* (8), 2102–2126.

Mendoza, Enrique and Marco Terrones, "An Anatomy of Credit Booms and their Demise," Working Papers Central Bank of Chile 670, Central Bank of Chile July 2012.

Peiris, Shanaka J., "Foreign Participation in Local Currency Bond Markets of Emerging Economies," *Journal of International Commerce, Economics and Policy (JICEP)*, 2013, *04* (03), 1–15.

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

_ , _ , and Tomas Williams, "International Asset Allocations and Capital Flows: The Benchmark Effect," *Journal of International Economics*, 2017, *forthcoming.*

Shleifer, Andrei, " Do Demand Curves for Stocks Slope Down?," *Journal of Finance*, July 1986, *41* (3), 579–90.

Vagias, Dimitrios and Mathijs A. Van Dijk, "International Capital Flows and Liquidity," Technical Report 2011.

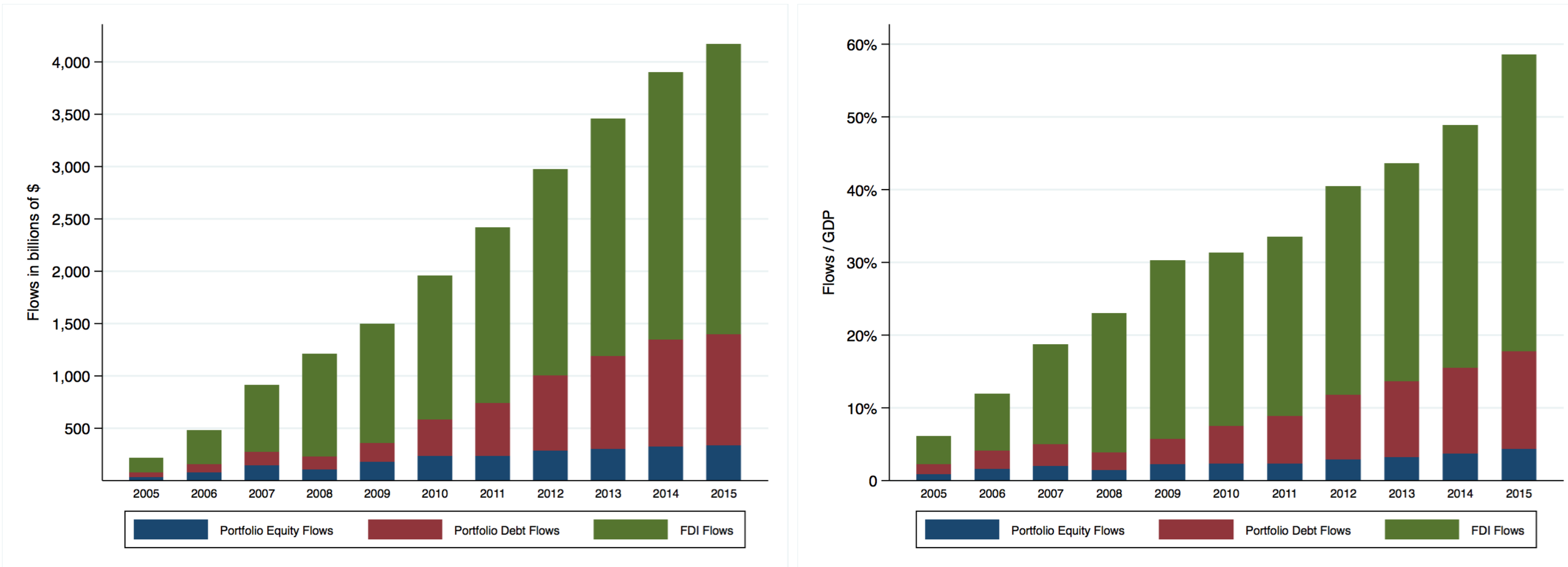
Vayanos, Dimitri and Jean-Luc Vila, "A Preferred-Habitat Model of the Term Structure of Interest Rates," CEPR Discussion Papers 7547, C.E.P.R. Discussion Papers November 2009.

_ and Paul Woolley, "An Institutional Theory of Momentum and Reversal," *Review of Financial Studies*, 2013, *26* (5), 1087–1145.

Warnock, Francis and Veronica Warnock, "International Capital Flows and U.S. Interest Rates," *Journal of International Money and Finance*, 2009, *28*, 903–919.

