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RESPONSE OF FUND FLOWS TO FUND PERFORMANCE FOR EMERGING MARKET BONDS: IS IT SYMMETRIC?

Key Points:

- *Mutual funds investing in emerging market economies (EMEs) bonds have grown by almost sevenfold since the global financial crisis to more than US$600 billion at the end of 2017. Therefore, from the perspective of financial stability, it is important for policymakers to understand the behaviour of EME bond fund investors.*

- *Against this backdrop, we investigate the relationship between the fund flow and past performance of EME bond funds. Our main finding is that EME bond funds display a convex flow-performance relationship, i.e. less outflow in response to bad performance than inflow to good performance.*

- *Such a relationship is arguably attributable to practices taken by fund management companies to dampen fund investors' incentives to redeem in reaction to bad performance, bias of media coverage towards outperforming funds, and the relatively high participation costs of EME bond funds.*

- *Therefore, while this finding may to some extent alleviate concerns about the fragility of EME bond funds, it is important to watch out for the changes in the factors (e.g. regulations, investor base and policies of fund management companies) that have contributed to the convexity of the flow-performance relationship.*

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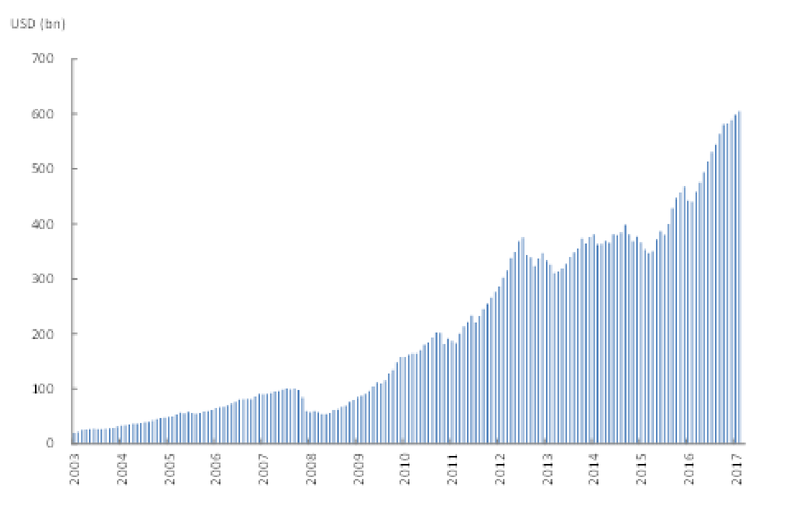
I. INTRODUCTION

Mutual funds investing in emerging market economies (EME) bonds have grown tremendously since the global financial crisis. According to the EPFR Global, the assets under management of EME bond funds totalled US$604 billion at the end of 2017, an almost sevenfold increase from US$88 billion at the end of 2009 (Chart 1). From the perspective of financial stability, it is therefore important for policymakers to understand more about the behaviour of EME bond fund investors. Against this backdrop, we investigate the relationship between EME bond fund flow and the past performance of these funds.

Chart 1. Total net assets of EME bond funds



Source: EPFR Global.

It is well established that the relationship between fund flow and fund performance is, other things being equal, positive (Christoffersen et al. (2014)). To put it simply, good performance attracts inflow and bad performance encourages outflow. What is important but often ignored is whether this positive relationship is asymmetric. There are two possible cases of asymmetry. First, it is *concave*: there is more outflow in response to bad performance than inflow to good performance. Second, it is *convex*: there is less outflow in response to bad performance than inflow to good performance. It is important because, without this knowledge, one would tend to underestimate or overestimate the potential capital flow reversal when market conditions change abruptly.[1]

[1] For example, based on the amount of inflow in a bull market, one will underestimate (overestimate) the potential size of the outflow in a bear market if the relationship is concave (convex).

II. METHODOLOGY

In order to investigate the flow-performance relationship in EME bond funds, we use a fixed effect panel data model. In our model, the dependent variable $FF_{i,t}$ is the net fund flow to an EME bond fund i at time t. To enable comparability across funds, $FF_{i,t}$ is specified as the value of the net subscription to the fund in the current period divided by the fund size of the preceding period. FF is computed based on the change of a fund's total net assets (TNA) adjusted for a fund's rate of return (RR). The formula is as follows:

$$FF_{i,t} \equiv \frac{TNA_{i,t} - TNA_{i,t-1}\left(1 + RR_{i,t}\right)}{TNA_{i,t-1}} \qquad (1)$$

