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Global Market Volatility and Portfolio Fund Flows in Emerging Market*

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This study investigates the role of global market volatility (VIX) on monthly bond and equity fund flows into emerging market economies during 2005-2015. We find that the effect of interest rate spread on the fund flow depends on the level of global market volatility. In particular, the spread is positively associated with net fund flow when the volatility is high, but negatively associated when the volatility is low. This switching effect shows that an ordinary monetary policy instrument (i.e., interest rate) alone may not be a sufficient tool in mitigating rapid capital flows.

JEL Classifications: F3, F21, G11
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1. INTRODUCTION

Portfolio investing has become an important part of international capital flow during the past decade. The volume of cross-border portfolio investment had shown steady growth and had claimed significant share of cross-border capital flow, while traditionally dominant bank debt flow had declined after the global financial crisis. These changes in the composition of international capital flow are expected to change the existing aspects of international capital flow, therefore further investigation is needed to understand the flow of international portfolio investments.

The aspects of global market risk has also changed since the global financial crisis. Global market risk represents the riskiness of global financial assets and can be measured with the volatility index, VIX. The volatility of international financial markets has remained at abnormally low levels, in part due to the extended period of expansionary monetary policies around the world. In addition, the level of volatility is expected to increase if the monetary policy begins to normalize. Therefore, it is important to investigate how the portfolio fund flow would react in response to the changes in volatility.

To address the above questions, we investigate how changes in the volatility affects the bond and equity fund flows, and further explore whether the effects of interest rate spread on fund flow is affected by the levels of volatility.

Literature on capital flow among countries has re-gained attention after the 2008 global financial crisis. Among the factors that determines effects on international capital flows, the volatility of international financial markets along with other push factors has been pointed out as an important factor in recent papers. Traditionally, push factors were known to explain the capital flows to developing countries[1)] and the literature is now shedding new light on the role of global market volatility.

[1)] See De Santis and Lührmann (2009), Fernandez-Arias (1996), Sarno and Taylor (1999) and others.

Forbes and Warnock (2012) analyzed the rapid capital flows from 1980 to 2009, analyzing the gross inflow and outflow of foreign investors and the flow by domestic investors. In the previous literature, capital flows were analyzed by focusing on the net flow, which is the difference between the gross inflow and the outflow. In Forbes and Warnock (2012), on the other hand, focused on the inflow and outflow by foreign investors. The analysis shows that the major factors are different for outflows and inflows, and that the real interest rates of major countries do not necessarily explain the rapid capital movements. However, financial volatility indicator VIX was found to be significantly associated with rapid capital movements.

Fratzscher (2012) focused on the events and impacts of the global financial crisis period and analyzed the importance of global factors and country-specific factors before and after the crisis. Fratzscher (2012) argued that during the financial crisis, events that have caused a global impact have had a major impact on capital flows, and that pull factors played an important role during the recovery. The analysis of the events were made possible due to the high frequency data. In his paper, weekly fund flow data from EPFR was used, whereas the ordinary data used in the previous literature was at most quarterly. Such event analyses would have been impossible with quarterly data. However, due to the limited availability of the data at the time, the sample period was selected from October 2005 to November 2010. The sample period of 5 years is rather short and the global financial crisis period accounts for a large part of the sample period. Moreover, it includes only fraction of the recent expansionary monetary policy period.

Ghosh, Qureshi, Kim, Zalduendo (2014) studied the events of surges, namely rapid capital inflows, of emerging countries in order to understand the causes of surges into emerging economies since the global financial crisis. Ghosh *et al*. (2014) pointed out that global factors such as the US real interest rate and global financial market uncertainty are important factors that lead to capital inflow into emerging economies, and foreigners are sensitive to these factors. In their study, yearly data were used from 1980 to 2011.

For the analysis on the capital flows in Korea, Kim, Kim, and Choi (2013)

examined the determinants of capital flows. They found that the world interest rate had become increasingly important factor for the capital flows in Korea, whereas pull factors had become less important over time. Their paper did not take into account the effect of global market risk, but considered the volatility of exchange rates as one of pull factor for Korea. Moreover, the exchange rate between Korean Won and US dollar has shown to have substantial impact on Korean equity index. Kang and Yoon (2013) showed that volatility in the exchange rate market spills over to equity market and the effect became more significant after the global financial crisis.

