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Does Strong USD Affect Emerging Market USD-Denominated  
Sovereign Bond Spreads?

強勢美元是否會對新興市場美元計價主權債券利差造成影響?

洪瑋謙

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Bond Spreads?

本論文係 洪瑋謙 (姓名) P10323024 (學號) 在國立臺灣大學經濟學系完成之碩士學位論文，  
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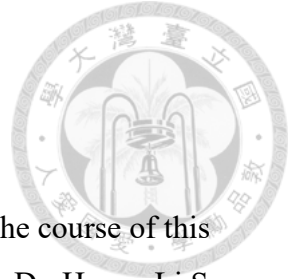
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## Chinese Abstract (摘要)

這篇論文探討了美元走強對新興市場 (EM) 美元計價主權債券利差的影響，這在全球投資者中常被視為衡量債券價格和相對估值的重要指標。具體而言，本文分析了美元、總體因素以及財政狀況如何影響新興市場國家風險，而國家風險通常由主權債券利差衡量。利用 2009 年 3 月至 2023 年 6 月的季度數據，我們採用了結構式 VAR，以區分對新興市場美元計價主權債券利差的直接和間接影響。結果顯示：

(1) 美元震盪對擴大新興市場美元計價主權債券利差 (即對債券價格的負面影響) 具有統計和經濟上的顯著影響；(2) 與以固定匯率或以非通膨目標政策的國家相比，具有更多匯率彈性或有設定通膨目標的國家在其美元主權債券上對美元震盪的負面影響具有更強的抵抗力。

# Abstract



Global investors often utilize U.S. dollar (USD)-denominated sovereign bond spreads as an indicator to measure bond price and conduct relative valuation. Hence, this study investigates whether the strengthening of the USD has a crucial impact on emerging market (EM) USD-denominated sovereign bond spreads. Specifically, we analyzed how USD, macro factors and individual countries' fiscal condition influence EM country risk, which is measured by sovereign bond spreads. We apply the structure vector autoregression (SVAR) model<sup>1</sup> to disentangle the direct and indirect influences on EM USD-denominated sovereign bond spreads using quarterly data for 15 emerging markets from Mar 2009 to Jun 2023. Results indicated that (1) USD shock has statistically and economically significantly impacts to widen EM USD-denominated sovereign bond spreads (i.e., negative impact toward bond prices); (2) countries with more exchange rate flexibility or inflation-targeting framework have more resistance against the negative impact of USD shock on their USD sovereign bonds compared with those having a fixed exchange rate or non-inflation-targeting policy do.

Keywords: emerging market, sovereign bond spread, macroeconomic fundamentals, solvency, structural VAR, panel VAR.

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<sup>1</sup> The structure model includes variables of USD, US interest rates, US GDP real growth rate, excess bond premium (EBP), commodity price, and EM, external debt to GDP ratio, debt servicing coverage ratio, and EM USD-denominated sovereign bond spreads.

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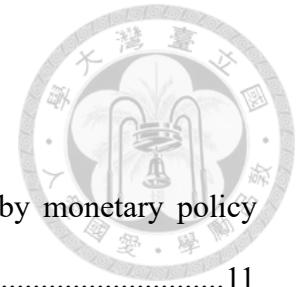


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# 1. Introduction

## 1.1 Background and Purpose

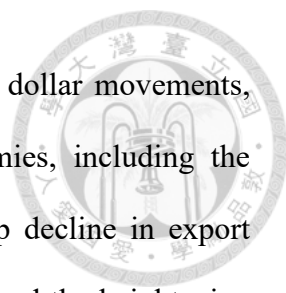
The Federal Reserve System (Fed) has taken an aggressive attempt to curb inflation by hiking the federal fund rate for 11 times to 5.25%–5.50% on July 26, 2023. The USD index started in a solid uptrend in 2022 as the Federal Reserve Bank of St. Louis said, “If the Fed raises interest rates while other central banks maintain or even lower their interest rates, then the return on savings is more attractive in the U.S. than in other countries. This higher rate in the U.S. propels international capital inflow to U.S. from other countries, resulting in the dollar’s appreciation.”

The dominance of the U.S. dollar (USD) in the financial system and international trade has led global investors to focus not only on the dollar movements but also on the impact on the global economy, particularly for emerging market (EM) economies (Shousha, 2019). Cycles of USD appreciation have been accompanied by slow global economic growth and have led to a negative impact on emerging economies, impacting asset valuation, particularly sovereign bonds.

EM USD denominated sovereign debt for years contributed to a significant portion of global assets management. Essentially, EM USD denominated sovereign bonds spreads remain benign with more than 550 basis points (bps) better than US aggregate investment grade bonds in 2023. Surprisingly, EM debt funds suffered outflows during 2022 and 2023. Flows out of dedicated hard currency EM debt funds were \$45 billion in 2022 and \$25 billion in 2023<sup>2</sup>(Figure 1) which is coincident with the widening spreads of EM debt.

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<sup>2</sup> The fund flows summary is cited from VanEck report whose source is originated from EPFR and Morgan Stanley research <https://www.vaneck.com/us/en/blogs/emerging-markets-bonds/technical-and-fundamental-factors-paint-a-rosy-picture-for-em-bonds/>



Obstfeld and Zhou (2023) contributed to the literature on the dollar movements, which can have a pervasive influence on EMDE's macroeconomies, including the generally negative impact on EMDE's economic health. The sharp decline in export prices resulted in a much bigger deterioration of the terms of trade and the heightening risk aversion which drives up sovereign dollar borrowing costs. Nevertheless, the empirical findings of Obstfeld and Zhou (2023) indicate that USD shock has an insignificant impact or that USD-denominated sovereign bond spread takes a long time (6–8 quarters) to respond to such shock (Figure 2; Figure 3; and Figure 4), which contradicts a widely accepted idea of an efficient capital market.

To answer this puzzle, we continue to use bond spreads as the response observation indicator for the following three main reasons: First, in the investment universe, investors often take bond spreads to conduct the relative valuation or pricing assessment of a bond. The wider the spreads between bonds of the same class and maturity, the greater the valuation difference.

Second, the interest rate spreads, which are the value added to the benchmark rate to account for the contractually agreed interest rate, not only measure EM's borrowing costs but also indicate their financial fragility and vulnerability (Kennedy & Palerm, 2014).

Third, the variation of yield spreads can give observers a quick glimpse of market sentiment. For instance, when investors are probing risk-averse asset allocation and prefer safer bonds (e.g., U.S. treasury bonds), the required rate of return is estimated to increase, thereby leading to the EM's widening bond spreads. Moreover, from the observation of historical data, the ICE USD index (DXY) moving trend seems to align with EM USD-denominated sovereign bond spreads, as shown in Figure 5.