To capture the convexity of the flow-performance relationship, we apply a piecewise regression model. Specifically, it consists of two linear segments of different slopes, with the turning point set at zero. Our general model is specified as follows:

$$FF_{i,t} = \alpha_0 + \beta_1 RR_{i,t-1} + \beta_2 D\left(RR_{i,t-1} \leq 0\right) RR_{i,t-1} + \beta_3 Ln\left(TNA_{i,t}\right) RR_{i,t-1} + \beta_4 Vol_{i,t-1} RR_{i,t-1} + \sum_{k=1}^{n} \gamma_k Z_{k,i,t} + \varepsilon_{i,t} \quad (2)$$

The convexity of the flow-performance relationship is estimated by an interaction term of $RR_{i,t-1}$ and a dummy variable $D\left(RR_{i,t-1} \leq 0\right)$ that equals one if the prior-period fund return is less than or equal to zero, and zero if otherwise.[2] Under this specification, a positive (negative) β_2 would indicate that fund flow is more (less) sensitive to a negative return. In addition to fund performance, other explanatory variables ($Z_{k,i,t}$) are included in the model to control for various factors that can affect fund flow, including the age of a fund, level of market risk aversion, lagged fund flow, fund size and volatility of its past returns.

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2 For robustness check, we also use benchmarked return as an alternative measure of fund performance and the results are very similar. Benchmarked return is defined as a fund's total return subtracting the return of the market benchmark index, with both rates of returns in US dollar terms.

Our model differs from typical studies in the literature in two salient features. First, we hypothesise that the sensitivity of fund flow to a fund's past performance is dependent on fund size. The reason is that a larger fund usually attracts more media attention (both positive and negative) and therefore fund investors should be more aware of any movement on its past return, leading to higher flow-performance sensitivity. Such a positive correlation between fund size and media coverage is supported by the empirical evidence found by Sirri and Tufano (1998). In their study, they found that fund size showed a statistically significant influence on the number of stories appearing in LexisNexis, which is a search engine of mainstream newspapers and periodicals. To control for the dynamics between fund size and fund flow sensitivity, we introduce an interaction term by multiplying a fund's past performance with its size, and expect the coefficient β_3 to be positive.

Second, we hypothesise that fund flow sensitivity depends on the volatility of a fund's past returns. The reason, as suggested by Huang et al. (2012), is that if a fund's past returns are highly volatile, this track record of performance is less informative of a fund manager's innate ability or skills. As such, investors would respond to a given fund performance less vigorously, leading to lower flow-performance sensitivity. We measure the volatility of a fund by the 12-month backward rolling standard deviation of its rate of return. If investors indeed rely less on past performances in forming investment decisions in the case of a volatile fund, we would expect the coefficient β_4 to be negative.

In addition to fund performance, we also include other explanatory variables to control for miscellaneous influences on fund flow, including the age of a fund, the level of market risk aversion and lagged fund flows. The age of a fund is included since it is typical for a newly launched mutual fund to attract substantial fund inflow, which is more likely the result of an intensive marketing campaign and not directly related to a fund's past performance. We include risk aversion level in the model since EME bond funds are often perceived to be riskier than their counterparts from developed markets. A heightened market risk aversion is expected to drive funds out of individual EME bond funds regardless of their past performance. This risk aversion is measured by the CBOE Volatility Index (VIX), which is an indicator of the expected volatility for options on the S&P 500 Index. Finally, given that fund flows are persistent, the lagged fund flows are included in the model to control for the momentum effect, with the lag structure determined by the Akaike information criterion. Apart from the above control variables, fund flows could also be influenced significantly by certain unobservable fund-specific factors, such as the general investment philosophy and the framework/ procedures for investment decision-making. As we expect these factors to remain relatively stable over time, cross-section fixed effect is included in our model to take into account these heterogeneities across funds.[3]

III. DATA

Our sample consists of 1,784 EME bond funds domiciled around the world. For each fund, data about its net fund flow, net asset value, rate of return and other fund-specific details is retrieved from the Morningstar database at monthly frequency. The data of market-level explanatory variables is obtained from Bloomberg. Subject to data availability, the sample period runs from January 2000 to December 2016.

The correction of survivorship bias is a crucial issue for the mutual fund data. This is because mutual fund companies tend to liquidate funds with bad performance, particularly if these funds have massive redemptions from investors that make it economically not feasible to continue operating. Therefore, if the survivorship bias is not corrected, the sample would be biased towards funds with good performance. It might also substantially reduce the number of observations in the region of negative returns, thus making the estimation of fund flow sensitivity for that region less reliable. To control for the bias, we include in our sample mutual funds that are in business at the end of the sample period, as well as those liquidated at some point during the sample period.