Our contribution to the existing literature is two-fold. First, we focus on the effect of volatility on the equity and bond fund flow. Forbes and Warnock (2012), Fratzscher (2012), and Ghosh *et al*. (2014) considered global volatility as a part of global push factor and compared it with other country specific pull factors. However, they do not consider the volatility as a state variable under which different underlying economic effects arise. Moreover, we consider equity and bond fund flow separately to better understand heterogeneity between the two asset classes. Separating the bonds and equity from international portfolio investments also enables us to find common factors that drive the two flows.

Second, we analyze relatively high frequency data for international capital flow and extend the sample period so that we could better understand the recent low volatility period caused by extraordinarily expansionary monetary policy. Traditional research on international capital flows usually rely on annually or at most quarterly data and focus their analysis on the cross-sectional variations. However, such low frequency data is not suitable for studying the effect of global volatility on the flows. Volatility changes rather quickly and the effect of sudden changes in volatility would not be correctly captured if we rely on low frequency flow data.

The remainder of this paper is organized as follows. In section 2, we describe the data and our empirical methodology. Section 3 presents the empirical results. Section 4 concludes.

2. DATA AND EMPIRICAL METHODOLOGY

Monthly equity and bond fund flow data was obtained from EPFR for 15 emerging countries. Among 23 emerging countries classified by MSCI, we chose the following 15 countries for which we could obtain one-year interest rate at a monthly frequency for the selected sample period: Brazil, Chile, China, Czech, Hungary, India, Indonesia, Korea, Pakistan, Peru, Poland, Russia, South Africa, Thailand, and Turkey.

Sample period of the EPFR data used in this paper is from January 2005 to August 2015. The beginning of our sample period is similar to that used in Fratzscher (2012), but our sample period is extended by 5 years, which is enough to cover the period with low volatility and very low interest rates.

For each investment destination country and asset class, EPFR provides the fund flow variable in percent and the dollar value of the assets invested in the country. For instance, the data tells us that during the August 2015 fund outflow from Korean bond was about 2% and that the total dollar amount invested in Korean bonds by funds was 17 billion USD at the end of August 2015.

The flow and assets under management variables are aggregated by EPFR from its collected funds data by destination country and by asset classes. According to Jotikasthira, Lundblad, and Ramadorai (2009) and IMF (2011), this sum accounts for about 5% to 20% of the official statistics of foreign equity and bonds portfolio investments. Although coverage is less than perfect, it was surveyed to have sufficient representation of the official data.

Although fund flows data are provided for each country, the flows to emerging market show high correlation with each other. Figure 1 shows heat map of correlations between monthly fund flows in selected emerging market countries. The figure displays all pairwise correlations between the countries and show very high correlations for many pairs. It is notable that the correlation is higher in bond flows compared to equity flows. The average of 105 pairwise correlations was 0.80 for bond flows and 0.62 for equity flows. Froot, O'Connell, and Seasholes (2001) also shows using daily frequency

data of fund flows that there are high correlation of international fund flows among emerging market countries. Miyajima and Shim (2014) also finds co-movement of investor flows in funds investing in emerging markets. The reason for the high correlation is often associated with category trading, in this case buying and selling the emerging market equity or bonds as a bundle (see Barberis and Shleifer, 2003). Because of the high correlations, it is sensible to aggregate the flows to simplify the analysis as country specific factors is expected to add small explanation power.

For the first part of our analysis, we aggregate the fund flow for all emerging markets so we could investigate the aggregate effects of fund flows to emerging markets. Aggregated fund flow to emerging market is calculated as weighted average of individual country fund flow where weights are invested asset size in each country at the end of previous month. Aggregated emerging market bond fund flow can be written as

$$EM\ BondFlow_t = \frac{\sum_{n=1}^{N} BondFlow_{n,t} BondTNA_{n,t-1}}{\sum_{n=1}^{N} BondTNA_{n,t-1}}, \tag{1}$$