Our analysis shows that (1) USD appreciation shocks lead to the widening of EM USD-denominated sovereign bond spreads (i.e., negative impact on bond prices), and the responses happen swiftly; (2) the exchange rate regime or monetary policy regime of EM

countries may help to explain the price resilience of their USD-denominated bonds.

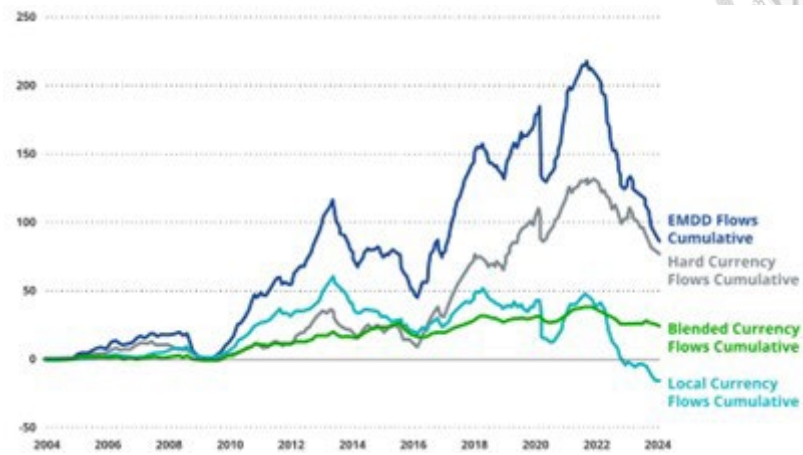


Figure 1: EM debt dedicated cumulative flows (US\$ bn)

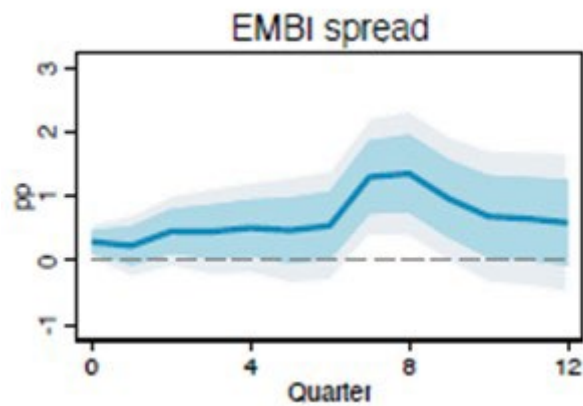


Figure 2: Impulse response of EM sovereign bond spreads to USD shock, cited from Obstfeld and Zhou (2023)

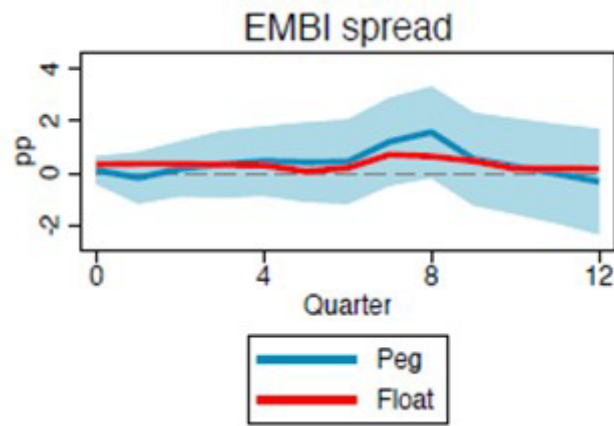


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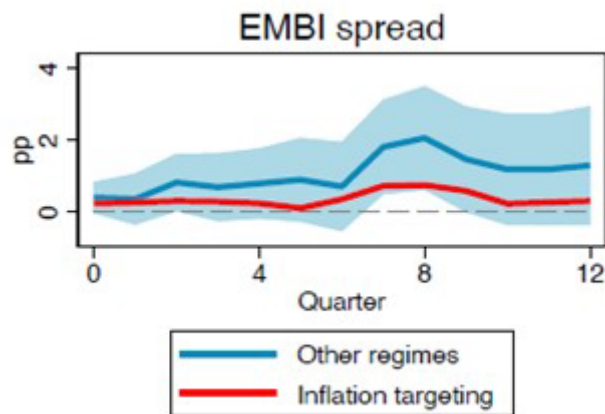


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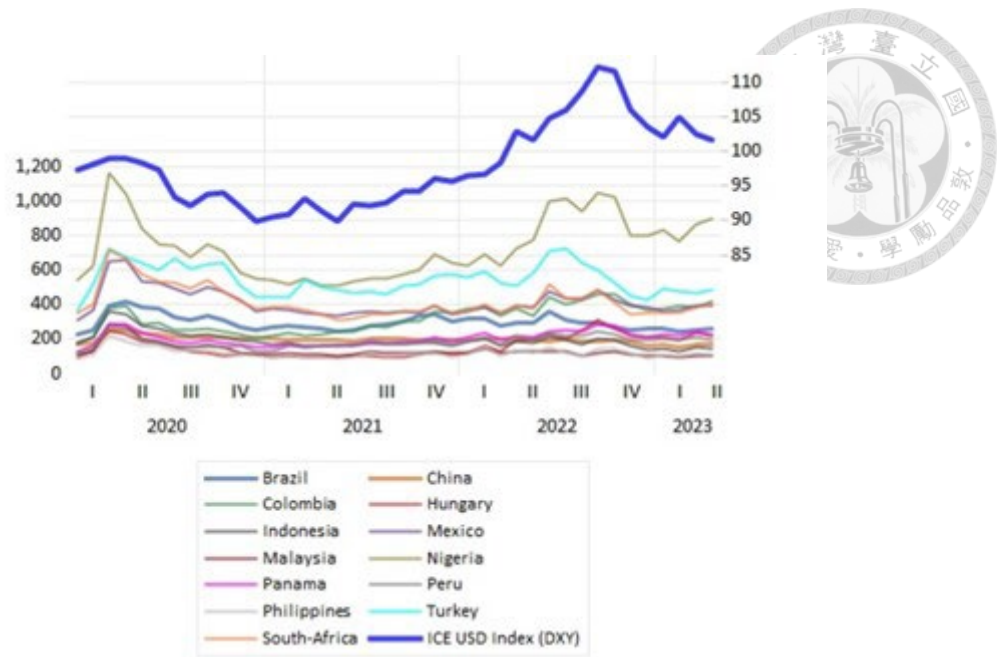


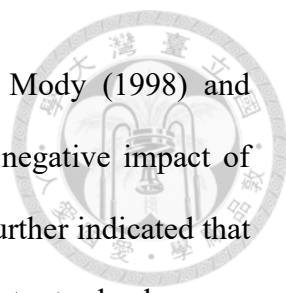
Figure 5: ICE USD Index versus EM USD-denominated sovereign bond spreads

## 1.2 Literature Review

Abundant empirical research has focused on the determinants of the sovereign bond spreads in EM. The existing literature indicated the domestic fundamental conditions of a debtor country are essential determinants of EM sovereign bond spreads. Countries with sustainable fiscal positions, low external debt levels (applied indicator as debt service to exports or debt to gross domestic product (GDP)), stable political environment, and healthy foreign exchange reserves are better off (Arora & Cerisola, 2001; Ferrucci, 2003; Kennedy & Palerm, 2014).

