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AN ASSESSMENT OF THE VULNERABILITIES OF THE EMERGING ASIAN DOLLAR CORPORATE BOND MARKET: A PERSPECTIVE OF OPEN-ENDED FUNDS

Key points:

- *Open-ended funds (OEFs) have increased their investment in emerging Asian (EMA) dollar corporate bonds in the past few years, particularly for those issued by corporates with a higher debt burden due to more attractive bond yields. While this development enables EMA corporates to more easily tap dollar funding, the resultant rise in leverage has made these corporates more vulnerable to acute financial risks, such as the abrupt tightening in dollar funding conditions in March 2020.*

- *Based on a novel dataset, we find that around 16% of EMA dollar corporate bonds were held by OEFs immediately before the March-2020 episode. During this period, fire sales of these bonds by OEFs contributed to a 58% surge in corporates' dollar funding cost and rising rollover risks. The funding stress is found to be significantly larger for those corporates with higher debt burdens given the higher exposure of their dollar bonds to OEFs' investment. We further find that, in response, these debt-ridden corporates became more likely to fill the funding gap by bank credits, thus exposing creditor banks to higher credit risks.*

- *Our findings point to a rising interconnectedness between OEFs and banks through their common exposure to EMA corporates. This could be one channel through which a shock on dollar funding tightening could be magnified, resulting in a spill over and adding vulnerabilities to the region's financial systems. This warrants closer monitoring, as the ongoing monetary policy tightening in major advanced economies continues apace.*

- *This also calls for policies to address the potential systemic risks. Therefore, our findings have two policy implications:*

    - *Policies to strengthen OEFs' liquidity management may help mitigate the risk of disorderly liquidation of dollar corporate bonds and the subsequent impacts on emerging Asian corporates in times of stress; and*

    - *While dollar funding stress on EMA corporates arising from drastic OEF outflows could be alleviated by bank lending, a closer monitoring of the asset quality of corporate loan portfolios of banks is warranted.*

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The views and analysis expressed in this paper are those of the authors, and do not necessarily represent the views of the Hong Kong Monetary Authority.

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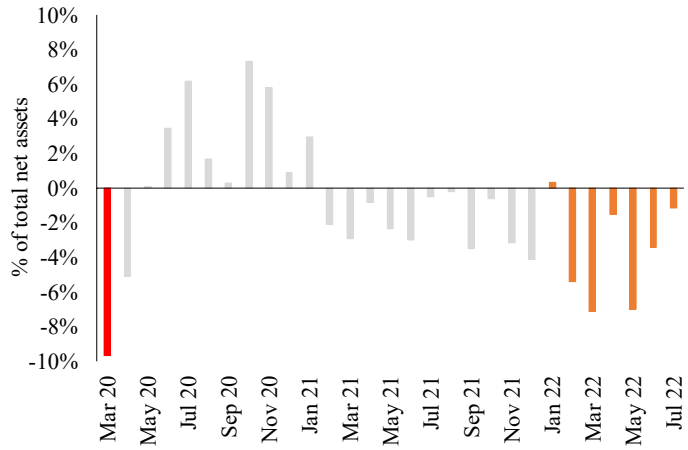
1. INTRODUCTION

Alongside tightening monetary policy across major advanced economies and a weakening global economic outlook, open-ended funds (OEFs) have witnessed accelerated outflows from emerging Asian (EMA) economies[1] in the first half of 2022, after moderate outflows for 2021 as a whole (Chart 1). These sizable capital outflows have raised concerns over financial stability risks on these EMA economies and the possible repercussions across the world.

Chart 1: Monthly flows of OEFs from EMA economies since March 2020



Source: EPFR

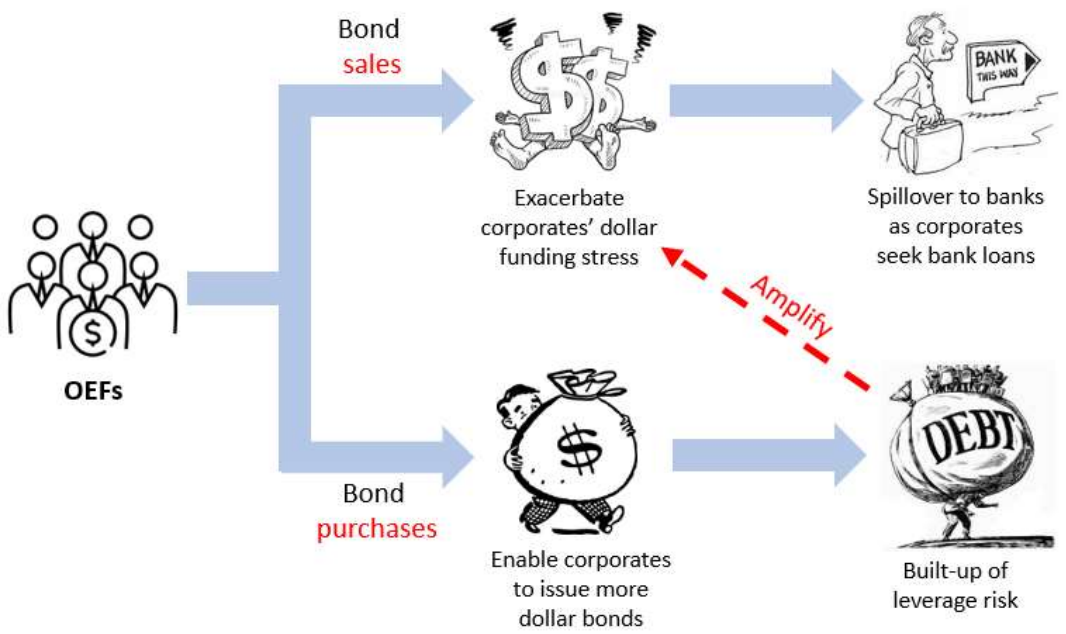
Such reversals in capital flows from OEFs could be particularly painful for some EMA corporates if they had built up substantial leverage through dollar bond issuance when there were large inflows to the bond markets from OEFs amid ample global liquidity in the past few years. When large capital flows move out abruptly such as the episode in March-2020, the resulting lower demand for dollar corporate bonds could push up corporates' dollar funding costs and dampen their ability to refinance. This shock could spill over to the banking sector if corporates struggle for bond refinancing and have to seek bank credits. For illustration, Chart 2 summarises these financial stability implications which could arise from OEF's purchases and sales of EMA dollar corporate bonds. That said, significant data gaps in OEFs' dollar bond holdings have obscured a closer examination of such systemic risks (Banks for International Settlements, 2020).