Williams, Tomas, "Capital Inflows, Sovereign Debt and Bank Lending: Micro-Evidence from an Emerging Market," Technical Report 2017.

Figure 1: Gross Liability Flows

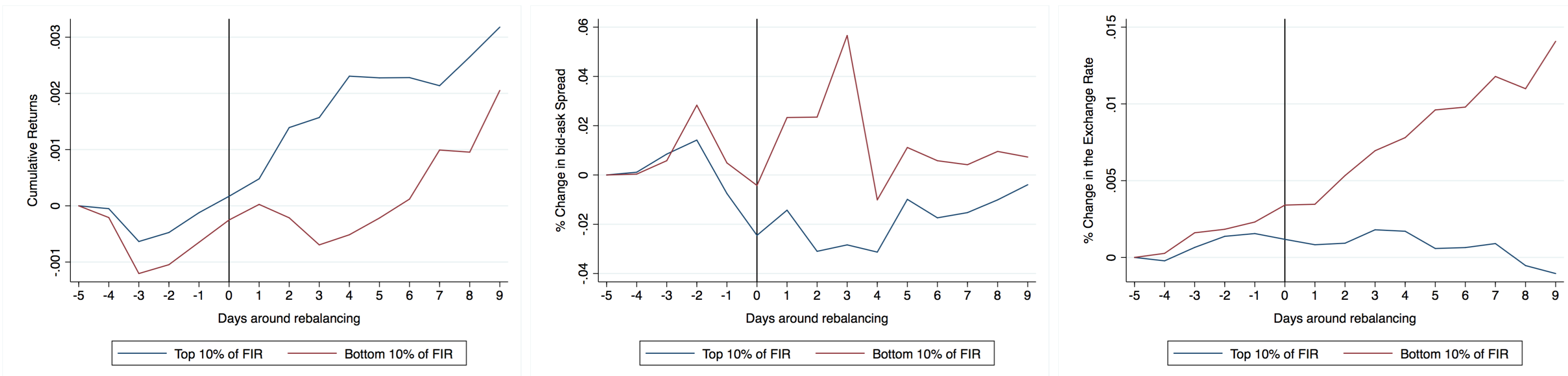


Absolute

Relative to GDP

Note: This figure plots the cumulative gross liability flows to emerging markets, divided by the type of assets. The left panel presents the sum of all gross inflows to emerging markets (in Billions of U.S. dollars). The right panel depicts the gross inflows as a percentage of GDP and is created by computing the cumulative flows over GDP for each country and then averaging across countries in each year. The countries included in the sample are: Brazil, Chile, Colombia, Hungary, Indonesia, Mexico, Peru, Philippines, Poland, Romania, Russia, South Africa, Thailand and Turkey.

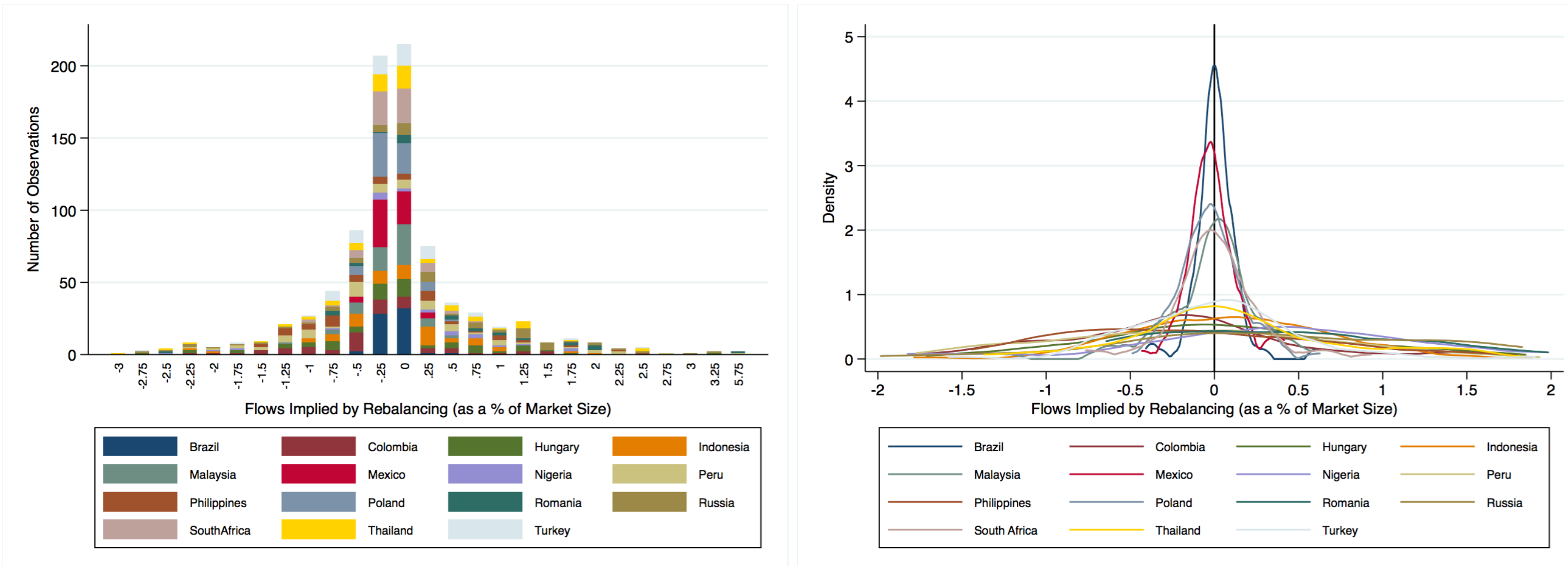
Figure 2: Price, Liquidity and FX around the Rebalancing date