Alternatively, Longstaff et al. (2011) and Amstad et al. (2016) provided evidence on global factors that mostly affect the variation of EM sovereign risk over time. The extent of these spreads' variation is led by country-specific variables. The existing literature has examined several external conditions.

From the U.S. monetary policy perspective, Arora and Cerisola (2001), Uribe and Yue (2003), and Banerji et al. (2014) presented empirical evidence on how the U.S.



monetary policy influenced EM's country risk. Eichengreen and Mody (1998) and Hofmann and Takáts (2015) provided supporting evidence on the negative impact of short-term U.S. interest rates on EM issuers. Uribe and Yue (2003) further indicated that EM's country spreads serve as a transmission mediator of U.S. interest rate shocks.

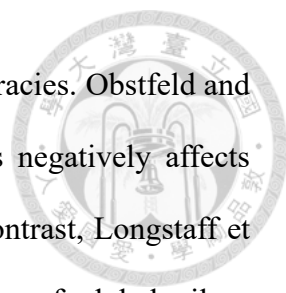
Özatay et al. (2009) and Philipp Engler (2023) both argued the U.S. spillover effect, such as U.S. GDP growth, could have a transmission on EM's credit spreads. Gelos et al. (2021) showed that U.S. GDP growth is negatively impacting the widening of EM sovereign bond spreads, often accompanied by the short- and medium-term EM portfolio outflows.

Most authors included a variable to represent global risk aversion. Ferrucci (2003) argued that the spreads of high-yield (high risk) over high-grade (low-risk) corporate bonds could be taken as a measurement of risk aversion, Meanwhile excess bond premium (EBP)<sup>3</sup>, constructed by Gilchrist and Zakrajsek (2012) using the difference between average U.S. corporate bond spreads and the average expected default risk, is perceived as an efficient proxy for investor sentiment or risk appetite. Gilchrist et al. (2021) further found that global financial risk, measured by EBP, has a persistent and significant impact on USD-denominated sovereign bond spreads in advanced and EM economies.

Several empirical studies indicated that the impact of international commodity prices impact on EM's sovereign bond spreads is mixed. Arezki and Brückner (2012) argued that international commodity price booms are expected to cause a significant reduction in sovereign bond spreads in democracies. In contrast, the surge in commodity price is

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<sup>3</sup> Gilchrist and Zakrajsek (2012) structured GZ spread, defined as the spread against a hypothetical safe bond that is expected to deliver the matching cash flows, to disentangle corporate bond credit spreads into two parts: expected default risk and a component, that is not directly attributable to expected default, capturing the variance between default risk and credit spreads.



expected to cause an increase in the sovereign bond spreads of autocracies. Obstfeld and Zhou (2023) argued that the decrease in dollar commodity prices negatively affects commodity exporters of emerging and developing economies. By contrast, Longstaff et al. (2011) concluded that there is lack of explanatory competence of global oil or commodity prices for sovereign credit spread change, except some Latin American countries.

Among the various global factors, few studies analyzed the dollars' impact on EM (Druck et al., 2015; Obstfeld & Zhou, 2023; Shousha, 2019). Even the relationship between USD appreciation impulse and EM USD-denominated sovereign bonds has been less studied. Druck et al. (2015) argued that strong USD leads to a subdued growth in EMs—and vice versa, which is mainly attributable to the reducing purchasing power of exporters and limiting the ability to import capital and production inputs. However, the characters of EMDE's are not alike nor does their economy rely heavily on exports. Obstfeld and Zhou (2023) documented the influence of dollar appreciations on EMDE's economies wholistically, including the decline in output, consumption, investment, and government spending.



## 2. Econometric Framework

### 2.1 Structural Vector Autoregression (SVAR)

The SVAR model considers the dynamic relationships and endogeneity among all variables in the model. SVAR obtains analyzing advantages of effects of economic policy effectiveness, macroeconomic shocks, and a typical method to exclude restrictions on the impact effect of structural shocks, (Kilian, 2009; Lütkepohl & Netsunajev, 2015).

We augment the SVAR model to investigate powerful influence of USD over EM USD-denominated sovereign bond spreads. This model is given by

$$A(L)Y_t = e_t, \quad (2.1.1)$$

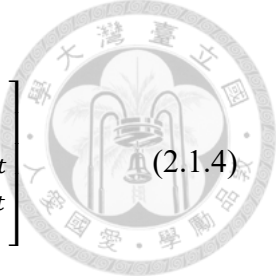
where  $A(L) = I - A_0 - A_1L^1 - \dots - A_pL^p$  is a polynomial matrix in the lag operator  $L$ .  $Y_t$  is a  $5 \times 1$  data vector corresponding to the USD Index, U.S. two-year treasury rate, U.S. real GDP growth rate, commodity price, and EM USD-denominated sovereign bond spreads.

$$Y_t = \begin{bmatrix} USD_t \\ US\ 2Y\ Treasury\ Rate_t \\ US\ real\ GDP_t \\ Commodity_t \\ Spread_t \end{bmatrix} \quad (2.1.2)$$

We considered a short-run identification with recursive structure through a Cholesky decomposition as the method proposed by Sims (1986) to restrict contemporaneous structural shocks in the VAR model. Another objective is to estimate the reduced form VAR by multiplying both sides of Eq. 2.1.1 by  $A(L)^{-1}$  and denote  $\varepsilon_t$  the vector of the reduced form VAR residuals.

$$Y_t = A_1Y_{t-1} + \dots + A_pY_{t-p} + \varepsilon_t \quad (2.1.3)$$

Next, we use Cholesky decomposition to derive orthogonal shocks  $e_t$ , given by



$$\begin{bmatrix} e_{USD,t} \\ e_{UST_{2Y},t} \\ e_{US\ real\ GDP,t} \\ e_{Commodity,t} \\ e_{Spread,t} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ h_{21} & 1 & 0 & 0 & 0 \\ h_{31} & h_{32} & 1 & 0 & 0 \\ h_{41} & h_{42} & h_{43} & 1 & 0 \\ h_{51} & h_{52} & h_{53} & h_{54} & 1 \end{bmatrix}^{-1} \begin{bmatrix} \varepsilon_{USD,t} \\ \varepsilon_{UST_{2Y},t} \\ \varepsilon_{US\ real\ GDP,t} \\ \varepsilon_{Commodity,t} \\ \varepsilon_{Spread,t} \end{bmatrix} \quad (2.1.4)$$

Denote the  $H^{-1}$  as a  $(5 \times 5)$  lower triangular matrix, and let

$$E(e_t) = E(H^{-1}\varepsilon_t) = H^{-1}E(\varepsilon_t) = 0 \quad (2.1.5)$$

Then, we move to the reduced form VAR and multiply by  $H^{-1}$  for both sides of Eq. 2.1.3,

$$H^{-1}Y_t = H^{-1}A_1Y_{t-1} + \dots H^{-1}A_pY_{t-p} + H^{-1}He_t \quad (2.1.6)$$

Let  $I - D_0 = H^{-1}$ , we can derive the SVAR model with D capturing contemporary effects.

$$Y_t = D_0Y_t + D_1Y_{t-1} + \dots D_pY_{t-p} + e_t \quad (2.1.7)$$

Under the SVAR short-run recursive restrictions structure, the order of variables is carefully placed from the most exogenous to less exogenous. The details are elaborated in Section 2.3.