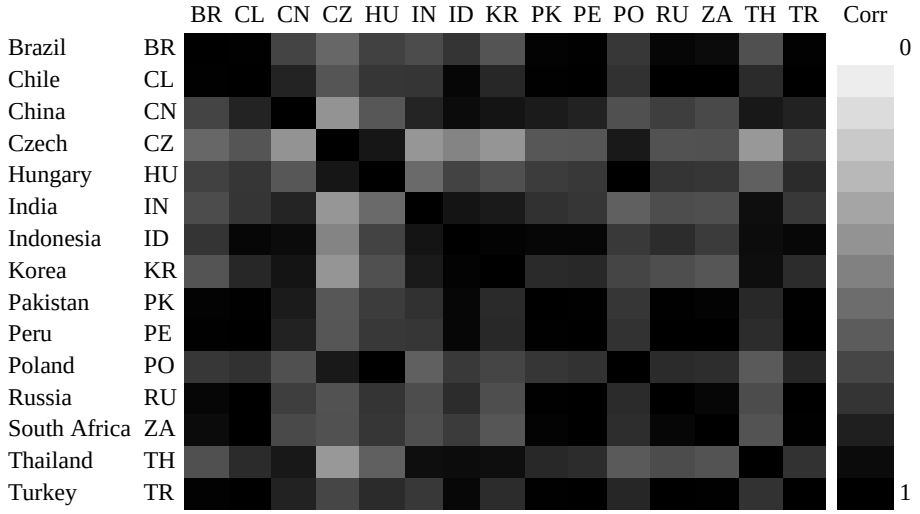
where $BondFlow_{n,t}$ is the bond fund flow to country n during month t and $BondTNA_{n,t-1}$ is the dollar amount of bond assets, namely total net value, invested in country n at the end of month $t-1$. Aggregated emerging market equity fund flow and aggregated interest rate spread for emerging market are calculated in a similar fashion. Note that there are two variants of the aggregated interest rate spread depending on the asset type.

$$SPREAD_{Bond,t} = \frac{\sum_{n=1}^{N} SPREAD_{n,t} BondTNA_{n,t-1}}{\sum_{n=1}^{N} BondTNA_{n,t-1}}, \tag{2}$$

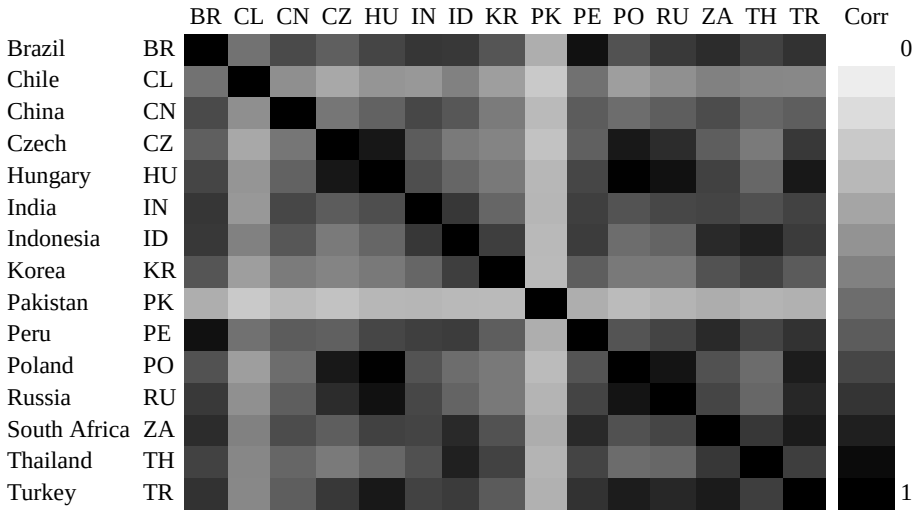
$$SPREAD_{Equity,t} = \frac{\sum_{n=1}^{N} SPREAD_{n,t} EquityTNA_{n,t-1}}{\sum_{n=1}^{N} EquityTNA_{n,t-1}}. \tag{3}$$

Figure 1 Heat Map of Fund Flow Correlation

Panel A: Bond fund flow



Panel B: Equity fund flow



Notes: This figure shows the heat maps of correlations between monthly fund flows among the emerging market countries. For each country pair, the correlation is calculated from the two monthly fund flow time-series. Correlation of 1 is represented in the figure as the darkest shade and zero the lightest. No correlation was below zero in the sample. The sample consists of country-level bond and equity fund flows from January 2005 to August 2015. The data is from EPFR.