Price | Spread | Exchange Rate

Note: The three figures represent the trend of average difference between the log of Price, bid-ask Spread and Exchange rate and the log of each of the three variable five days prior to the rebalancing date, for observations in the first and the last decile of the distribution of Flows Implied by the Rebalancing.

Figure 3: Distribution of Flows Implied by Rebalancing



Histogram

Kernel density

Note: This figure depicts the distribution of FIR across countries. In the left panel, each bin in the histogram contains the number of month-specific observations, both aggregate and by country, for which the FIR is included in the interval whose lower bound is on the x axis. The right panel shows the Kernel density estimate of the country-specific distribution of the FIR measure.

Table 1: Summary Statistics

Panel A: Bond level summary statistics					
	Mean	Sd	Min	Median	Max
$\Delta\log(\text{Price})_3$	-0.01	1.32	-11.6	0.00	10.2
$\Delta\log(\text{Price})_5$	-0.03	1.50	-14.2	0.00	11.0
$\Delta\log(\text{Price})_7$	-0.05	1.69	-18.3	0.00	11.9
Relative bid-ask Spread	0.01	0.01	0.0	0.00	0.2
$\Delta\log(\text{Spread})_3$	-1.07	34.42	-624.6	0.00	552.5
$\Delta\log(\text{Spread})_5$	-0.66	35.85	-583.5	0.00	621.7
$\Delta\log(\text{Spread})_7$	-0.72	35.53	-579.4	0.00	621.7
Years to Maturity	8.64	7.32	1.0	6.28	50.4
Years of Life	4.73	3.39	0.0	4.09	22.6
Panel B: Country level summary statistics					
FIR	0.05	0.87	-2.8	0.00	5.9
$\Delta\log(\text{FX rate})_3$	0.14	2.10	-6.4	-0.02	15.7
$\Delta\log(\text{FX rate})_5$	0.16	2.30	-6.0	-0.02	14.1
$\Delta\log(\text{FX rate})_7$	0.29	2.51	-10.7	-0.01	16.8
Total Market Value in US $	63.79	54.12	1.1	52.74	261.9
Weight in the Index	7.35	3.38	0.2	9.60	10.0

Note: $\Delta\log(\text{y})_z$ is the cumulative log change of y over an interval that goes from 5 days prior to the rebalancing date to z days after it. The average of the relative bid-ask spread is computed in $d-5$, that is, 5 days before the rebalancing. Statistics in Panel A are calculated on the whole sample of bonds used in the main regressions on Price and Spread, that includes 15 of the 16 countries in the Index. The statistics in Panel B are computed on the whole population of country, including Chile, that is not present in the bond-level panel.