## 2.2 Panel VAR and the Regime Classification

We follow Abrigo and Love (2016) to construct the following k-variable homogeneous panel VAR of order P to examine how EM's own exchange rate regime and monetary policy affect their USD-denominated sovereign bond spreads amid USD shocks, which is represented by

$$Y_{it} = Y_{it-1}A_1 + Y_{it-2}A_2 + \dots Y_{it-p}A_p + X_{it}B + u_i + e_{it} \quad (2.2.1)$$

$i \in \{1,2, \dots, 15\}$ , 15 EM countries ;  $t \in \{2009Q1, \dots, 2023Q2\}$ , obsesrvation time

$$Y_{it} = \begin{bmatrix} USD_t \\ US\ 2Y\ Treasury\ Rate_t \\ US\ real\ GDP_t \\ EBP \\ Commodity_t \\ External\ Debt\ to\ GDP\ Ratio_t \\ Debt\ Service\ Coverage\ Ratio_t \\ Spread_t \end{bmatrix} \quad (2.2.2)$$



where  $Y_{it}$  is a  $(1 \times k)$  vector of dependent variables,  $X_{it}$  is a  $(1 \times 1)$  vector of exogenous covariates, and  $u_i$  and  $e_{it}$  are  $(1 \times k)$  vectors of error terms capturing dependent variable-specific panel fixed-effects and idiosyncratic errors respectively.

Abrigo and Love (2016) confirmed that the stability of the panel VAR model implies that this model is invertible and has an infinite order vector moving average. By applying Sims's (1986) Cholesky decomposition, we derive the impulse response function confidence intervals based on the asymptotic distribution of panel VAR parameters and the cross-equation error variance–covariance matrix inspired by Abrigo and Love (2016).

Moving to the panel data grouping method, we classified the exchange rate regime (fixed or floating) using the method developed by Ilzetzi et al. (2017)<sup>4</sup> and the computation of effective exchange rate regimes described by Harms and Knaze (2021).<sup>5</sup> In addition, we classified EM countries' monetary policy type into inflation and not inflation targets, according to the International Monetary Fund (IMF)<sup>6</sup> and the literature (Hammond, 2012; Roger, 2010).

<sup>4</sup> For the years 2009–2019, data on effective de-facto exchange rate regimes are based on the classification of Ilzetzi et al. (2017), <https://www.ilzetzi.com/irr-data>

<sup>5</sup> For the years 2020–2021 (and after June 2016 of Turkey): data on effective de-facto exchange rate regimes are based on the classification of IMF offered by Dr. Philipp Harms, <https://www.international.economics.uni-mainz.de/data-on-effective-exchange-rate-regimes/>

<sup>6</sup> International Monetary Fund's country classification can be referred to IMF's Annual Report on Exchange Arrangement and Exchange Restriction database, <https://www.imf.org/external/pubs/ft/fandd/basics/72-inflation-targeting.htm>



Table 1: EM countries categorized by exchange rate regime and by monetary policy regime

Regime		Countries
Exchange rate regime	Fixed rate	Argentina, China, Ecuador, Hungary, Indonesia, Panama, Peru, Philippines
	Floating rate	Brazil, Colombia, Malaysia, Mexico, Poland, Turkey, South-Africa.
Monetary policy regime	Inflation target	Brazil, Colombia, Hungary, Indonesia, Mexico, Peru, Philippines, Poland, South-Africa, Turkey.
	Not inflation target	Argentina, China, Ecuador, Malaysia, Panama

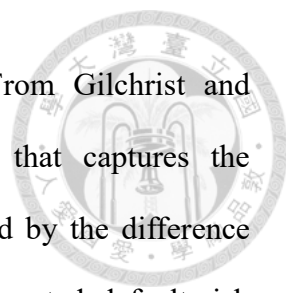
### 2.3 Order of Variables

Based on the literature and general macroeconomic intuition, the international elements are placed before domestic elements. The sequence of variables and supporting rationale are elaborated as follows: .

First, the two-year treasury yield is a proxy of the U.S. monetary policy. The U.S monetary policy is less directly impacted by the fluctuations of U.S. real GDP, commodity prices and EM USD-denominated sovereign bond spreads. However, the U.S. monetary policy can directly impact the other variables (Foley-Fisher & Guimaraes, 2013; Obstfeld & Zhou, 2023; Shousha, 2019).

Second, U.S. GDP in this study is a proxy of U.S. business cycle, which triggers spillover effects toward commodity price (Van der Nest & Gary van, 2023) and EM credit spreads

Third, excess bond premium (EBP) is to measure global investors’ risk sentiment or risk appetite, as indicated by the empirical results of Gilchrist and Zakrajsek (2012),



which show that EBP increased before economic downturns. From Gilchrist and Zakrajsek's definition, EBP represents the residual component that captures the unexplained credit spreads beyond the default risk and is estimated by the difference between average U.S. corporate bond spreads and the average expected default risk (Gilchrist & Zakrajsek, 2012). The finding showed that credit spread information contents greatly reflect the variation in the non-default components instead of the default components. Recently, as shown by Gilchrist et al. (2021), EBP has a significant impact on USD denominated sovereign bond spreads in EM economies. EBP shock can significantly impact commodity prices (Liao et al., 2022). Thus, we put EBP before commodity prices in sequence.

Fourth, we assume that the global commodity price does not respond to shocks of a single EM's credit spread as an EM economies' portion to global commodity aggregate demand and supply is marginal. Alternatively, commodity prices could affect EM sovereign bond spreads (Arezki & Brückner, 2012; Obstfeld & Zhou, 2023).

Fifth, to capture the domestic fundamentals, we use external debt to GDP (external debt/GDP) as a proxy for the solvency condition. The other is the debt service coverage ratio (foreign exchange reserve/interest payment on external debt), reflecting the country's debt sustainability. Both variables are identified as important determinants of EM sovereign spreads (Kennedy & Palerm, 2014; Min, 1998).