This study sheds light on these systemic implications by using our novel dataset. Firstly, we carve out OEFs' holdings of EMA dollar corporate bonds and analyse how OEFs' inflows to these bonds had motivated issuance of dollar corporate

[1] These include Mainland China, India, Indonesia, Malaysia, the Philippines, Thailand and Vietnam.

bonds in the past few years. Following that, we learn from the March 2020 episode to assess how dollar bond funding of EMA corporates would be affected by sizable outflows from OEFs and the implications for the asset quality of corporate loan portfolios of banks. Based on the assessment, we draw policy implications for EMA economies to safeguard financial stability in the face of further tightening of global monetary conditions.

Chart 2: Illustration of financial stability implications which could arise from OEFs' purchases and sales of dollar bonds issued by EMA corporates



Our study is organised as follows. The next section provides an overview of OEFs' investment in the EMA dollar corporate bond market based on our dataset. Section 3 empirically assesses how EMA corporates and their bank lenders may be affected by OEFs' bond sales during the March-2020 episode. The final section concludes.

2. OEFs' INVESTMENT IN EMA DOLLAR CORPORATE BOND MARKET

2a) How exposed are EMA dollar corporate bonds to OEFs' investment?

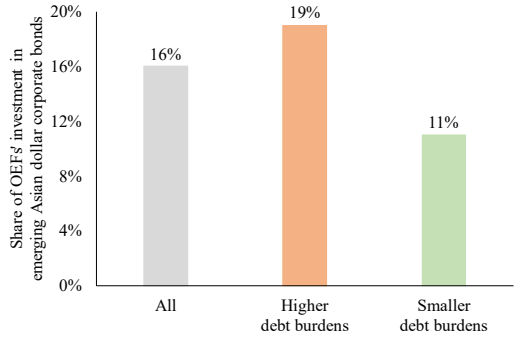
Using our novel dataset which covers 11,395 dollar-denominated non-equity OEFs and their holdings of dollar bonds issued by 11,123 non-financial listed corporates headquartered in the EMA economies[2], we find OEFs are a significant holder

[2] The OEF sample is retrieved from Morningstar Direct and represents 72% of non-equity open-ended mutual funds and exchange-traded funds in the world. Morningstar's data providers do not guarantee the accuracy,

of EMA dollar corporate bonds. Immediately prior to the March-2020 episode, OEFs held about 16% of the total outstanding amount of these dollar bonds at the end of 2019 (grey bar, Chart 3).[3]

In addition, our data show the dollar bonds issued by corporates with higher debt burdens were more exposed to OEFs' investment. In this study, we classify a corporate as one with higher debt burdens if its liability-to-asset ratio exceeds the sample median; or else, as with smaller debt burdens.[4] At the end of 2019, about 19% of dollar bonds issued by corporates with higher debt burdens were held by OEFs (orange bar, Chart 3). This was higher than the 11% of their counterparts with smaller debt burdens (green bar, Chart 3), reflecting OEFs' preference for bonds issued by corporates with higher debt burdens which generally paid higher coupon rates (Chart 4)[5]. Given a higher exposure of their dollar bonds to OEFs' investment, the financing conditions of corporates with higher debt burdens could be hit harder in times of reversals in OEFs' investment.

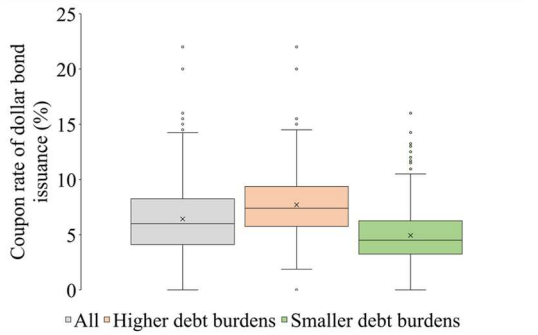
Chart 3: Share of OEFs' investment in EMA dollar corporate bonds



Note: This chart depicts the share of OEFs' investment in EMA dollar corporate bonds by all corporates, those with higher debt burdens and those with smaller debt burdens at the end of 2019.