Table 2: Summary Statistics by country

	Brazil	Colombia	Hungary	Indonesia	Malaysia	Mexico	Nigeria	Peru	Philip-pines	Poland	Romania	Russia	S. Africa	Thailand	Turkey
Panel A: Bond level summary statistics, by country															
Δlog(Price)$_3$	-0.30	-0.05	-0.01	-0.12	0.01	-0.09	-0.10	-0.21	0.11	-0.03	-0.01	0.05	-0.06	0.06	0.01
Δlog(Price)$_5$	-0.24	-0.03	0.06	-0.27	-0.01	0.04	-0.13	-0.28	0.10	-0.02	-0.04	0.00	-0.07	0.03	-0.03
Δlog(Price)$_7$	-0.20	-0.06	0.06	-0.39	-0.02	0.06	-0.29	-0.26	0.16	-0.02	-0.01	-0.05	-0.06	-0.02	-0.10
Relative bid-ask Spread	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.01	0.01	0.00	0.01	0.01	0.00	0.00	0.01
Δlog(Spread)$_3$	0.66	-0.28	-3.07	0.73	-1.52	-0.62	4.49	-0.75	-2.39	2.39	-0.76	-1.48	-1.04	-2.05	-2.23
Δlog(Spread)$_5$	0.25	0.26	-2.62	3.11	0.42	2.01	0.81	-0.94	-2.28	0.54	-2.59	-1.08	-1.01	-2.50	-2.94
Δlog(Spread)$_7$	-0.06	-0.43	-3.81	2.72	0.97	-0.23	0.08	-1.52	-2.24	0.24	-1.67	1.81	-0.18	-2.42	-3.69
Years to Maturity	8.24	7.95	7.61	11.60	9.59	10.43	7.71	15.82	9.66	8.49	5.04	6.69	15.04	10.80	6.45
Years of Life	2.31	2.54	2.04	3.10	2.34	3.09	2.89	3.12	3.77	1.97	3.74	0.51	3.99	3.13	-0.88
Panel B: Country level summary statistics, by country															
FIR	0.01	-0.23	-0.01	0.10	-0.03	-0.01	0.24	0.12	-0.02	-0.02	0.69	0.39	0.00	0.09	-0.00
Δlog(FX rate)$_3$	0.33	0.04	0.45	0.48	-0.16	-0.05	0.26	0.07	-0.25	0.21	0.30	0.83	-0.13	0.02	0.26
Δlog(FX rate)$_5$	0.27	0.03	0.39	0.47	-0.08	-0.02	0.36	0.04	-0.19	0.11	0.41	1.04	-0.04	0.09	0.18
Δlog(FX rate)$_7$	0.38	-0.11	0.60	0.87	-0.03	0.18	0.75	0.01	-0.14	0.41	0.24	1.17	0.43	0.06	0.37
Total Market Value in US $	201.28	29.51	32.76	51.19	67.56	135.61	11.66	10.09	2.73	100.85	13.67	40.18	74.90	47.29	59.68
Weight in the Index	10.00	4.83	6.34	9.20	9.98	10.00	1.82	1.91	0.47	10.00	2.12	7.13	9.96	8.49	9.88
Panel C: Average Number of bonds observed in each period, by years to maturity															
1 to 3 years to maturity	1.56	3.39	4.48	6.11	8.27	4.09	1.25	1.89	11.52	3.23	2.78	7.30	2.02	10.28	4.27
3 to 5 years to maturity	1.34	2.94	2.97	3.47	6.31	3.48	1.38	1.45	9.58	3.61	1.73	4.23	1.80	6.50	2.98
5 to 7 years to maturity	1.02	1.88	1.92	2.77	4.80	1.75	0.52	1.64	7.30	1.66	1.56	1.83	1.41	3.91	0.52
7 to 10 years to maturity	1.61	2.19	2.19	4.78	3.91	2.28	0.44	3.08	9.52	2.42	0.80	1.52	1.95	5.00	2.55
More than 10 years to maturity	1.88	3.38	2.19	14.67	8.98	6.63	1.59	10.42	20.33	3.42	0.50	1.48	5.98	12.11	0.00
Total	7.41	13.78	13.75	31.8	32.27	18.23	5.18	18.48	58.25	14.34	7.37	16.36	13.16	37.8	10.32

Note: $\Delta\log(\mathrm{y})_z$ is the cumulative log change of y over an interval that goes from 5 days prior to the rebalancing date to z days after it. The average of the relative bid-ask spread is computed in $d-5$, that is, 5 days before the rebalancing. Statistics in Panel A are calculated on the whole sample of bonds used in the main regressions on Price and Spread, for each of the 15 countries used in the analysis, separately. Chile is omitted from the table due to bond data availability. As regards country-level data, the average FIR in Chile is equal to $-.10$; the average $\Delta\log(\mathrm{FX\ rate})_z$ is $-.15$, $-.20$ and $-.13$ for z equal to 3, 5 and 7, respectively. The average market value is US$ is 1.12 and the average weight in the GBI EM Global diversified equals .19.