For the second part of our analysis, we analyze the funds flow in Korea separately. For this part of the analysis, we use 10 year bond rate spread instead of one-year interest spread in the first part. Since 10 year interest spread is more stable, it is more suitable choice of interest spread. However, 10 year bond rate were not available for many emerging market countries, making it hard for us to construct reliable spread variable. For the case of Korea, we also included added two additional variables on foreign exchange: dollar return of holding Korean currency and the standard deviation of the currency return.

The summary statistics of the variables used in the regressions are reported in table 1. Also, figure 2 depicts the time-series data of VIX, the aggregated bond fund flow, and the aggregated interest spread from bond fund AUM.

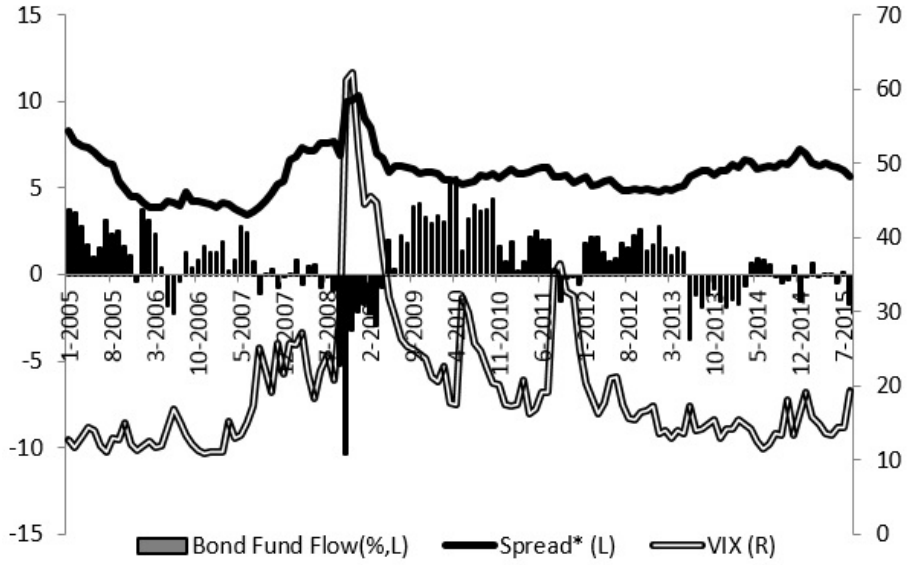
We used two main explanatory variables, namely changes in interest rate spreads and volatility in our regressions. Interest rate spreads is defined to be the difference between the interest rate of emerging market and the interest rate in the US. Also, we utilize dummy variables indicating volatility levels

Table 1 Summary Statistics

	Mean	Std.	Min	Max
VIX	19.71	9.44	10.79	62.25
ΔVIX	0.05	4.46	–10.20	31.37
$EM\ BondFlow$	0.76	2.14	–10.41	5.61
$SPREAD_{Bond}$	5.81	1.29	3.45	10.38
$\Delta SPREAD_{Bond}$	–0.02	0.45	–1.48	3.10
$EM\ Equity\ Flow$	0.32	1.21	–3.15	4.10
$SPREAD_{Equity}$	4.23	1.52	1.17	6.34
$\Delta SPREAD_{Equity}$	0.01	0.40	–1.42	1.85
$KR\ BondFlow$	0.77	1.88	–7.90	7.65
$KR\ EquityFlow$	0.31	0.95	–2.19	2.83
$KR\ SPREAD$	1.27	1.06	–0.84	2.75
$\Delta KR\ SPREAD$	0.00	0.27	–0.95	0.90

Notes: This table shows summary statistics of the main variables. The sample period is from January 2005 to August 2015. The data frequency is monthly. Fund flow data are from EPFR, VIX and interest rate data are from Datastream.