Sources: Bloomberg, Dealogic, Morningstar Direct, Refinitiv and authors' estimates

Chart 4: Distribution of coupon rates in EMA dollar corporate bonds



Note: This chart depicts coupon rates of the EMA dollar corporate bonds issued between 2015 and 2019, by issuer type.

Sources: Bloomberg, Dealogic and Refinitiv.

completeness or timeliness of any information provided by them and shall have no liability for their use. Table A.1 of Annex A describes the construction of this novel dataset and data sources.

[3] The share of OEFs' investment in dollar corporate bonds also grew notably in developed Asia, reaching 9% of the total outstanding amount. In other regions, their shares of investment, while staying at relatively higher levels, have been on a slight downtrend in recent years (e.g. North America: 46% and Europe: 21%). As reference, OEFs held about 15% of the bonds at end March 2021 (i.e. last data point in the sample).

[4] Results in all empirical models in this paper remain robust if other indicators, such as interest coverage ratio and whether any dollar liabilities are due in 12 months, are used for classification.

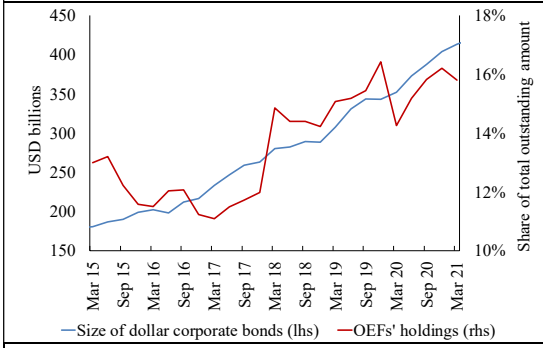
[5] OEFs held about 18% of dollar bonds issued by corporates with higher debt burdens and 11% of dollar bonds by those with smaller debt burdens as at end March 2021 (i.e. last data point in the sample).

2b) Did corporates amass leverage amid inflows to dollar bond markets from OEFs?

As OEFs increasingly invested in dollar bonds in the past few years, EMA corporates could benefit from greater bond demands and lower cost of funding. This in turn increased their incentives in new bond issuance, thus adding to their leverage over time. Our dataset shows supporting evidence that EMA dollar corporate bonds increased more than twofold from the first quarter of 2015 to the first quarter of 2021 (blue line, Chart 5), as OEFs took up an increasing share of these bonds (red line, Chart 5).

Our empirical analysis also shows that increases in OEFs' investment in these outstanding dollar bonds could raise the probability of new bond issuance among the EMA corporates, especially those with higher debt burdens. For illustration, take the average quarterly increase of 8.27% in OEFs' investment in 2019. Given such an increase, corporates are estimated to be 9.50% more likely to issue new dollar bonds in the next quarter (grey bar, Chart 6). For those with higher debt burdens, the likelihood of issuing new bonds will rise even more notably by 10.32% (orange bar, Chart 6).[6]

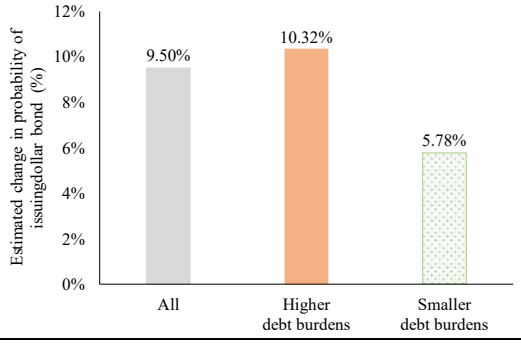
Chart 5: Size of EMA dollar corporate bonds and their exposure to OEFs' investment



Note: This line chart depicts the outstanding amount of EMA dollar corporate bonds (blue) and their exposure to OEFs as a percentage of their total outstanding amount (red).

Sources: Morningstar Direct, Bloomberg, Refinitiv, Dealogic and HKMA staff estimates.

Chart 6: Estimated impacts of increases in OEFs' investment on corporates' probability in issuing new dollar bonds



Notes:

(i) This bar chart depicts the effects of an average quarterly increase in OEFs' investment in 2019 on the probability of issuing new dollar bonds by all corporates (grey), corporates with higher debt burdens (orange) and corporates with smaller debt burdens (green); and

(ii) The solid bars denote 10% level of statistical significance.

Source: HKMA staff estimates.

[6] The technical details are presented in Table B.1 of Annex B.

In summary, EMA dollar corporate bonds are found to be increasingly exposed to OEFs' investment in the past few years, hinting that the financing condition of the corporates could be subject to a larger squeeze amid fund reversals. Concurrently, the substantial inflows to dollar bond markets from OEFs added to the vulnerability of these corporates by lifting their leverage, which could amplify shocks from fund reversals on the financial health of the corporates and the resilience of the banking system. The next section discusses these implications by using our empirical assessment of the stress episode in March 2020.