A final issue is concerned with the pre-processing of fund flow data before quantitative analysis. We note that many extreme outliers in fund flow data are probably attributable to reasons not directly related to a fund's performance or general market condition. For example, restructuring of a mutual fund (e.g. merging with another fund, changes of investment mandate) and a marketing campaign at the launch of a fund would sometimes lead to an outsized surge of inflow or outflow. It is hard to take into account such idiosyncratic factors individually by introducing control variables. Due to the relatively short history of EME bond funds, their fund flows tend to be more volatile and susceptible to the above-mentioned events. Therefore, to avoid the distortion caused by extreme

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[3] As the omitted variable is expected to be correlated with the observed variables (e.g. funds managed by famous fund houses tend to be larger in size), the random effect model is not applicable here. This is also supported by the Hausman specification test performed on our sample.

outliers, the relative fund flows are winsorized at 95%, rather than the standard practice of 99% for many empirical studies dealing with developed markets. A similar situation is also found in the data of fund returns. In particular, we note that some funds recorded abnormally high monthly returns (with a return of more than 200% in one case) immediately before their cessations. While the phenomenon could be caused by various reasons, such as an acquisition premium paid to unit holders or processing errors, it appears to be idiosyncratic and is not the main focus of our analysis. As such, we have applied a 99% winsorization on the fund returns to prevent these outliers from distorting our data.

IV. EMPIRICAL RESULTS

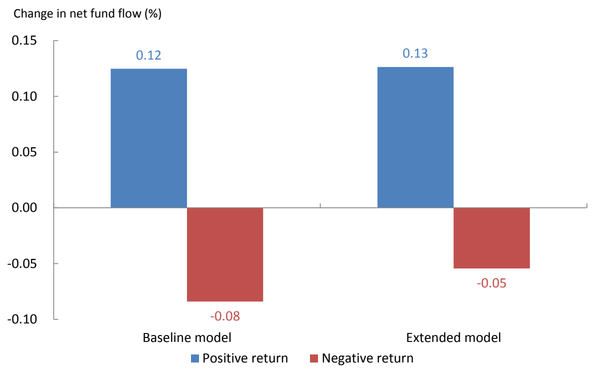
Our findings suggest a convex flow-performance relationship for EME bond funds. As shown in Table 1, fund flow reacts positively to past return as β_1 is found to be positive at 0.12 in the baseline model and significant. The coefficient of the interaction term (β_2) is found to be negative at -0.04 and significant, implying a convex relationship. This relationship remains unchanged in the extended model where other control variables are added. Fund flow sensitivities with respect to positive and negative fund performance are shown in Chart 2.

Table 1. Summary of regression result

	Dependent variable: $FF_{i,t}$ Emerging market bond fund flow Baseline model	 Extended model
Constant	-0.07 *** (0.03)	3.87 *** (0.42)
$RR_{i,t-1}$	0.12 *** (0.01)	0.13 *** (0.01)
$RR_{i,t-1} \times D(RR_{i,t-1} \leq 0)$	-0.04 *** (0.02)	-0.07 *** (0.02)
$LN(TNA_{i,t})$		-0.13 *** (0.02)
VIX_t		-0.03 *** (0.00)
$LN(Fund\ Age_{i,t})$		-0.81 *** (0.04)
No. of observations	79288	79288
Adjusted R-squared	0.255	0.259

Note: Standard errors in parenthesis. Significance level: *** p<0.01.

Chart 2. Sensitivities of net fund flow toward positive and negative returns



Note: The bars represent the corresponding changes in net fund flow when fund return increases (decreases) by one percentage point.

Table 2. Summary of regression results for models with indirect effect

	Dependent variable: $FF_{i,t}$ Emerging market bond fund flow	
Constant	1.59 *** (0.09)	1.58 *** (0.10)
$RR_{i,t-1}$	-0.16 *** (0.04)	-0.05 (0.04)
$RR_{i,t-1}$ x $D(RR_{i,t-1} \leq 0)$	-0.08 *** (0.02)	-0.08 *** (0.02)
$RR_{i,t-1}$ x $Ln(TNA_{i,t-1} \leq 0)$	0.02 *** (0.00)	0.02 *** (0.00)
$RR_{i,t-1}$ x $Vol_{i,t}$		-0.02 *** (0.00)
VIX_t	-0.03 *** (0.00)	-0.03 *** (0.00)
$LN(Fund\ Age_{i,t})$	-0.80 *** (0.04)	-0.81 *** (0.04)
No. of observations	79288	79076
Adjusted R-squared	0.259	0.260

Note: Standard errors in parenthesis. Significance level: *** p<0.01.