### 3. Data



Our empirical analysis relies on a panel of 15 EM countries: Argentina, Brazil, China, Colombia, Ecuador, Hungary, Indonesia, Mexico, Malaysia, Panama, Peru, Philippines, Poland, Turkey, and South Africa. We take quarterly data for USD-denominated sovereign bond spreads for the period ranging from 2009:Q1 to 2023:Q2, using the J.P. Morgan Emerging Market Bond Index Global database. In addition, EM's USD-denominated bond spreads, displayed by Figure 11 in the Appendix, are defined as weighted averages of bond yield spreads over U.S. government debt securities of external debt instruments issued by sovereign entities in emerging economies. The USD index is referred from the Nominal Broad U.S. Dollar Index<sup>7</sup>, which is constructed using the currencies of the most important U.S. trading partners in advanced foreign and EM economies from Federal Reserve Economic Data (FRED®). The data of the two-year U.S. Treasury (UST) yield released by the FRED are selected as a proxy of the U.S. monetary policy interest rate. Nominal UST yields impact EM credit spreads, supported by several empirical studies (Gilchrist & Zakrajsek, 2012; Hofmann & Takáts, 2015; Obstfeld & Zhou, 2023). We include U.S. real GDP growth rate as a proxy of the global economic cycle (Gelos et al., 2021). EBP, a component of corporate bond spreads that is not directly attributable to expected default risk, is used to measure risk sentiment, as argued by Gilchrist and Zakrajsek (2012) argued. Furthermore, we adopted the monthly commodity price obtained from Primary Commodity Prices constructed by IMF to measure commodity price movement. This approach was identical to the method applied by Obstfeld and Zhou (2023). Finally, the sources of EM's external debt to GDP ratio and

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<sup>7</sup> The Nominal Broad U.S. Dollar Index, which is constructed using the currencies of the most important U.S. trading partners by volume of bilateral trade, retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/DTWEXBGS>

debt service coverage ratio are from the CEIC database, IMF, World Bank, EM's central bank, and Bloomberg Terminal.





## 4. Empirical Results

### 4.1 Impulse Responses of EM USD-Denominated Sovereign Bond Spreads to USD Shock

Figure 6 shows the impulse responses of the EM USD-denominated sovereign bond spreads by individual countries to USD shock at the rear of the shock in 12 months. To assess the optimal number of lags for the VAR model, we used the Schwarz Information Criterion or Bayesian Information Criterion and the 95% confidence bands. We find a uniform pattern that a positive shock, the USD appreciation by one standard deviation (equivalent to USD appreciation by approximately 5%), causes the bond spreads to widen. Within a year, the USD shock converges to insignificance, and the spreads recover to their original level. The sovereign spreads spiked swiftly in the first quarter, consistently for 15 EM countries, regardless of the different time frames or data frequency (monthly or quarterly data), the results are aligned for each case. The results from Figure 6 indicate that the impulse response of sovereign spreads to USD appreciation is economically and statistically significant. Table 2 presents the movement of the spreads after the USD shock. These findings further provide evidence on the country level compared with Obstfeld and Zhou's (2023) research on aggregation level, which grouped countries by exchange rate regime or inflation monetary framework.

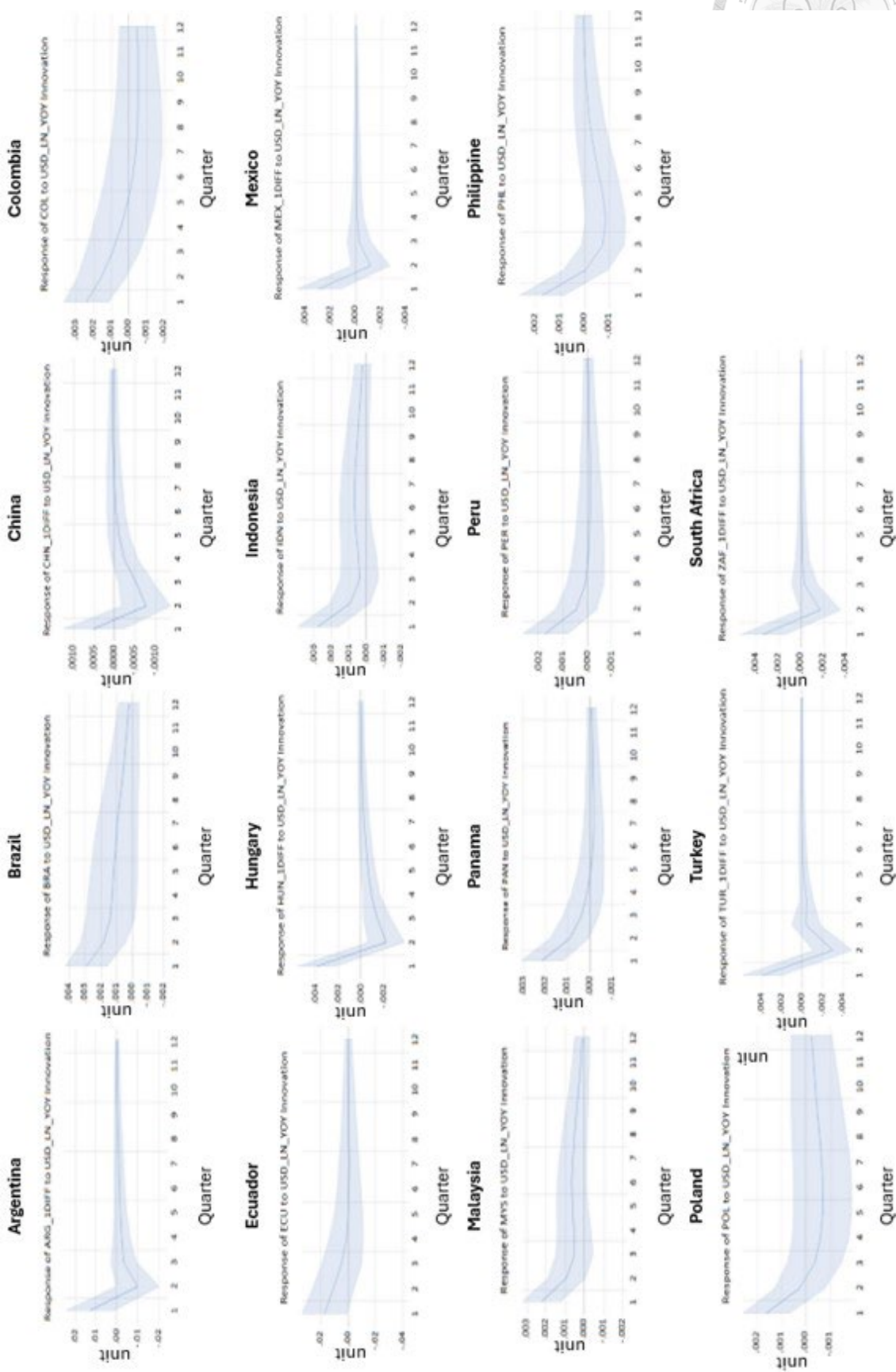
Table 2: Impulse responses magnitude of sovereign bond spreads