Figure 2 Aggregated Emerging Market Bond Fund Flow and Interest Spread



Notes: The sample period is from January 2005 to August 2015. Bond fund flow is calculated as weighted average of country-level bond fund flow where weights are the dollar amount of the bonds invested in each country. Similarly the interest spread is calculated as the weighted average of interest spread for the countries using the same weight. Fund flow data are from EPFR, VIX and interest rate data are from Datastream.

to analyze the effect of the main variables on the fund flow depending on the level of volatility. The following equation describes our baseline empirical model:

$$fund\ \ flow = \beta_0 + \beta_1 \Delta VIX + \beta_2 \Delta VIX \times D + \beta_3 \Delta SPREAD + \beta_4 \Delta SPREAD \times D. \quad (4)$$

Natural candidate for the volatility dummy variable was financial crisis dummy as in Fratzsher (2012), which represents the period from July 2008 to February 2009. In order to further investigate the effect of the volatility, four additional dummy variables for the following four cases are considered: volatility is above or below the 0.5 standard deviation from the mean, the

volatility is above the mean, the volatility is above the mean by 0.5 standard deviation, and the volatility is below 0.5 standard deviation from the mean. More sophisticated method such as smooth transition regression (STR) can be used, as in Sarno, Valente, and Leon (2006), but such methods could be limited because of fixed functional form. To address the concern that using dummy variables are over simplification of non-linearity, we considered several cases depending on the levels of volatility.

3. EMPIRICAL RESULTS

Table 2 shows the time-series regression results of the bond fund flows to emerging markets. In all of the regression models, changes in VIX (ΔVIX) show significantly negative association with the net inflow of bond funds. The result in column (1) shows additional net outflow may have occurred in response to rising volatility during the financial crisis, but results from other specifications show the level of volatility does not seem to have meaningful effect when interacted with the changes in volatility.

Also, result in column (1) and (2) shows that changes in the interest rate spread ($\Delta SPREAD$) doesn't seem to have significant effect on the bond fund flows in general. Basic theory suggests that if the difference between the interest rate of emerging countries and that of the US Treasury bond widens, it will induce the inflow of the bond fund flow. However, such an effect is not empirically supported in our analysis. Further investigation of the spread depending on the levels of volatility gives us interesting results. The results from column (3), (4), and (5) suggests that there is significant negative effect of widening spread on the bond fund inflow when volatility level is kept at low levels.

Bond rates in emerging economies are closely related to the economic growth rate of the countries, but they also represent credit risk in international financial markets. The simple correlation between VIX and the interest rate spread of emerging markets is about 0.57, which is considered to

Table 2 Effects of Volatility on Emerging Market Bond Fund Flow

	(1)	(2)	(3)	(4)	(5)
ΔVIX	–0.119**	–0.283***	–0.253**	–0.221**	–0.201***
	(–2.20)	(–2.87)	(–2.45)	(–2.57)	(–4.62)
$\Delta VIX \times D_{FinancialCrisis}$	–0.163				
	(–1.58)				
$\Delta VIX \times D_{\lvert VIX-\mu\rvert>0.5\sigma}$		0.132			
		(1.21)			
$\Delta VIX \times D_{VIX-\mu>0}$			0.076		
			(0.67)		
$\Delta VIX \times D_{VIX-\mu>0.5\sigma}$				0.030	
				(0.30)	
$\Delta VIX \times D_{VIX-\mu<0.5\sigma}$					0.182
					(0.99)
$\Delta SPREAD$	–0.642	–1.315	–1.841**	–1.984***	–0.282
	(–1.24)	(–1.17)	(–2.46)	(–2.86)	(–0.61)
$\Delta SPREAD \times D_{FinancialCrisis}$	0.582				
	(0.56)				
$\Delta SPREAD \times D_{\lvert VIX-\mu\rvert>0.5\sigma}$		0.525			
		(0.43)			
$\Delta SPREAD \times D_{VIX-\mu>0}$			1.457		
			(1.62)		
$\Delta SPREAD \times D_{VIX-\mu>0.5\sigma}$				1.811**	
				(2.09)	
$\Delta SPREAD \times D_{VIX-\mu<0.5\sigma}$					–2.034**
					(–2.03)
Adj R^2	0.1961	0.1901	0.2004	0.2092	0.2118