3. THE IMPACTS OF OEFS' BOND SALES ON EMA CORPORATES AND BANK LENDERS

Having provided EMA corporates with more funding opportunities in normal periods, OEFs' investment could reverse abruptly in stress times, thereby exposing these corporates to significant funding stress. In the first quarter of 2020, OEFs sold about 14% of their holdings of EMA dollar corporate bonds. By using this scale of bond sales, we can gauge the impacts of the bond sales on the funding cost and the probability of these corporates issuing new bonds in the March 2020 episode. We can also gauge the likelihood these corporates will shift to bank loans when they face difficulty in refinancing from the dollar bond markets in such circumstances. The major findings are presented below, and the technical details of the empirical models used are all available in Annex B.

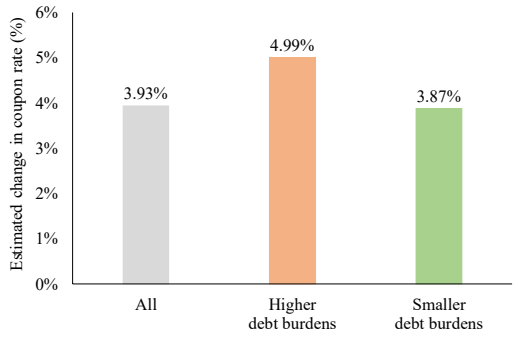
3a) Did OEFs' bond sales add to dollar funding stress in EMA corporates?

First, OEFs' bond sales will reduce the dollar funding available for emerging Asia corporates in the bond markets, which could lead to a surge in their dollar funding cost. Specifically, our results show that the bond sales realised in the first quarter of 2020 pushed up the coupon rate for dollar corporate bond issuance contemporaneously by 3.93 ppts on average (grey bar, Chart 7), equivalent to a rise of 58% from the average level seen in the fourth quarter of 2019. The surge was even more notable for corporates with higher debt burdens, which saw a jump of 4.99 ppts in their coupon rates on average during this stress period (orange bar, Chart 7).

Secondly, the reduced availability of dollar funding due to OEFs' bond sales could also lead to a contraction in new issuance activities. Our results show OEFs' bond sales in the first quarter of 2020 reduced the likelihood for all corporates to issue

new dollar bonds in the second quarter of 2020 by 17% (grey bar, Chart 8).[7] Likewise, the effect is slightly stronger for corporates with higher debt burdens, with their probability to issue new bonds being reduced by 18% (orange bar, Chart 8).

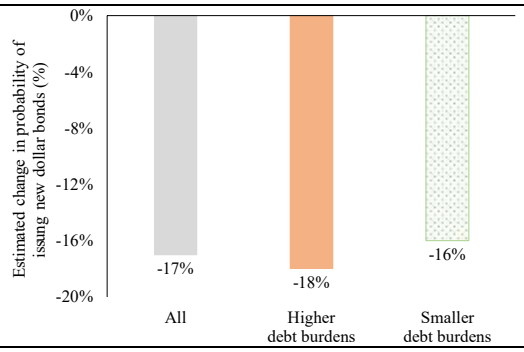
Chart 7: Estimated impact of OEFs' bond sales on coupon rates



Notes:
(i) This bar chart depicts the effects of OEFs' bond sales on the coupon rates of dollar bonds issued by all corporates (grey), corporates with higher debt burdens (orange) and corporates with smaller debt burdens (green) in the first quarter of 2020; and
(ii) The solid bars denote 10% level of statistical significance.

Source: HKMA staff estimates.

Chart 8: Estimated impact of OEFs' bond sales on corporates' probability of issuing new dollar bonds



Notes:
(i) This bar chart depicts the estimated effects of OEFs' bond sales in the first quarter of 2020 on the probability of issuing new dollar bonds by all corporates (grey), corporates with higher debt burdens (orange) and corporates with smaller debt burdens (green) in the second quarter of 2020; and
(ii) The solid bars denote 10% level of statistical significance.

Source: HKMA staff estimates.

Taken together, OEFs' bond sales added to the dollar funding stress in EMA corporates in March 2020. This challenge is particularly daunting for corporates with higher debt burdens, considering (i) their higher exposure to OEFs' investment before the market stress, as well as the larger estimated impacts of OEFs' bond sales on (ii) their funding cost, and (iii) their ability to issue new bonds. In response to the shortfall in dollar bond issuance activities, these corporates might have to seek alternative funding sources, possibly creating adverse spillover to the broader financial system, such as the bank lenders.

3b) Did OEFs' bond sales pose negative spillover to the banking sector?

For EMA corporates, bank loans are another key source of dollar funding comparable to bond issuance in terms of scale. Specifically, at the end of 2019, our

[7] This is in line with a year-on-year decrease of 25% in their new dollar bonds issued in the second quarter of 2020.