In addition, fund performance is found to affect fund flow indirectly through its interaction with fund size. This distinguishes our study from others that typically ignore such indirect effects. As shown in Table 2, the coefficient of the interaction term between fund return and fund size is found to be positive and significant, indicating that a larger fund tends to have higher fund flow sensitivity. As a robustness check, we perform a sub-sample regression analysis and the results also suggest indirect effect through fund size. As shown in Table 3, the flow-performance sensitivity of funds with above-median size ("Large size") is significantly higher than that of funds with below-median size ("Small size").

Table 3. Sub-sample analysis on the effects of fund size

	Dependent variable: $FF_{i,t}$ Emerging market bond fund flow	
	Small size	Large size
Constant	0.57 ***	3.02 ***
	(0.13)	(0.15)
$RR_{i,t-1}$	0.09 ***	0.16 ***
	(0.01)	(0.01)
$RR_{i,t-1} \times D(RR_{i,t-1} \leq 0)$	-0.05 **	-0.09 ***
	(0.02)	(0.02)
VIX_t	-0.02 ***	-0.04 ***
	(0.00)	(0.00)
$LN(Fund\ Age_{i,t})$	-0.44 ***	-1.33 ***
	(0.06)	(0.07)
No. of observations	39535	39753
Adjusted R-squared	0.219	0.290

Note: Standard errors in parenthesis. Significance levels: ** p<0.05, *** p<0.01.

Another channel for fund performance to affect fund flow indirectly is through the volatility of a fund's historical returns. As shown in the second column of Table 2, the coefficient of the interaction term between fund return and fund volatility is found to be negative and significant. We also conduct a separate sub-sample analysis and obtain consistent results. Specifically, we find that EME bond funds with below-median volatility ("Low volatility") have fund flow sensitivity significantly higher than those funds with above median volatilities ("High volatility") (Table 4).

Table 4. Sub-sample analysis on the effects of return volatility

	Dependent variable: $FF_{i,t}$ Emerging market bond fund flow	
	Low volatility	High volatility
Constant	1.92 ***	1.99 ***
	(0.15)	(0.14)
$RR_{i,t-1}$	0.23 ***	0.09 ***
	(0.02)	(0.01)
$RR_{i,t-1}$ x $D(RR_{i,t-1} \leq 0)$	-0.09 ***	-0.05 ***
	(0.04)	(0.02)
VIX_t	-0.04 ***	-0.04 ***
	(0.01)	(0.00)
$LN(Fund\ Age_{i,t})$	-0.81 ***	-0.99 ***
	(0.06)	(0.06)
No. of observations	39535	39721
Adjusted R-squared	0.249	0.276

Note: Standard errors in parenthesis. Significance level: *** p<0.01.

V. EXPLANATIONS FOR A CONVEX FLOW-PERFORMANCE RELATIONSHIP

Broadly speaking, there are three possible explanations for the shape of the asymmetric flow-performance relationship in EME bond funds.

The first explanation lies in the practices taken by asset management companies to pre-empt a fire sale risk. This risk is particularly notable for funds holding illiquid assets as fund managers have to accept a large discount in selling these assets when there are outsized redemptions. Since these extra costs would be borne by the remaining investors, the first batch of redeeming investors would have a first mover advantage over others. Such an advantage will motivate investors to redeem their funds once market conditions deteriorate, potentially leading to a large outflow. There is empirical evidence that such incentive results in a concave flow-performance relationship for funds investing in relatively illiquid assets such as US corporate bonds (Goldstein et al. (2017)).

Table 5. Cash holding positions of US and EME bond funds

Cash holding position	EME bond funds	US bond funds
Mean (%)	13.86	9.52
Median (%)	6.88	5.46
SD (%)	10.89	7.91
No. of observations	1251	1360

Source: Morningstar.
Notes:

1. Cash holding position is the proportion of fund assets held in cash in per cent. Cash encompasses both actual cash and cash equivalents (fixed-income securities with a maturity of one year or less) held by the portfolio plus receivables minus payables.
2. EME bond funds cover funds categorized as "Emerging Markets Fixed Income" according to Morningstar Global Category Classifications (MGCC). US bond funds cover funds under MGCC "US Fixed Income".