Notes: This table shows the results of time-series regressions of monthly bond fund flows to emerging markets on an intercept (not reported), change of VIX, change of the 1 year rate spread between the emerging market and the US, and the interactions terms with financial crisis dummy and the dummies indicating the levels of VIX. The sample consists of aggregated bond fund flows to emerging markets from January 2005 to August 2015. It reports the estimated coefficients, associated *t*-statistics, as well as the adjusted R^2. Standard errors are corrected with the Newey-West (1987) procedure with three lags. Fund flow data are from EPFR, and VIX and one-year rates are from Datastream. Bond fund flow and spread for the emerging market are aggregated from country level data using previous month-end asset size invested in each country as weights. μ and σ are mean and standard deviation of VIX, respectively.

be in a close relationship. As credit risk rises, the spread between US Treasuries and emerging market interest rates increases, and therefore additional capital outflow pressures should be offset to some extent. However, when the volatility of the international financial market is at low levels, such offsetting effect is not observed and instead we see a positive

association between widening spread and the capital outflow, which is a new finding in our paper.

The phenomenon in which widening of the spread and the capital outflow happening at the same time could be explained by the momentum trading behavior of international investors. Momentum trading can be characterized by buying when prices increase and selling when prices decline. Since the bond rate is inversely related to the bond price, falling price of bonds associated with outflow of bond funds could be the result of momentum trading.

The regression results of emerging market equity fund flow analysis are shown in table 3. Similar to the results seen in bond fund flow, the change in the VIX index have a statistically significant negative relationship with the net inflow of equity funds. However, results in column (2) and (4) suggests that during the times of high volatility the effect of change in volatility on the fund flow is reduced. This reduced sensitivity could be explained by volatility clustering effects. When volatility level is high, changes in volatility may happen in clusters and fund flow could react less sensitively when volatility level is high.

We also looked at the effect of the interest spread on the flow of emerging market equities funds. Unlike bonds where interest rates and returns are directly linked, there is no direct relationship between interest rates and stock returns. However, since a stock investor expects higher return than the domestic bond interest rate, an increase in the interest rate could increase the expected stock return, which may lead to the net inflow of the stock funds. Results in column (3) and (4) indeed show widening interest spread is associated with inflows of the equity funds. However, as seen in column (5) this relationship is reversed when the volatility is at a low level.

Table 4 shows the result of bond fund flows to Korea. In this Korean analysis, we focused on the dummy variables for high-volatility and low-volatility cases as seen in table 2. Instead of using the interest rate difference of 1 year as the interest rate spread, the difference between the 10-year Korean bond rate and 10-year US Treasury rates was used. We also

Table 3 Effects of Volatility on Emerging Market Equity Fund Flow

	(1)	(2)	(3)	(4)	(5)
ΔVIX	–0.181***	–0.264***	–0.221***	–0.236***	–0.133***
	(–6.04)	(–4.80)	(–3.84)	(–4.89)	(–5.92)
$\Delta VIX \times D_{FinancialCrisis}$	0.092*				
	(1.73)				
$\Delta VIX \times D_{\lvert VIX-\mu\rvert>0.5\sigma}$		0.168***			
		(2.79)			
$\Delta VIX \times D_{VIX-\mu>0}$			0.103*		
			(1.65)		
$\Delta VIX \times D_{VIX-\mu>0.5\sigma}$				0.127**	
				(2.32)	
$\Delta VIX \times D_{VIX-\mu<0.5\sigma}$					–0.010
					(–0.10)
$\Delta SPREAD$	–0.290	0.072	–0.681*	–0.489	0.371
	(–1.03)	(0.17)	(–1.66)	(–1.40)	(1.41)
$\Delta SPREAD \times D_{FinancialCrisis}$	0.714				
	(1.03)				
$\Delta SPREAD \times D_{\lvert VIX-\mu\rvert>0.5\sigma}$		–0.190			
		(–0.36)			
$\Delta SPREAD \times D_{VIX-\mu>0}$			1.076**		
			(2.10)		
$\Delta SPREAD \times D_{VIX-\mu>0.5\sigma}$				0.852*	
				(1.73)	
$\Delta SPREAD \times D_{VIX-\mu<0.5\sigma}$					–2.179**
					(–3.11)
Adj R^2	0.2341	0.2318	0.2302	0.2386	0.2426