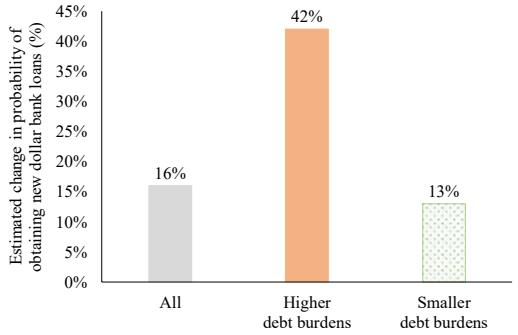
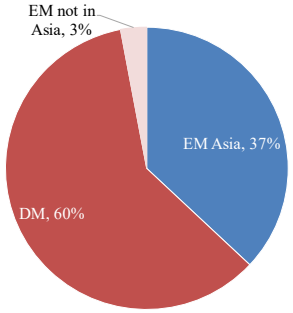
dataset shows that 54% of EMA corporates' dollar borrowing was from bank loans, while the rest was from bond issuance. If the corporates decided to make up the shortfall in bond issuance with bank credits, the banking sector could also be indirectly affected by OEFs' bond sales. In particular, the shift could expose their bank lenders to higher credit risks, considering that those corporates with higher debt burdens may have more pressing needs to seek bank credit given their higher difficulty in securing bond refinancing.

Indeed, our empirical results show that corporates would be 16% more likely to seek dollar bank loans in the second quarter of 2020 after OEFs' bond sales in the first quarter of 2020 (grey bar, Chart 9).[8] In addition, this impact is more notable for corporates with higher debt burdens, which were 42% more likely to seek dollar loans in the same circumstances (orange bar, Chart 9).

In addition, the impact on the banking sector may also be transmitted across borders. Our novel data suggest six-tenths of EMA corporates' dollar bank loans came from banks headquartered in developed markets (red part, Chart 10), while the rest were mostly lent by banks headquartered in EMA economies (blue part, Chart 10).[9] This suggests that the adverse impact may also spill over to the banking sector in developed markets.

[8] This is in line with a year-on-year increase of 32% in their new dollar bank loans obtained in the second quarter of 2020.

[9] While these bank lenders can be foreign banks' branches operating in emerging Asian economies, dollar funding of these branches is usually internally obtained from their parents or US branches (Bank for International Settlements, 2020).

Chart 9: Estimated impact of OEFs' bond sales on corporates' probability of obtaining new dollar bank loans	Chart 10: Dollar bank loans extended to EMA corporates, by bank headquarter
	
Notes: (i) This bar chart depicts the estimated effects of OEFs' bond sales in the first quarter of 2020 on the probability of obtaining new dollar bank loans by all corporates (grey), corporates with higher debt burdens (orange) and corporates with smaller debt burdens (green) in the second quarter of 2020; and (ii) The solid bars denote 10% level of statistical significance. Source: HKMA staff estimates.	Notes: (i) This chart depicts the share of dollar bank loans extended to EMA corporates by bank headquarter; and (ii) Following the classification by IMF, "DM" denotes the share of dollar bank loans from banks headquartered in developed markets; "EM Asia" denotes that from banks in emerging Asia; and "EM not in Asia" denotes the rest. Sources: Bloomberg and Refinitiv

4. CONCLUSION AND IMPLICATIONS

Our findings show that OEFs are a significant holder of EMA dollar corporate bonds. While the increasing share of OEFs' investment enabled these corporates to issue more dollar bonds in the past few years, the build-up of leverage risk could subject them to significant vulnerabilities once there is a reversal of capital flows from OEFs.

Our empirical analysis shows that, in the March-2020 episode, OEFs' bond sales contributed to a surge in the corporates' dollar funding cost and dampened their ability to refinance via dollar bond markets, particularly for corporates with higher debt burdens. We further find these corporates were more likely to borrow from banks given the difficulty in bond refinancing, thus exposing corporate loans portfolios of banks to higher credit risks, including some headquartered in developed markets.

Looking ahead, the ongoing monetary policy normalisation in many advanced economies will further tighten global financial conditions. This, coupled with the darkening world economic outlook, might continue to amplify swings in OEF capital

flows for EMA economies and add to the vulnerabilities of the financial system. This calls for close monitoring and policies to address potential systemic risks. As such, our findings have two policy implications:

i. Policies to strengthen OEFs' liquidity management may help mitigate their liquidation of dollar corporate bonds and the subsequent impacts on EMA corporates in times of stress; and

ii. While banks may lend to corporate borrowers to help alleviate their financial pressures arising from drastic OEF fund outflows, a closer monitoring of the asset quality of corporate loan portfolios of banks is warranted.

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Annex

Annex A: Details on the data items

Table A.1 provides details on the data items used in this study:

Data item	Data sources
OEFs information: Investment in dollar corporate bond	Morningstar Direct
Bond-specific information: Issuance volume Coupon rate Maturity year Credit rating at issuance	Bloomberg, Dealogic, and Refinitiv
Loan-specific information: Loan amount Interest rate Maturity year	Bloomberg and Refinitiv
Corporate-specific information: Liability to asset ratio Interest coverage ratio Firm size Book-to-market ratio Capital expenditure to asset ratio Tangible asset to total asset ratio	S&P Capital IQ
Market information: The Chicago Board Options Exchange Volatility Index (VIX Index) ICE BofA Asia EM Markets Corporate Plus Index*	Federal Reserve Bank of St. Louis

Note: *An index tracking price changes in bonds issued by corporates in emerging Asia.