Country	First quarter	Second quarter	Third quarter	Fourth quarter
Argentina	+160bps	-16bps	+1bps	0bps
Brazil	+30bps	+17bps	+15bps	+15bps
China	+5.1bps	-7.6bps	-5.2bps	-2.4bps
Colombia	+24bps	+16bps	+9bps	+5bps
Ecuador	+170bps	+110bps	+5bps	+1bps
Hungary	+39bps	-22bps	-14bps	-9bps
Indonesia	+28bps	+9bps	+4bps	+4bps
Mexico	+30bps	-11bps	-2bps	-1bps
Malaysia	+22bps	+9bps	+5bps	+5bps
Panama	+22bps	+9bps	+4bps	+1bps
Peru	+17bps	+4bps	+1bps	0
Philippine	+17bps	0	-7bps	-8bps
Poland	+16bps	+3bps	-4bps	-6bps
Turkey	+40bps	-30bps	-4bps	-4bps
South Africa	+34bps	-17bps	-3bps	-1bps



Figure 6: Impulse response of EM's bond spreads: one SD appreciation of USD



## 4.2 Impulse Responses of EM USD-Denominated Sovereign Bond Spreads to USD Shock by Policy Regime



Figure 7 and Figure 8 present evidence that EM countries with high exchange rate flexibility do have small spike in bonds' spreads (floating rate regime: +28bps versus fixed rate regime: +57bps, in the first quarter after USD shock). This result indicates the cushion to mitigate negative dollar impact. Moreover, we observed that the floating rate regime's sovereign spreads recovered sharply and quickly compared with those of the fixed rate regime after the USD appreciation shock. This result provides evidence that the market of floating rate regime is highly efficient mitigating the adverse effects. These results are contrary to the findings of Obstfeld and Zhou (2023), who argued that there is little difference in the response of EMBI spreads between floating or pegged exchange rate regimes.

Similarly, Figure 9 and Figure 10 show that inflation target regime does make a difference after the USD shock. The sovereign bond spreads of inflation target countries experience a smaller spike than those of non-inflation target countries' (inflation target: +26bps versus non-inflation target: +73bps, in the first quarter after USD shock). The results are consistent with the findings of Mishkin and Schmidt-Hebbel (2006) and Obstfeld and Zhou (2023). That is the inflation-targeting monetary policy seems to strengthen EM's monetary policy's credibility and help EM countries achieve low inflation in the long run, thereby reducing their response to USD shocks.

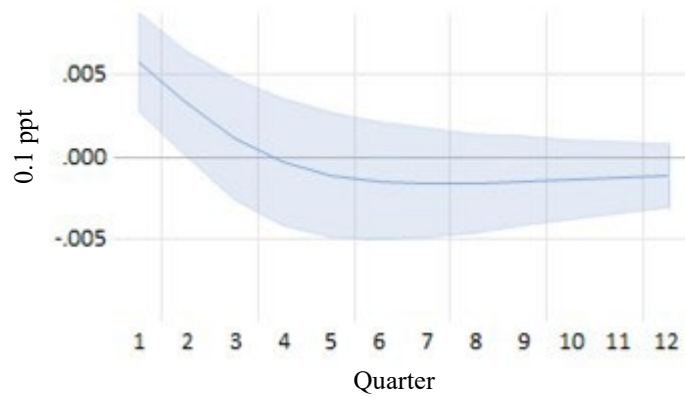


Figure 7: Impulse response of fixed exchange rate regime's USD-denominated sovereign bond spreads to USD shock

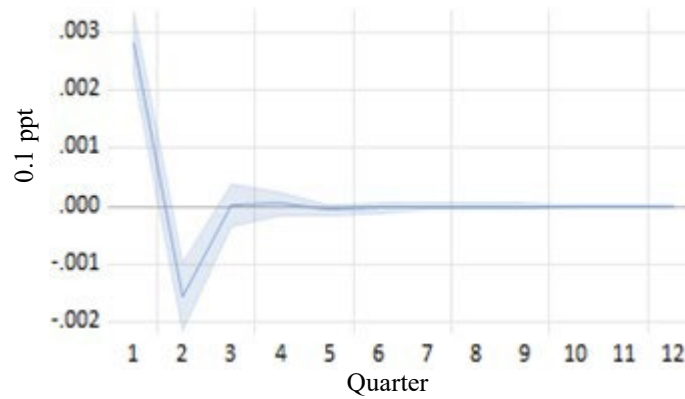


Figure 8: Impulse response of floating exchange rate regime's USD-denominated sovereign bond spreads to USD shock

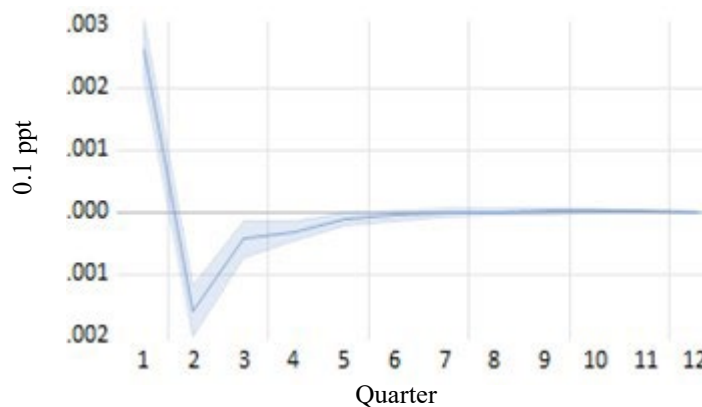


Figure 9: Impulse response of inflation-targeting regime's USD-denominated sovereign bond spreads to USD shock

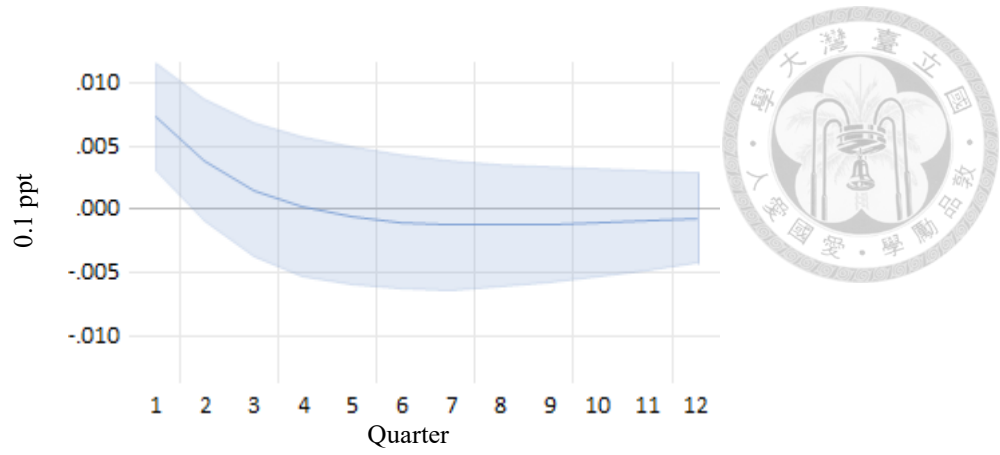


Figure 10: Impulse response of non-inflation-targeting regime's USD-denominated sovereign bond spreads to USD shock