Notes: This table shows the results of time-series regressions of monthly equity fund flows to emerging markets on an intercept (not reported), change of VIX, change of the 1 year rate spread between the emerging market and the US, and the interactions terms with financial crisis dummy and the dummies indicating the levels of VIX. The sample consists of aggregated equity fund flows to emerging markets from January 2005 to August 2015. It reports the estimated coefficients, associated *t*-statistics, as well as the adjusted R^2. Standard errors are corrected with the Newey-West (1987) procedure with three lags. Fund flow data are from EPFR, and VIX and one-year rates are from Datastream. Equity fund flow and spread for the emerging market are aggregated from country level data using previous month-end asset size invested in each country as weights. μ and σ are mean and standard deviation of VIX, respectively.

considered the effects of exchange rate volatility and the return of holding Korean Won.

Similar to the results of emerging market bonds, all regression results show that the change in the VIX has a significant negative association with the net inflow of the bond funds. This relationship does not seem to be

Table 4 Effects of Volatility on Korean Bond Fund Flow

	(1)	(2)	(3)	(4)	(5)
ΔVIX	–0.099**	–0.226***	–0.211***	–0.172***	–0.090***
	(–2.17)	(–3.83)	(–3.69)	(–3.21)	(–2.59)
$\Delta VIX \times D_{FinancialCrisis}$	–0.121*				
	(–1.69)				
$\Delta VIX \times D_{VIX-\mu>0.5\sigma}$		0.070	0.162**		
		(0.78)	(2.30)		
$\Delta VIX \times D_{VIX-\mu<0.5\sigma}$				0.073	0.010
				(0.69)	(0.10)
$\Delta SPREAD$	–0.388	–0.982	–0.803	0.295	0.361
	(–0.69)	(–1.51)	(–1.33)	(0.55)	(0.65)
$\Delta SPREAD \times D_{FinancialCrisis}$	0.996				
	(0.75)				
$\Delta SPREAD \times D_{VIX-\mu>0.5\sigma}$		2.057**	2.121**		
		(2.28)	(2.10)		
$\Delta SPREAD \times D_{VIX-\mu<0.5\sigma}$				–0.449	–0.477
				(–0.46)	(–0.51)
avg FX return			2.189**		1.514**
			(2.29)		(1.96)
stdev FX return			–1.260***		–1.204**
			(–2.78)		(–2.56)
Adj R^2	0.1704	0.1755	0.2921	0.1472	0.2397

Notes: This table shows the results of time-series regressions of monthly bond fund flows to Korea on an intercept (not reported), change of VIX, change of the 10 year rate spread between Korea and the US, and the interactions terms with financial crisis dummy and the dummies indicating the levels of VIX. The sample consists of bond fund flows to Korea from January 2005 to August 2015. It reports the estimated coefficients, associated *t*-statistics, as well as the adjusted R^2. Standard errors are corrected with the Newey-West (1987) procedure with three lags. Fund flow data are from EPFR, and VIX and ten-year rates are from Datastream. μ and σ are mean and standard deviation of VIX, respectively.

affected by the levels of volatility except for the specification (1) and (3).

The effect of the spread on the Korean bond fund flow show somewhat similar results as the aggregate results seen in table 2. The results in column (2) and (3) show that the changes in the spread and the bond fund inflow have a significant and positive relationship when volatility level is high. However, we could not observe the significant negative relationship between the spread and flow in the cases of low volatility.

Results in column (3) and (5) show interesting effect of foreign exchange rate on the bond fund flows. The results suggest that appreciation of Korean