Annex B: Technical details of regression analysis

This Annex covers the technical details of various empirical analyses discussed in Sections 2 and 3. The panel regression model used in each case is described below:

Estimated impacts of increase in OEFs' investment on corporates' probability in issuing new dollar bonds (Chart 6)

Following Zhu (2021), the succeeding panel logistic model is considered for the lead-lag effect of OEFs' dollar bond **purchases** (in net terms) in a corporate's dollar bonds on that corporate's dollar bond issuance policy:

$$D(Issue_{i,t+1} > 0) = \beta_1 \boldsymbol{Purchase_{i,t}} + Control_{i,t} + FE_i + FE_t + FE_s + \varepsilon_{i,t+1} \quad (1)$$

where $D(Issue_{i,t+1} > 0)$ is a dummy variable equal to one if corporate i issues at least one dollar bond in quarter $t+1$. $\boldsymbol{Purchase_{i,t}}$ is the percentage **increase** in OEFs' aggregate investment in corporate i's dollar bonds in quarter t. $Control_{i,t}$ is a set of control variables which include corporate i's balance sheet information and market information (detailed in Table A.1). FE_i, FE_t and FE_s capture the corporate, time and industry fixed effects. Finally, $\varepsilon_{i,t+1}$ is the residual error. The coefficient of interest is β_1 under this set-up, which denotes the effect of OEFs' dollar bond **purchases** on the probability of dollar bond issuance by the corporate. As we are also interested in the disaggregated effect by corporate types, we extend the model as follows:

$$D(Issue_{i,t+1} > 0) = \theta_1 \boldsymbol{Purchase_{i,t}} \times D_{i,t} + \theta_2 \boldsymbol{Purchase_{i,t}} \times (1 - D_{i,t}) + Control_{i,t} + FE_i + FE_t + FE_s + \varepsilon_{i,t+1} \quad (2)$$

where $D_{i,t}$ is a dummy variable equal to one if corporate i is with higher debt burdens, otherwise zero. Three metrics are adopted for classification. Specifically, a corporate is regarded as 'with higher debt burdens' than its peers if (1) its liability-to-asset ratio is larger than the sample median, or (2) its interest coverage ratio is lower than the sample median, or (3) it has to repay dollar liabilities in 12 months. As such, β_1 is split into θ and θ_2 to estimate the disaggregated effects. Table B.1 reports the estimation results.

Table B.1: Estimated impacts of increase in OEFs' investment on the probability of corporates issuing dollar bonds

	$D(Issue_{i,t+1} > 0)$			
	(1)	(2)	(3)	(4)
$\boldsymbol{Purchase_{i,t}}$	**1.15*** **	--	--	
$\boldsymbol{Purchase_{i,t}} \times D_{i,t}$	--	**1.25*** **	1.25***	1.24***
$\boldsymbol{Purchase_{i,t}} \times (1 - D_{i,t})$	--	0.74	1.19	0.34
$D_{i,t} = 1$ if	--	Liability-to-asset ratio > median	Interest coverage ratio < median	Having dollar liability due in 12 months
$Control_{i,t}$	Yes	Yes	Yes	Yes
Corporate FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Sample	Corporate-quarter observations from 2015Q1 to 2019Q4			
No. of corporates	8,211	8,211	8,211	8,211
Observations	152,134	152,134	152,134	152,134

Note: ***, ** and * denote statistical significance at 1%, 5% and 10%, respectively.

For illustration, take the average quarterly increase of 8.27% in OEFs' investment in 2019. Given such an increase, the corporates are estimated to be 9.50% more likely to issue new dollar bonds in the next quarter (i.e. 8.27% × 1.15). For those with higher debt burdens, the likelihood to issue new bonds will rise by an even larger extent, at 10.32% (i.e. 8.27% × 1.25).

<u>Estimated impacts of OEFs' bond sales on coupon rates (Chart 7)</u>

The following GMM panel linear model is used to gauge the contemporaneous effect of OEFs' **sales** of a corporate's dollar bonds on a corporate's coupon rates for issuing new dollar bonds:

$$Coupon_{i,j,t} = \beta_1 \boldsymbol{Sales_{i,t}} \times Stress_t + \beta_2 \boldsymbol{Sales_{i,t}} \times (1 - Stress_t) + \beta_3 Stress_t + Control_{i,j,t} + FE_i + FE_t + FE_s + \varepsilon_{i,j,t} \quad (3)$$

where $Coupon_{i,j,t}$ is the coupon rate of bond j issued by corporate i in quarter t. $\boldsymbol{Sales_{i,t}}$ is the percentage **decrease** in OEFs' aggregate investment in corporate i's dollar bonds in quarter t. $Stress_t$ is a dummy variable equal to one if the VIX Index in quarter t exceeds the sample median, otherwise zero. $Control_{i,j,t}$ is a set of control variables not only including corporate i's balance sheet information and market information, but also bond j's information at issuance (details in Table A.1). The coefficient of interest is β_1 under this set-up, which denotes the effect of OEFs' dollar bond **sales** on corporate i's coupon rates in stress times, while β_2 estimates the effect in normal periods. Similarly, as we are also interested in the disaggregated effect by corporate types, we extend the model as follows:

$$\begin{aligned} Coupon_{i,j,t} = {} & \theta_1 \boldsymbol{Sales_{i,t}} \times Stress_t \times D_{i,t} + \\ & \theta_2 \boldsymbol{Sales_{i,t}} \times Stress_t \times (1 - D_{i,t}) + \\ & \theta_3 \boldsymbol{Sales_{i,t}} \times (1 - Stress_t) \times D_{i,t} + \\ & \theta_4 \boldsymbol{Sales_{i,t}} \times (1 - Stress_t) \times (1 - D_{i,t}) + \\ & \beta_3 Stress_t + Control_{i,j,t} + FE_i + FE_t + FE_s + \varepsilon_{i,j,t} \quad (4) \end{aligned}$$