## 5. Conclusions

In this study, we examined the impact of strong USD on EM USD-denominated sovereign bond spreads. We consider using macro and micro variables as control factors, including U.S. interest rate, U.S. real GDP, EBP, commodity price, external debt to GDP ratio, and debt service coverage ratio. The objective is to purify the impact of USD on sovereign bond spreads. We found that, first, EM sovereign bonds' spreads consistently widened in the first quarter after the USD appreciation shock. Second, EM countries with high exchange rate flexibility have small spike in bonds' spreads and a fast recovery from the USD shock. Third, we confirm that the inflation-targeting framework may act as a USD shock sober for EM countries in sovereign bond spreads. Nevertheless, no solid evidence exists that the regime that combines flexible exchange rate and inflation targeting is performing better than the others amid USD appreciation shocks. EM countries may have varied data quality, which may distort examination results under multiple criteria. Hence we encourage deepening the research by broadening EM country list and improving filtering methods.



## 6. Appendix



Table 3: Ten-year EM USD-denominated sovereign bond spreads statistics

	Argentina	Brazil	China	Colombia	Ecuador
Mean	0.110	0.027	0.017	0.023	0.104
Median	0.083	0.026	0.017	0.020	0.082
Maximum	0.380	0.055	0.029	0.049	0.513
Minimum	0.035	0.014	0.004	0.011	0.036
Std. Dev.	0.069	0.008	0.004	0.009	0.076
Skewness	1.265	1.221	-0.087	1.108	3.070
Kurtosis	4.167	5.050	4.513	3.414	13.092
lags	6 (1diff)	0	0 (1diff)	0	7
ADF test statistics	-4.502	-3.128	-13.771	-3.084	-3.569
Observations	174	174	174	174	174

	Hungary	Indonesia	Mexico	Malaysia	Panama
Mean	0.023	0.024	0.028	0.015	0.019
Median	0.021	0.021	0.027	0.014	0.018
Maximum	0.065	0.079	0.066	0.035	0.048
Minimum	0.008	0.012	0.015	0.008	0.010
Std. Dev.	0.013	0.009	0.010	0.005	0.005
Skewness	1.170	3.319	1.012	1.563	2.295
Kurtosis	3.920	18.118	4.233	5.450	11.733
lags	12 (1diff)	0	1 (1diff)	0	0
ADF test statistics	-5.488	-5.953	-10.544	-4.338	-5.187
Observations	174	174	174	174	174

	Peru	Philippines	Poland	Turkey	South-Africa
Mean	0.018	0.015	0.011	0.036	0.030
Median	0.017	0.013	0.010	0.032	0.028
Maximum	0.043	0.048	0.032	0.073	0.072
Minimum	0.011	0.007	0.001	0.017	0.014
Std. Dev.	0.005	0.007	0.007	0.013	0.010
Skewness	2.018	2.175	0.976	0.711	1.040
Kurtosis	9.711	8.880	3.849	2.581	4.845
lags	0	1	1	1 (1diff)	1 (1diff)
ADF test statistics	-5.664	-4.896	-3.194	-10.253	-14.207
Observations	174	174	174	174	174

\* ADF Test critical values (1%): -3.469

ADF Test critical values (5%): -2.878

ADF Test critical values (10%): -2.576

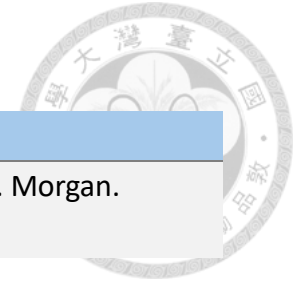
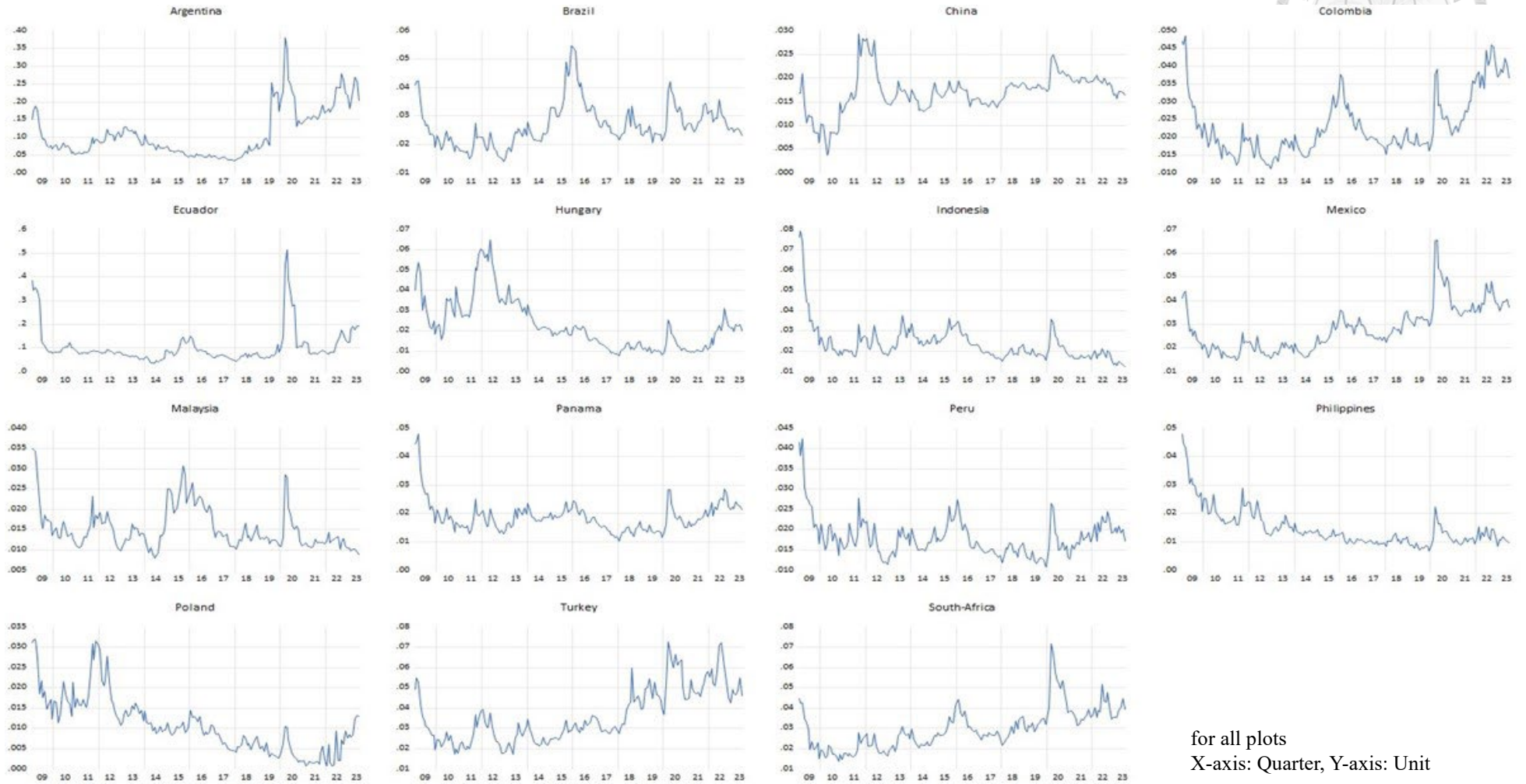