Table 3: Effects of Flow Implied by Rebalancing on Bond Prices

Dependent Variable: Cumulative Returns									
	Time FE			Time FE & Controls			Country and Time FE		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	$[d+3]$	$[d+5]$	$[d+7]$	$[d+3]$	$[d+5]$	$[d+7]$	$[d+3]$	$[d+5]$	$[d+7]$
FIR	0.088***	0.090***	0.113***	0.089***	0.091***	0.113***	0.089***	0.096***	0.123***
	(0.021)	(0.024)	(0.034)	(0.021)	(0.024)	(0.034)	(0.023)	(0.025)	(0.035)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	No	No	No	No	No	Yes	Yes	Yes
Controls	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Mean Indep. Var.	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
Standard dev.	0.875	0.875	0.875	0.875	0.875	0.875	0.875	0.875	0.875
Observations	19101	19087	19077	19101	19087	19077	19101	19087	19077
N. of Countries	15	15	15	15	15	15	15	15	15
N. of Bonds	623	623	623	623	623	623	623	623	623
R^2	0.177	0.210	0.233	0.177	0.210	0.233	0.184	0.219	0.244

Note: The Table reports the OLS coefficients of FIR on cumulative returns in a period that starts 5 days before the rebalancing and ends 3, 5 and 7 days after it. Controls include bonds' life to maturity, that is measured using a set of dummies identifying bonds with maturity between 1 and 3 years, 3 and 5 years, 5 and 7 years, 7 to 10 years, and more than 10 years. Chile is excluded by the regression due to data availability. The main independent variable is the FIR measure computed following equation (2). Standard errors in parenthesis are clustered by country and years to maturity (following the categories described above). *** p< 0.01, ** p< 0.05, *p< 0.10.

Table 4: Effects of Flow Implied by Rebalancing on the Bid-Ask Spread

Dependent Variable: Δ log(Bid-Ask Spread)									
	Time FE			Time FE & Controls			Country and Time FE		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	$[d+3]$	$[d+5]$	$[d+7]$	$[d+3]$	$[d+5]$	$[d+7]$	$[d+3]$	$[d+5]$	$[d+7]$
FIR	-1.175***	-0.456	-0.493	-1.149***	-0.426	-0.462	-1.294***	-0.447	-0.602*
	(0.353)	(0.299)	(0.318)	(0.354)	(0.297)	(0.327)	(0.359)	(0.318)	(0.322)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	No	No	No	No	No	Yes	Yes	Yes
Controls	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Mean Indep. Var.	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
Standard dev.	0.872	0.872	0.872	0.872	0.872	0.872	0.872	0.872	0.872
Observations	18826	18800	18769	18826	18800	18769	18826	18800	18769
N. of Countries	15	15	15	15	15	15	15	15	15
N. of Bonds	618	618	618	618	618	618	618	618	618
R^2	0.036	0.031	0.044	0.036	0.032	0.045	0.038	0.035	0.048

Note: The Table reports the OLS coefficients of FIR on the change in the log of the bid-ask spread in a period that starts 5 days before the rebalancing and ends 3, 5 and 7 days after it. Controls include bonds' life to maturity, that is measured using a set of dummies identifying bonds with maturity between 1 and 3 years, 3 and 5 years, 5 and 7 years, 7 to 10 years, and more than 10 years. Chile is excluded by the regression due to data availability. The main independent variable is the FIR measure computed following equation (2). Standard errors in parenthesis are clustered by country and years to maturity (following the categories described above). *** p< 0.01, ** p< 0.05, *p< 0.10.

Table 5: Effects of Flow Implied by Rebalancing on the Exchange Rate

Dependent Variable: Δ log(FX Rate)									
	Time FE			Time & Country FE			Clustered SE		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	$[d+3]$	$[d+5]$	$[d+7]$	$[d+3]$	$[d+5]$	$[d+7]$	$[d+3]$	$[d+5]$	$[d+7]$
FIR	-0.325***	-0.364***	-0.367***	-0.359***	-0.413***	-0.424***	-0.359***	-0.413***	-0.424***
	(0.091)	(0.097)	(0.110)	(0.096)	(0.099)	(0.115)	(0.109)	(0.131)	(0.143)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country FE	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Mean Indep. Var.	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.049
Standard dev.	0.879	0.879	0.879	0.879	0.879	0.879	0.879	0.879	0.879
Observations	876	878	877	876	878	877	876	878	877
N. of Countries	16	16	16	16	16	16	16	16	16
R^2	0.438	0.451	0.421	0.462	0.478	0.451	0.462	0.478	0.451

Note: The Table reports the OLS coefficients of FIR on the change in the log of the exchange rate in a period that starts 5 days before the rebalancing and ends 3, 5 and 7 days after it. The main independent variable is the FIR measure computed following equation (2). Robust standard errors in parenthesis in columns (1)-(6), and standard errors clustered at the country-year level in columns (7)-(9). *** p< 0.01, ** p< 0.05, *p< 0.10.