As such, β_1 is split into θ_1 and θ_2 which measures the effects on the corporates with larger and smaller debt burdens in stress times, respectively. β_2 is similarly split into θ_3 and θ which measures the disaggregated effects in normal periods. Table B.2 reports the estimation results:

Table B.2: Estimated effects of OEFs' dollar bond **sales** on corporate's coupon rates for issuing new dollar bonds

	$Coupon_{i,j,t}$			
	(1)	(2)	(3)	(4)
$\boldsymbol{Sales_{i,t}} \times Stress_t$	**0.28****			

$\boldsymbol{Sales_{i,t}} \times (1 - Stress_t)$	-0.04	--	--	--
$\boldsymbol{Sales_{i,t}} \times Stress_t \times D_{i,t}$	--	**0.36****	0.45*	0.40**
$\boldsymbol{Sales_{i,t}} \times Stress_t \times (1 - D_{i,t})$	--	0.28*	0.28**	0.26*
$\boldsymbol{Sales_{i,t}} \times (1 - Stress_t) \times D_{i,t}$	--	0.01	0.04	0.02
$\boldsymbol{Sales_{i,t}} \times (1 - Stress_t) \times (1 - D_{i,t})$	--	0.08	0.03	0.02
Wald test: $\theta_1 - \theta_2$	--	0.08*	0.17*	0.14*
$D_{i,t} = 1$ if	--	Liability -to-asset ratio > median	Interest coverage ratio < median	Having dollar liability due in 12 months
$Control_{i,j,t}$	Yes	Yes	Yes	Yes
Corporate FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Sample	Bond issuance-quarter observations from 2015Q1 to 2021Q4			
Observations	1,752	1,752	1,752	1,752

Note: ***, ** and * denote statistical significance at 1%, 5% and 10%, respectively.

Take the OEFs' bond sales of 14% in the first quarter of 2020 for illustration. The bond sales realised in the first quarter of 2020 pushed up the coupon rate for dollar corporate bond issuance by 3.93 ppts on average contemporaneously (i.e. 14% × 0.28). For those with higher debt burdens, the surge was even more notable, at 4.99 ppts (i.e. 14% × 0.36).

<u>Estimated impact of OEFs' bond sales on corporates' probability of issuing new dollar bonds (Chart 8)</u>

The following panel logistic model is considered for the lead-lag effect of OEFs' dollar bond **sales** (in net terms) in a corporate's dollar bonds on that corporate's dollar bond issuance policy:

$$D(Issue_{i,t+1} > 0) = \beta_1 \boldsymbol{Sales_{i,t}} \times Stress_t + \beta_2 \boldsymbol{Sales_{i,t}} \times (1 - Stress_t) + Control_{i,t} + FE_i + FE_t + FE_s + \varepsilon_{i,t+1} \quad (5)$$

The coefficient of interest is β_1 under this set-up, which denotes the effect of OEFs' dollar bond **sales** on the probability of dollar bond issuance by corporate i, while β_2 estimates the effect in normal periods. As we are also interested in the disaggregated effect by corporate types, we extend the model as follows:

$$D(Issue_{i,t+1} > 0) = \theta_1 \boldsymbol{Sales_{i,t}} \times Stress_t \times D_{i,t} + \theta_2 \boldsymbol{Sales_{i,t}} \times Stress_t \times (1 - D_{i,t}) + \theta_3 \boldsymbol{Sales_{i,t}} \times (1 - Stress_t) \times D \quad +$$

$$\theta_4 \boldsymbol{Sales_{i,t}} \times (1 - Stress_t) \times (1 - D_{i,t}) +$$
$$Control_{i,t} + FE_i + FE_t + FE_s + \varepsilon_{i,t+1} \quad (6)$$

As such, β_1 is split into θ_1 and θ_2 which measures the effects on corporates with larger and smaller debt burdens in stress times, respectively. β_2 is similarly split into θ_3 and θ which measures the disaggregated effects in normal periods. Table B.3 reports the estimation results:

Table B.3: Estimated effects of OEFs' dollar bond **sales** on corporates' probability of issuing new dollar bonds