Table 4: Variables employed in the model estimation

<b>Variable</b>	<b>Definition</b>	<b>Source</b>
EM bond spreads	Weighted averages of bond yield spreads over U.S. government debt securities of external debt instruments issued by EM sovereign entities.	EMBI, J.P. Morgan.
USD index	Value of the USD against currencies widely used in international trade	U.S. FED
U.S. interest rate	Two years T-bill	Bloomberg
U.S. Real GDP	Measure of the global economic cycle	Bloomberg
EBP	EBP is an effective indicator for evaluating investor sentiment or risk preference in the corporate bond market	U.S. FED
Commodity index	Weighted averages of individual commodity price indices	IMF
DSCR	Foreign exchange reserve/interest payment on external debt	CEIC, IMF, Central Bank,
External debt to GDP	External debt/GDP	World Bank, Bloomberg



Figure 11: Ten-year EM USD-denominated sovereign bond spreads graphs



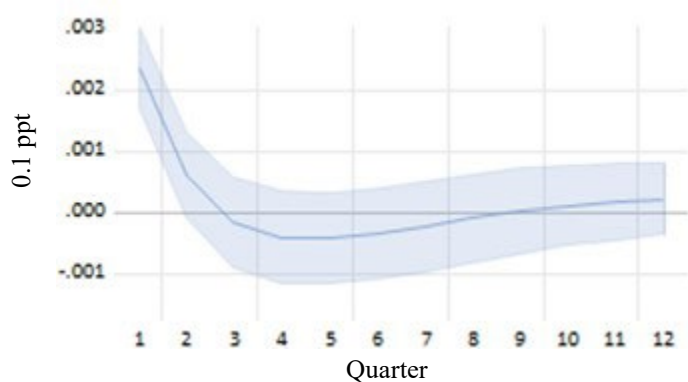


Figure 12: Impulse response of fixed and inflation-targeting regime's USD-denominated sovereign bond spreads to USD shock

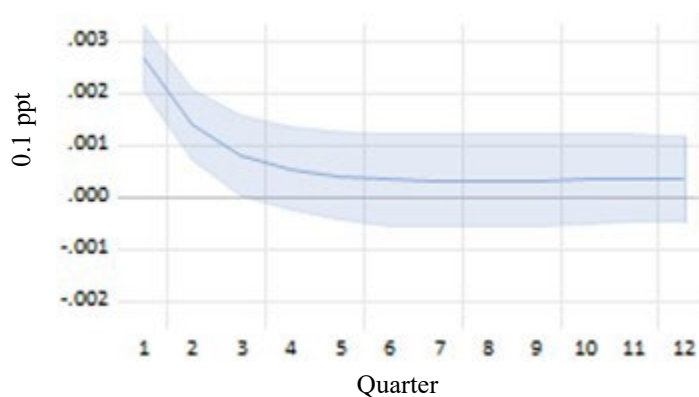


Figure 13: Impulse response of floating and inflation-targeting regime's USD-denominated sovereign bond spreads to USD shock

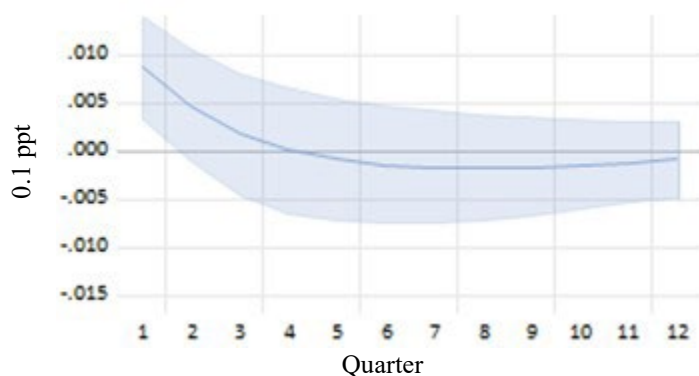


Figure 14: Impulse response of fixed and non-inflation-targeting regime's USD-denominated sovereign bond spreads to USD shock

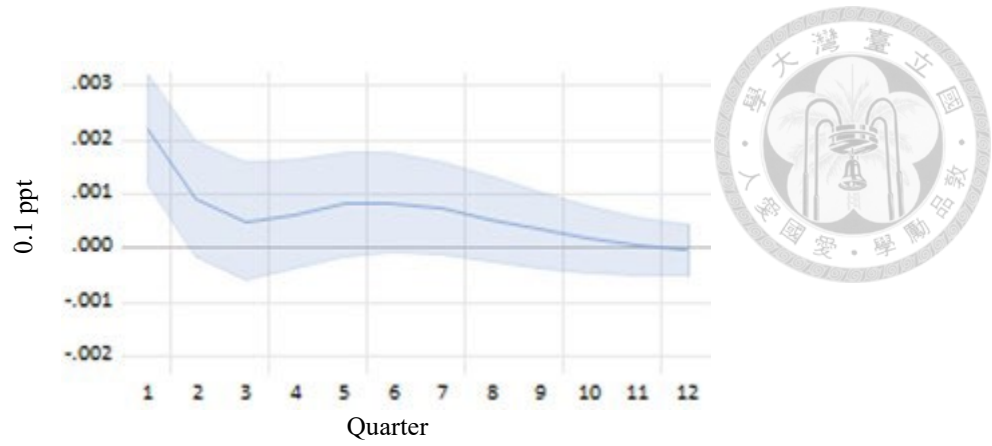



Figure 15: Impulse response of floating and non-inflation-targeting regime's USD-denominated sovereign bond spreads to USD shock



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