Table 6: Cumulative Returns around the Rebalancing date

Dependent Variable: Cumulative Returns									
	Pre-rebalancing				Rebalancing	Post-rebalancing			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	$[d-4]$	$[d-3]$	$[d-2]$	$[d-1]$	d	$[d+1]$	$[d+2]$	$[d+3]$	$[d+4]$
FIR	0.011	0.001	0.011	0.014	0.007	0.027	0.064***	0.089***	0.098***
	(0.009)	(0.012)	(0.013)	(0.017)	(0.018)	(0.018)	(0.018)	(0.021)	(0.022)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean Indep. Var.	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058	0.058
Standard dev.	0.875	0.875	0.875	0.875	0.875	0.875	0.875	0.875	0.875
Observations	19101	19101	19101	19101	19101	19101	19101	19101	19092
N. of Countries	15	15	15	15	15	15	15	15	15
N. of Bonds	623	623	623	623	623	623	623	623	623
R^2	0.055	0.096	0.114	0.128	0.152	0.154	0.159	0.177	0.190

Note: The Table reports the OLS coefficients of FIR on cumulative returns, computed as the difference between the log of Price in $d-5$, where d is the rebalancing date, and the log of Price in the days around the rebalancing. Controls include bonds' life to maturity, that is measured using a set of dummies identifying bonds with maturity between 1 and 3 years, 3 and 5 years, 5 and 7 years, 7 to 10 years, and more than 10 years. Chile is excluded by the regression due to data availability. The main independent variable is the FIR measure computed following equation (2). Standard errors in parenthesis are clustered by country and years to maturity (following the categories described above). *** $p< 0.01$, ** $p< 0.05$, *$p< 0.10$.

Table 7: Change in the Spread around the Rebalancing date

Dependent Variable: Δ log(Bid-Ask Spread)									
	Pre-rebalancing				Rebalancing	Post-rebalancing			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	$[d-4]$	$[d-3]$	$[d-2]$	$[d-1]$	d	$[d+1]$	$[d+2]$	$[d+3]$	$[d+4]$
FIR	-0.024	0.132	0.024	-0.116	-0.425	-0.640**	-0.810**	-1.149***	-0.702**
	(0.256)	(0.263)	(0.350)	(0.243)	(0.311)	(0.314)	(0.352)	(0.354)	(0.340)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean Indep. Var.	0.056	0.056	0.056	0.056	0.056	0.057	0.057	0.058	0.058
Standard dev.	0.873	0.873	0.873	0.873	0.873	0.872	0.873	0.872	0.872
Observations	18839	18843	18836	18845	18839	18836	18803	18826	18815
N. of Countries	15	15	15	15	15	15	15	15	15
N. of Bonds	618	618	618	618	618	618	618	618	618
R^2	0.008	0.006	0.005	0.043	0.040	0.039	0.039	0.036	0.047

Note: The Table reports the OLS coefficients of FIR on on the change in the log of the bid-ask spread, computed as the difference between the log of Spread in $d-5$, where d is the rebalancing date, and the log of Spread in the days around the rebalancing. Controls include bonds' life to maturity, that is measured using a set of dummies identifying bonds with maturity between 1 and 3 years, 3 and 5 years, 5 and 7 years, 7 to 10 years, and more than 10 years. Chile is excluded by the regression due to data availability. The main independent variable is the FIR measure computed following equation (2). Standard errors in parenthesis are clustered by country and years to maturity (following the categories described above). *** p< 0.01, ** p< 0.05, *p< 0.10.