	$D(Issue_{i,t+1} > 0)$			
	(1)	(2)	(3)	(4)
$\boldsymbol{Sales_{i,t}} \times Stress_t$	**-1.21***	--	--	--
$\boldsymbol{Sales_{i,t}} \times (1 - Stress_t)$	0.17	--	--	--
$\boldsymbol{Sales_{i,t}} \times Stress_t \times D_{i,t}$	--	**-1.29***	-2.21***	-3.87***
$\boldsymbol{Sales_{i,t}} \times Stress_t \times (1 - D_{i,t})$	--	-1.14	-0.55	-1.11
$\boldsymbol{Sales_{i,t}} \times (1 - Stress_t) \times D_{i,t}$	--	0.18	0.74	-2.95
$\boldsymbol{Sales_{i,t}} \times (1 - Stress_t) \times (1 - D_{i,t})$	--	2.21	0.55	0.18
$D_{i,t} = 1$ if	--	Liability -to-asset ratio > median	Interest coverage ratio < median	Having dollar liability due in 12 months
$Control_{i,t}$	Yes	Yes	Yes	Yes
Corporate FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Sample	Corporate-quarter observations from 2015Q1 to 2021Q4			
No. of corporates	8,211	8,211	8,211	8,211
Observations	152,134	152,134	152,134	152,134

Note: ***, ** and * denote statistical significance at 1%, 5% and 10%, respectively.

Take the OEFs' bond sales of 14% in the first quarter of 2020 for illustration. The bond sales realised in the first quarter of 2020 reduced corporates' probability of issuing new dollar bonds by 17% (i.e. 14% × 1.21). For those with higher debt burdens, the probability of issuing new dollar bonds was reduced slightly more by 18% (i.e. 14% × 1.29).

Estimated impact of OEFs' bond sales on corporates' probability of obtaining new dollar bank loans (Chart 9)

Similar to Equations 5 and 6, the following panel logistic model is considered for the lead-lag effect of OEFs' dollar bond **sales** (in net terms) in a corporate's dollar bonds on that corporate's dollar borrowing from banks:

$$D\left(Loan_{i,t+1} > 0\right) = \beta_1 \boldsymbol{Sales_{i,t}} \times Stress_t + \beta_2 \boldsymbol{Sales_{i,t}} \times (1 - Stress_t) + Control_{i,t} + FE_i + FE_t + FE_s + \varepsilon_{i,t+1} \quad (7)$$

$D\left(Loan_{i,t+1} > 0\right)$ is a dummy variable equal to one if corporate i obtains at least a dollar bank loan in quarter $t+1$. The coefficient of interest is β_1 under this set-up, which denotes the effect of OEFs' dollar bond **sales** on the probability that corporate i obtains dollar bank loans in stress times, while β_2 estimates the effect in normal periods. As we are also interested in the disaggregated effect by corporate types, we extend the model as follows:

$$\begin{aligned} D\left(Loan_{i,t+1} > 0\right) = {} & \theta_1 \boldsymbol{Sales_{i,t}} \times Stress_t \times D_{i,t} + \\ & \theta_2 \boldsymbol{Sales_{i,t}} \times Stress_t \times \left(1 - D_{i,t}\right) + \\ & \theta_3 \boldsymbol{Sales_{i,t}} \times (1 - Stress_t) \times D_{i,t} + \\ & \theta_4 \boldsymbol{Sales_{i,t}} \times (1 - Stress_t) \times \left(1 - D_{i,t}\right) + \\ & Control_{i,t} + FE_i + FE_t + FE_s + \varepsilon_{i,t+1} \end{aligned} \quad (8)$$

As such, β_1 is split into θ_1 and θ_2 which measures the effects on the corporates with larger and smaller debt burdens in stress times, respectively. β_2 is similarly split into θ_3 and θ which measures the disaggregated effects in normal periods. Table B.4 reports the estimation results:

Table B.4: Estimated effects of OEFs' dollar bond **sales** on corporates' probability of obtaining new dollar bank loans

	$D\left(Loan_{i,t+1} > 0\right)$			
	(1)	(2)	(3)	(4)
$\boldsymbol{Sales_{i,t}} \times Stress_t$	**1.14***	--	--	--
$\boldsymbol{Sales_{i,t}} \times (1 - Stress_t)$	0.19	--	--	--
$\boldsymbol{Sales_{i,t}} \times Stress_t \times D_{i,t}$	--	**3.01***	1.71**	4.18***
$\boldsymbol{Sales_{i,t}} \times Stress_t \times \left(1 - D_{i,t}\right)$	--	0.95	-0.95	0.57
$\boldsymbol{Sales_{i,t}} \times (1 - Stress_t) \times D_{i,t}$	--	2.47	0.19	1.14
$\boldsymbol{Sales_{i,t}} \times (1 - Stress_t) \times \left(1 - D_{i,t}\right)$	--	0.00	0.57	0.19
$D_{i,t} = 1$ if	--	Liability -to-asset ratio > median	Interest coverage ratio < median	Having dollar liability due in 12 months
$Control_{i,t}$	Yes	Yes	Yes	Yes

Corporate FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Sample	Corporate-quarter observations from 2015Q1 to 2021Q4			
No. of corporates	8,211	8,211	8,211	8,211
Observations	152,134	152,134	152,134	152,134

Note: ***, ** and * denote statistical significance at 1%, 5% and 10%, respectively.

Take the OEFs' bond sales of 14% in the first quarter of 2020 for illustration. The bond sales realised in the first quarter of 2020 increased corporates' probability of obtaining new dollar bank loans by 16% (i.e. 14% × 1.14). For those with higher debt burdens, the probability of obtaining new dollar bank loans was increased more by 42% (i.e. 14% × 3.01).