Table 5 Effects of Volatility on Korean Equity Fund Flow

	(1)	(2)	(3)	(4)	(5)
ΔVIX	–0.102***	–0.126***	–0.121***	–0.092***	–0.065***
	(–3.82)	(–3.66)	(–3.91)	(–6.07)	(–2.90)
$\Delta VIX \times D_{FinancialCrisis}$	0.030				
	(1.01)				
$\Delta VIX \times D_{VIX-\mu>0.5\sigma}$		0.045	0.076*		
		(1.12)	(1.95)		
$\Delta VIX \times D_{VIX-\mu<0.5\sigma}$				–0.002	–0.031
				(–0.03)	(–0.43)
$\Delta SPREAD$	–0.431	–0.565	–0.469	–0.095	0.177
	(–1.14)	(–1.27)	(–1.18)	(–0.35)	(0.45)
$\Delta SPREAD \times D_{FinancialCrisis}$	0.419				
	(0.82)				
$\Delta SPREAD \times D_{VIX-\mu>0.5\sigma}$		0.365	0.602		
		(0.68)	(0.89)		
$\Delta SPREAD \times D_{VIX-\mu<0.5\sigma}$				–1.224*	–1.472*
				(–1.66)	(–1.95)
avg FX return			1.398**		1.334**
			(2.02)		(2.07)
stdev FX return			–0.282		–0.212
			(–1.35)		(–1.00)
Adj R^2	0.1766	0.1792	0.2336	0.1889	0.2339

Notes: This table shows the results of time-series regressions of monthly equity fund flows to Korea on an intercept (not reported), change of VIX, change of the 10 year rate spread between Korea and the US, and the interactions terms with financial crisis dummy and the dummies indicating the levels of VIX. The sample consists of equity fund flows to Korea from January 2005 to August 2015. It reports the estimated coefficients, associated *t*-statistics, as well as the adjusted R^2. Standard errors are corrected with the Newey-West (1987) procedure with three lags. Fund flow data are from EPFR, and VIX and ten-year rates are from Datastream. μ and σ are mean and standard deviation of VIX, respectively.

Won with respect to US dollar significantly increase the bond fund flow and that foreign exchange rate volatility significantly reduces the bond fund inflow.

The results on Korean equity fund flows are reported in table 5. As in the Korean bond fund results, we focused on the dummy variables for high-volatility and low-volatility cases. In all of the specifications, the change of VIX had significant negative association with the net inflow of equity funds. And the relationship of equity fund flow with volatility was not affected by the level of the volatility. The effect of the spread of interest rates on the net

inflow of Korean stock funds was not statistically significant in general, but it had significant negative association with fund flow when volatility level was low.

Also, it is worthwhile to note that the appreciation of Korean Won had a significantly positive association with the equity fund flow, similar to the results seen in Korean bond fund flow. However, equity fund flow was less affected by the exchange rate volatility than bond fund flow. These results suggest that stock investors responds to the direction of the exchange rate, but does not necessarily avoid exchange rate volatility.

4. CONCLUDING REMARKS

This paper analyzes the role of volatility on the emerging market fund flows. In line with previous literature, an increase in volatility was associated with the increase in fund outflow and the effect was maintained regardless of the level of volatility. On the other hand, we observed mixed results on the effect of widening interest rate spread on the fund flow. During the period of high volatility, an increase in the spread was positively and significantly associated with the net fund inflow to emerging market. However, the opposite effect was observed in the case of low volatility. In other words, narrowing of the interest spread had significantly positive effect on the fund inflows when volatility was low.

Under low volatility, risk appetite of international investors tends to increase, so investors who were sensitive to volatility tend to buy more risky assets that have not been invested or kept at a low exposure. If perceived risk increases, the assets purchased may be sold off and net outflows may occur at the same time as prices fall. In contrast, if the price of a risky asset rises, the fund's return will increase due to the increase in the valuation of the already-invested asset. If the risk appetite is high enough to purchase a relatively highly valued asset, more investment can be made and the net inflow can occur simultaneously with the rise of the price. This type of investment

behavior is consistent with the empirical results shown in this paper which show the negative relationship between the spread and net fund inflow during the times of low volatility. On the other hand, when the volatility is relatively high, we see that the expansion of the spread has a significant positive relationship with the net inflow. This effect is consistent with the theory that net inflows occur as the prices fall.

Further investigations of funds which invest in Korea show that there is a significantly positive relationship between the net inflow of bond funds and the interest rate spread when volatility is high. However, the negative relationship between the bond fund flows and the spread could not be found. In the results that incorporate the effect of the Won dollar exchange rate, we find that volatility of the exchange rate had negative effect on the Korean bond fund flow and that appreciation of Korean Won had significantly positive effect on the Korean equity fund flow.

Since the effects of interest rate spread may vary depending on the levels of volatility, the empirical results of this paper suggests that there may be difficulty in policy responding to capital flows with the usual monetary policy that focuses only on the interest rate movement.

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