Table 8: Change in the Exchange Rate around the Rebalancing date

Dependent Variable: Δ log(FX Rate)									
	Pre-rebalancing				Rebalancing	Post-rebalancing			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	$[d-4]$	$[d-3]$	$[d-2]$	$[d-1]$	d	$[d+1]$	$[d+2]$	$[d+3]$	$[d+4]$
FIR	-0.035	-0.064*	-0.067	-0.116**	-0.238***	-0.280***	-0.299***	-0.325***	-0.358***
	(0.030)	(0.038)	(0.045)	(0.054)	(0.068)	(0.076)	(0.088)	(0.091)	(0.103)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean Indep. Var.	0.048	0.048	0.049	0.049	0.046	0.049	0.050	0.049	0.049
Standard dev.	0.878	0.878	0.878	0.878	0.876	0.879	0.879	0.879	0.879
Observations	877	877	879	879	877	875	876	876	878
N. of Countries	16	16	16	16	16	16	16	16	16
R^2	0.331	0.422	0.362	0.406	0.412	0.417	0.413	0.438	0.439

Note: The Table reports the OLS coefficients of FIR on the change in the log of the exchange rate, computed as the difference between the log of the exchange rate in$d-5$, where d is the rebalancing date, and the log of the exchange rate in the days around the rebalancing. The main independent variable is the FIR measure computed following equation (2). Robust standard errors in parenthesis. *** p< 0.01, ** p< 0.05, *p< 0.10.

Table 9: Effects of Flow Implied by Rebalancing on Bond Prices (additional results)

Dependent Variable: Cumulative Returns									
	Bonds in the Index			Bonds not in the Index			Country Level		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	$[d+3]$	$[d+5]$	$[d+7]$	$[d+3]$	$[d+5]$	$[d+7]$	$[d+3]$	$[d+5]$	$[d+7]$
FIR	0.099***	0.138***	0.185***	0.072***	0.061**	0.070*	0.092***	0.101***	0.117***
	(0.026)	(0.036)	(0.056)	(0.025)	(0.029)	(0.036)	(0.022)	(0.025)	(0.039)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean Indep. Var.	0.042	0.042	0.042	0.069	0.069	0.069	0.046	0.046	0.046
Standard dev.	0.786	0.786	0.786	0.930	0.929	0.929	0.822	0.822	0.822
Observations	7569	7568	7566	11532	11519	11511	3986	3985	3985
N. of Countries	15	15	15	15	15	15	15	15	15
N. of Bonds	222	222	222	401	401	401			
R^2	0.256	0.283	0.298	0.163	0.197	0.223	0.224	0.255	0.279

Note: The Table reports the OLS coefficients of FIR on cumulative returns in a period that starts 5 days before the rebalancing and ends 3, 5 and 7 days after it. Controls include bonds' life to maturity, that is measured using a set of dummies identifying bonds with maturity between 1 and 3 years, 3 and 5 years, 5 and 7 years, 7 to 10 years, and more than 10 years. In columns (1)-(3) estimates are computed on the subsample of bonds included in the GBI EM Global Diversified. Sovereign debt straight bonds in local currency not in the index constitute the subsample used in columns (4)-(6). Finally, in the last three columns, estimates are produced after collapsing data by country, time and years to maturity (following the above mentioned 5 categories). Chile is excluded by the regression due to data availability. The main independent variable is the FIR measure computed following equation (2). Standard errors in parenthesis are clustered by country and years to maturity. *** p< 0.01, ** p< 0.05, *p< 0.10.

Table 10: Effects of Flow Implied by Rebalancing on the Bid-Ask Spread (additional results)

Dependent Variable: Δ log(Bid-Ask Spread)									
	Bonds in the Index			Bonds not in the Index			Country Level		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	$[d+3]$	$[d+5]$	$[d+7]$	$[d+3]$	$[d+5]$	$[d+7]$	$[d+3]$	$[d+5]$	$[d+7]$
FIR	-1.128**	0.056	0.112	-1.367***	-1.192***	-1.199***	-1.288***	-0.212	-0.104
	(0.472)	(0.376)	(0.433)	(0.429)	(0.376)	(0.407)	(0.463)	(0.339)	(0.393)
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean Indep. Var.	0.039	0.039	0.039	0.070	0.070	0.071	0.043	0.043	0.044
Standard dev.	0.784	0.784	0.784	0.925	0.925	0.925	0.820	0.820	0.819
Observations	7502	7500	7493	11324	11300	11276	3959	3958	3956
N. of Countries	15	15	15	15	15	15	15	15	15
N. of Bonds	222	222	222	396	396	396			
R^2	0.015	0.025	0.024	0.082	0.079	0.092	0.032	0.032	0.048