As the assets held by EME bond funds are generally low in market liquidity, managers of these funds have adopted practices to pre-empt fire sales. One of them is the precautionary holding of cash that could help avoid selling its underlying illiquid assets at deep discounts to meet large redemption orders. As cash holding is typically reported in the fund factsheets that are publicly available, a higher level of cash holding is expected to alleviate investors' concern about fire sales. The higher cash holding ratio of EME bond funds seems to support this conjecture (Table 5).[4]

Another practice to mitigate the fire sale risk is the swing pricing mechanism, which is the adjustment of a fund's net asset value to pass on the dilution costs of trading to investors associated with purchasing or redeeming the fund. In fact, there is empirical evidence that this mechanism can internalise the transaction costs and liquidation costs incurred by investors who redeem their shares, and neutralise their first-mover advantage from redeeming earlier than others (Lewrick and Schanz (2017)). Note that the EME bond funds in our sample are mainly domiciled in jurisdictions that allow swing pricing (e.g., Luxemburg, Ireland, UK, and Cayman Islands).[5] This may explain why a convex flow-performance relationship is identified.

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[4] To further verify the effect of cash holding on fund flow sensitivity, a sub-sample analysis between EME bond funds with high cash holding and low cash holding is performed. The result suggests that the fund flow sensitivity of high cash holding funds is 16% lower than that of low cash holding funds at negative return on average.

[5] Mutual funds domiciled in the US are allowed to adopt swing pricing only starting from 2018, which is beyond our sample period. For details, refer to: https://www.sec.gov/rules/final/2016/33-10234.pdf.

The second explanation is related to the bias of media coverage, notably mutual fund advertisements, towards outperforming funds (Sirri and Tufano (1998)). As these advertisements serve as powerful drivers for inflow into the advertised funds, the attention of fund investors is driven towards the top-performing funds whereas the worst-performing funds are often overlooked, leading to a convex relationship.[6] Investors from EMEs are probably more influenced by media as they are on average less sophisticated.[7] Meanwhile, investors from developed countries are typically less familiar with EME markets and more likely to be influenced by advertisements and media reporting.

The third explanation is concerned with the higher participation costs of EME bond funds.[8] A rational investor would invest in a fund only if its expected return exceeds participation costs. As the expected return of a fund is often based on its past performance, mutual funds with higher participation costs can attract inflow only when they have a track record of outperforming returns.[9] On the other hand, higher participation costs reduce the incentive of existing investors to unwind their positions in reaction to bad performance. While it is difficult to exactly measure participation costs due to the unobservable nature of certain components, we may still estimate their relative magnitudes by looking at the summary statistics of bond fund net expense ratios in Table 6. Together with the higher average transaction costs in emerging markets, it seems reasonable to conclude that investors in EME bond funds face higher participation costs when making fund investments.[10]

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6 For the powerful influence of mutual fund advertisement on fund flow, see Jain and Wu (2000).

7 According to the *OECD/INFE International Survey of Adult Financial Literacy Competencies 2016,* EME based investors generally have a lower level of financial knowledge.

8 Participation costs consist of (1) information cost of collecting and analysing information about a mutual fund before investing and (2) transaction cost of subscribing or redeeming fund units. For details, see Huang and Yan (2007).

9 For empirical evidence about how the expected return of a fund is related to its past performance, see Goetzmann and Peles (1997).

10 For details about average transaction costs in emerging markets, see Ferreira et al. (2012).

Table 6. Net expense ratios of EME and US bond funds

Net expense ratios	EME bond funds	US bond funds
Eightieth Percentile	0.88	0.40
Sixtieth Percentile	1.05	0.58
Fortieth Percentile	1.25	0.78
Twentieth Percentile	1.56	0.97
No. of observations	410	939
Median	1.17	0.66

Source: Morningstar.

Note: The expense ratio is the percentage of fund assets paid for operating expenses and management fees in 2016. It is used as a proxy for transaction fees involved in investing in mutual funds.

VI. CONCLUSION

In summary, EME bond funds are found to display a convex flow-performance relationship, i.e. less outflow in response to bad performance than inflow to good performance. Two driving forces possibly play a role in shaping the relationship. On the one hand, the potential concavity of these funds is mitigated by practices taken by fund management companies to dampen fund investors' incentives to redeem in reaction to bad performance. On the other hand, the bias of media coverage towards outperforming funds and the relatively high participation costs of EME bond funds increase the convexity of the relationship.

While the finding may to some extent assuage concerns about the fragility of EME bond funds, it is crucial to note that the convexity is determined by a number of institutional and structural factors such as regulations, investor base and policies of fund management companies. Any changes in these factors should thus be closely monitored.

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