Note: The Table reports the OLS coefficients of FIR on the change in the log of the bid-ask spread in a period that starts 5 days before the rebalancing and ends 3, 5 and 7 days after it. Controls include bonds' life to maturity, that is measured using a set of dummies identifying bonds with maturity between 1 and 3 years, 3 and 5 years, 5 and 7 years, 7 to 10 years, and more than 10 years. In columns (1)-(3) estimates are computed on the subsample of bonds included in the GBI EM Global Diversified. Sovereign debt straight bonds in local currency not in the index constitute the subsample used in columns (4)-(6). Finally, in the last three columns, estimates are produced after collapsing data by country, time and years to maturity (following the above mentioned 5 categories). Chile is excluded by the regression due to data availability. The main independent variable is the FIR measure computed following equation (2). Standard errors in parenthesis are clustered by country and years to maturity (following the categories described above). *** p< 0.01, ** p< 0.05, *p< 0.10.

Table 11: Heterogeneity Analysis

Heterogeneous effects of FIR on Price, Liquidity and Exchange Rate									
	Cumulative Returns			Δ log(Bid-Ask Spread)			Δ log(FX Rate)		
	$[d+3]$	$[d+5]$	$[d+7]$	$[d+3]$	$[d+5]$	$[d+7]$	$[d+3]$	$[d+5]$	$[d+7]$
negative FIR × FIR	0.163***	0.137**	0.206**	-0.525	1.072	0.380	-0.724***	-0.801***	-0.740***
	(0.055)	(0.066)	(0.087)	(0.991)	(1.270)	(1.318)	(0.222)	(0.230)	(0.262)
positive FIR × FIR	0.177***	0.177***	0.207***	-1.435**	-1.007*	-1.411***	-0.231**	-0.214*	-0.226*
	(0.034)	(0.044)	(0.056)	(0.592)	(0.545)	(0.519)	(0.103)	(0.118)	(0.131)
2009-2011 × FIR	0.030	-0.010	0.032	-0.736	-0.728**	-0.761	-0.247*	-0.123	-0.100
	(0.037)	(0.039)	(0.050)	(0.580)	(0.346)	(0.631)	(0.139)	(0.137)	(0.143)
2012-2014 × FIR	0.119***	0.108***	0.143***	-1.410***	-0.298	-0.286	-0.311**	-0.305**	-0.376**
	(0.024)	(0.030)	(0.047)	(0.530)	(0.469)	(0.512)	(0.149)	(0.147)	(0.174)
2015-2016 × FIR	0.070	0.139***	0.116**	-0.906	-0.461	-0.610	-0.424**	-0.739***	-0.635***
	(0.045)	(0.042)	(0.050)	(0.595)	(0.666)	(0.674)	(0.165)	(0.196)	(0.237)
Long-Term × FIR	0.153***	0.156***	0.209***	-1.060**	-0.578	-0.827*			
	(0.030)	(0.032)	(0.050)	(0.464)	(0.407)	(0.448)			
Medium-Term × FIR	0.070**	0.078	0.083	-1.432*	-0.270	0.090			
	(0.029)	(0.051)	(0.075)	(0.780)	(0.794)	(0.927)			
Short-Term × FIR	0.032	0.031	0.029	-1.157**	-0.321	-0.262			
	(0.022)	(0.028)	(0.036)	(0.553)	(0.429)	(0.443)			
Observations	19101	19087	19077	18826	18800	18769	876	878	877

Note: The Table reports the OLS coefficients of FIR on the change in the log of Price, Spread and Exchange Rate in a period that starts 5 days before the rebalancing and ends 3, 5 and 7 days after it. All regressions include Time FE, and regressions on Price and Spread also include the usual controls on bonds' life to maturity. Chile is excluded by the sample in the regressions on Price and Spread. Positive (negative) FIR is a dummy variable that equals 1 when FIR is greater (smaller) than 0. 2009-2011, 2012-2014 and 2015-2016 are dummy variables that equal 1 when the observation is from a date included in the corresponding time interval. Long-Term is a dummy that equals 1 when the bond has less than 5 years of life to maturity; Medium-Term is a dummy that equals 1 when the bond has 5 to 10 years of life to maturity. Long-Term equals 1 when the bond matures in more than 10 years. The main independent variable is the FIR measure computed following equation (2). Standard errors in parenthesis are clustered by country and years to maturity (following the categories described above). *** $p< 0.01$, ** $p< 0.05$, *$p< 0.10$.